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Focus on

**Digital
citizenship**

EDITORS
**COSIMO ACCOTO
LUCA DE BIASE
STEFANO MORIGGI**

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BY THE ITALIAN E-LEARNING ASSOCIATION**

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EDITORIAL

Digital Citizenship

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The digital age has contributed to bringing the concept of citizenship back to the center of political and cultural, as well as educational, debate; even if – and it seems opportune to point this out from the outset – the need to qualify the horizon of reflection on citizenship with the adjective “digital”, measures the delay that still separates us from a complete socio-cultural (and therefore also linguistic) metabolization of the now widespread and pervasive presence of devices, individuals, institutions connected to the network. That said, there is no doubt that this transformational process confronts us with an

urgency that cannot be postponed any longer: a radical rethinking of the very concept of citizenship as it is still commonly understood.

And it is precisely in this direction that this special issue has set itself the objective of intercepting reflections capable of proposing attempts to revise a category that is now insufficient to describe the complexity of an increasingly connected and accelerated world. In other words, our hope is to contribute (and try to correspond thanks to the contributions of scholars of different backgrounds and training) to the need for a reconceptualisation of the meaning of the expression “being a citizen”.

An exercise, this one, fundamental in order to become ever and again aware of how the evolution, from age to age, of the very concept of citizenship has redefined and protected relations between individuals and (increasingly) also between humans, non-humans, and

the environment and the contexts that facilitate civil and sustainable forms of coexistence and coevolution.

Not only that, the hope would also be to accept the cultural challenge of those who do not reduce technologies to mere tools of use that, if well managed, can facilitate or simplify daily life practices and interpersonal relationships. Rather, it is a matter of striving to frame them in terms of genuine adaptive challenges, reacting to which we can and must all together redesign the social ontology (and the digital identity) within which to give, again and again, shape and meaning to our lives as citizens, to the labile boundary between individual and collective, public and private – not to mention between what pertains to the professions and, instead, to the leisure time of individuals.

In this perspective – in which reverberate, albeit topicalised, styles of analysis and methodological approaches in some ways indebted to media ecology – it seems more intuitive to realize how, thanks on the one hand to the space-time of a pervasive and increasingly empowered digital world, and on the other hand to the practices, relations and interactions increasingly “redesigned” by the software code (along with data, algorithms, networks and protocols), citizenship inevitably becomes plural and boundless, imposing on people a multiplicity of belongings and redesigning communities and criteria of belonging (and of marginalization or exclusion) in a variety of dimensions, both geographical and sectorial. The digital, in this sense understood as a new wittgensteinian “form of life”, is therefore envisaged as a space-time within which to go and co-design a spectrum of unprecedented strategies and alliances to inhabit the planet that the current horizon of the sense of citizenship cannot in any way contain and describe. And if, just as mentioned above, it cannot be the mere addition of an adjective – “digital” – to guarantee an epistemologically grounded integration of the traditional concept of citizenship in the light of the new scenarios that lie ahead; on the other hand, this same opportunity-necessity shows and measures how much we still have to do to culturally metabolize the digital, above all, precisely, in the perspective of a (new) planetary citizenship project (and citizenship education).

This becomes even more evident if we conceptualize this “digital turn” – as is only right – also as a horizon of meaning and practices in the making within which to try to address and manage the great challenges of humanity, the emergencies of climate, information and inequalities – all issues that require and admit solutions, or at least measures, that are both global and local. From this point of view, therefore, digital citizenship, or rather digital citizenships, become the (theoretical and practical) test-bed on which an increasingly complex society will experiment with ways of life, conditions of habitability and models of coexistence (and relations) capable of re-declining (re-evaluating its profound meaning) the

concept of democracy in (and for) the near and plausible future.

In an attempt to offer readers a more direct access to the contributions collected, it was decided to divide them into three macro-sections that in some way contribute to articulating the complexity of the theme as it has been effectively declined in this issue.

1. From Gaius to Gaia: Citizens in The Digital Age

New technologies such as programmes, data, algorithms and protocols challenge fundamental constitutional jurisdictions and human rights (from the protection of citizens’ data to people’s freedom of expression), calling for a careful investigation of current limits and remedies. But even more, the (r)evolution of digital technology pushes us to question the Western idea of society (world) and, consequently, the traditional idea of citizenship, calling for a more radical critique and hacking of human-centric citizenship.

In this first part, **Massimiliano Panarari** faces the morphing question of public sphere in the age of platformization, analyzing the hybrid nature of the current media system and the consequent emergence of a post-representational politics in which the media directly incorporate different mechanisms of representation. This, Panarari suggests, is the inescapable and ambivalent context within which we need to rethink citizenship.

Oreste Pollicino and **Federica Paolucci** explore the transforming constitutional dimension of citizenship in the digital age. Analyzing as a case study the complex applicability of the right to erasure in the algorithmic society, they illustrate in a situated way the necessary revision that awaits concepts such as identity, citizenship and the city. **Massimo Di Felice** goes beyond the anthropocentric society researching how it will be possible to engage not only human beings and digital rights but also non-human actors and networks in building a new idea of a planetary citizenship (Gaia) beyond jurisprudential heritages (Gaius). The need to go beyond the traditional and intersubjectively shared meaning of citizenship also reverberates in the text by **Daniel Villar-Onrubia**, **Luca Morini**, **Victoria I. Marín** and **Fabio Nascimbeni** who, insisting on the concept of “post-digital”, draw a new horizon of practices, knowledge and skills within which to search for new invariances for a plausible education. Which they do through the comparative analysis of twenty-four reference frameworks (for teacher competence frameworks), selected from geographical areas that differ considerably from a socio-economic as well as a cultural point of view.

2. Socialities, Urbanities, Citizenries in the Making

Social capital and civic participation feed and sustain communities and institutions. But new ways of creating and cultivating socialities (from the web to the social web and beyond) are emerging in the making of a citizen. The changing relationship between spatiality and citizenry is impacted by the morphing contemporary conditions of personal and professional lives. From urban tourists (temporary citizens) to remote workers (citizens of everywhere) to migrants, a ‘variable citizenship’ concept is invoked to face the constant weight of shifting crises, technological changes, human movements and flows. In this second part, both **Maurizio Ferraris** and **Ethan Zuckerman** study the evolution of social relations in the context of platforms that organize collective communications, deliberations and decisions, as well as everyday societal behaviors from entertainment, to education to knowledge. Ferraris, more specifically, describes the opportunity allowed by a digitally augmented ontology to transit from a system of Welfare to a system of Webfare, i.e. a recapitalisation for purely humanistic purposes of the same data that commercial platforms generate and use for liberal purposes. While Zuckerman even puts forward a “modest proposal”. In a scenario in which, appropriately, scholars monitor the potentially negative effects of platforms on the democratic life of nations, and while the relevant institutions legislate in an attempt to reduce online disinformation and ensure the transparency of the platforms themselves; citizens - as such - should progressively migrate to digital contexts that they can manage and control in order to work on building digital spaces in which they can learn and practice the democratic way of life.

Daniele Belleri, Michael Baick, Carlo Ratti discuss new forms of temporary urban citizenship (newly reconnecting civitas and urbs) produced by city stacks and logistical flows. In this re-making of socialities and urbanities, the idea of citizenry is morphing profoundly.

Instead, **Chaka Chaka** seeks to stigmatize the threats to a full experience of digital citizenship for the underrepresented communities of the Global South, placing at the center of his reflection and analysis the risks of marginalization on a global scale connected above all to the colonization of data, as well as to the (“human more than human”) prejudices that vitiate the work of algorithms. The contribution by **Wibowo Heru Prasetyo, Beti Indah Sari, Patmisari, Halimah Sa’diyah, and Noor Banu Mahadir Naidu** also deals with the difficulties of the most disadvantaged areas of the planet in acquiring the necessary preconditions to concretely develop a new widespread project of digitally (and therefore culturally) “augmented” citizenship. They do not

neglect to highlight differences and disparities – attributable to socio-cultural reasons – in the citizenship experience of a sample of Indonesian high school students who, moreover, demonstrate a good average level of digital skills. Which underlines once again – albeit implicitly – how a digital citizenship project cannot in any way be reduced to an updating, however fundamental, of technical-computer skills.

3. Designing the Digital Citizenship Education

In digital ecosystems and tech stacks, people and communities, code and software programs, data and cloud infrastructures, sensors and satellites, animals and forests, protocols and algorithms started to orchestrate complex and collaborative assemblages that sense and respond, process and learn, train and educate. In this perspective, designing the new educational practices for a digital citizenship means first of all reimagining the significance of a new more-than-human knowledge production, circulation and activation. Secondly, it means to question and hack the traditional meaning of digital citizenship moving beyond the current notion of a digitally-skilled human person to envision a more sophisticated and planetary conceptualisation of “being a citizen” of/on/for the Earth.

In this third part, **Pier Cesare Rivoltella** and **Mario Pireddu** frame and envision possible forms of citizenship design from a perspective that deeply involves education. Underlining the gap between digital citizenship in educational discourses and citizenship experience in real contexts, Rivoltella proposes a framework for a more conscious approach in educating digital citizens including different dimensions, attentions, rights and skills. Pireddu closes the loop focusing on rethinking citizenship education in a networked ecosystemic perspective as educational discourses/practices are themselves under a deep tech turn experimenting and forging new horizons.

In other contributions, appropriate training (as well as a widespread guarantee of access) to connected devices and digital contexts becomes instead an inescapable ethical strategy, as well as a political one, in order to contain risky contractions of the very horizon of citizenship - and at different levels. If, actually, **Mercedes López-Aguado, Lourdes Gutiérrez-Provecho, José Quintanal Díaz** and **José Luis García Llamas** focus their reflections and proposals on the attempt to stem the logic of progressive marginalization that affects the most fragile categories (the elderly, people with a low level of education, the sick and disabled, the unemployed and the unemployable); **Antonella Carbonaro, Jennifer A. Moss Bree Kuzelka** and **Filippo**

Piccinini bet on digitally augmented didactic innovation to realize within organizations, and in the context of a global economy, an education that aims at inclusiveness and social justice. And precisely by leveraging ethical-social assumptions set as foundational, **Massimiliano Lo Iacono**, inspired by the principles of Universal Design for Learning, proposes a model of digital citizenship education, functional to breaking down barriers and increasing awareness and responsibility. **Margherita di Stasio**, **Loredana Camizzi** and **Laura Messini**, on the other hand, find in the school a strategic training agency, and rely on the rigorous tool of analytical philosophy, identifying in the analysis of the structure of language (natural and codified) a useful starting point to start a functional literacy course for a citizenship project. Finally, transversal to all the three sections proposed above seems to be the contribution by **Eliane Schlemmer**, **Lisiane C ezar de Oliveira** and **Antonio Wilson dos Santos**, who present and analyze a project of co-creation of a Social Technological Startup. It consists of the re-invention of a dance performance under conditions of physical distance, during the pandemic. The use of mapped projection and wearable technology not only allows for unprecedented experimentation in the specific field of dance, but also opens up an unprecedented (digitally extended) experience of one's own physicality and the way of inhabiting the space of the world and thus also of learning, together with others, in the world.

INVITED PAPER

**The transformations of “public sphere” category,
and the contemporary debate about digital citizenship**

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1. Digital turn and the metamorphosis of democratic society

The *digital turn* has shaken at its foundations the «mass society», the label that entered the lexicon of social sciences in the Twentieth century, accompanying advanced industrial societies for a long time (Gili, 1990), before their transformation into post-industrial ones (Touraine, 1969). The new context in which the increasingly important role assumed by telematic technologies and Information and communication technologies has opened a profound debate around the redefinition of the concepts and practices of democracy, as well as – gradually more and more – of citizenship. The Network society, firstly described by Manuel Castells, constitutes the background (and, partially, the accelerator) of a change in the social

morphology of liberal-representative democracies. The network society constantly encourages and supports the processes of individualization and subjectivization, together with those of political personalization (Calise, 2000), «vetrinizzazione» (Codeluppi, 2021) and celebrification (Marshall, 2014). Thus, the tendency towards self-communication (Castells, 2002), has become generalized, amplified by the technological conditions of permanent connection and digital convergence, with the widespread diffusion on a very large scale and democratization of what we can call the “means of communicative production”.

A scenario whose fundamental path is that indicated by the considerations on the media of Neil Postman in his book of 1985, and which led Western societies towards the horizon of public democracy (Manin, 2010) typical of «communicative abundance» (Keane, 2013), starting with the «commercial deluge» of private television networks (Blumler, 1992) and «neo-televisione» as Umberto Eco had named it. This multiplication of channels and networks has led to the revision of some characteristics of audience democracy in the direction of post-broadcast democracy (Prior, 2007). Individual users are meaningfully part of this landscape; in the «postmodern condition» (Lyotard, 1979) and its stages they are consumers of goods and content increasingly leaning towards a personalized media diet and a “do-it-

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yourself' schedule (ensured by the horizontal media) but also at the same time producers. That is to say «consumattori», and «prosumers», according to the definition coined at the beginning of the Eighties by Alvin Toffler (Toffler, 1980), whose field of application has gradually extended to confirm a social process from considerable range.

The citizen-voters of the digital age have become «netizens», who carry out more or less assiduously, or even just casually in most cases, a series of online political participation and mobilization activities (Vaccari, 2012). Or who carry out even just episodic activation and speaking with reference to facts and events of associated and collective life or to issues of public discourse. It is one of the aspects that contribute to delineating the sphere of digital citizenship, within which a fundamental component of reflection is directed towards the transformations of the mechanisms of public opinion. Public opinion (and public sphere) became the subject, in the light of the upheavals produced by the digital turn and digital mediation (which can also be defined as re-mediation), of great attention from sociology and communication sciences – also according to the sensitivities of non-western scholars and belonging to the Global South (Shankar Pandey, 2019), as well as the “prophecies” of some media operators and professionals, such as the «end of the public debate» predicted by Mark Thompson (2016). Communication disintermediation (Ceccarini, 2015) and mass self-communication are powerful impulses that push towards disengaging public opinion, which in recent years has been increasingly involved in the process of platformization of the public sphere. The vocation and the pedagogical function of politics towards the community and the electoral body (Diamanti, 2014) are ultimately dismissed. Nevertheless, the normative model of citizenship at the origins of liberal-representative democracy – the one that can be summed up, in its evolutions, in the paradigm of the «good citizen» as an «informed citizen» (Schudson, 2010) – continues to constitute an ideal reference also within the postmodern condition and the changes in its «constellation» (Bernstein, 1994).

Claimed – often in an instrumental or “idealistic” (and “renouncing”) way – by various sectors of the political classes, highly revised and subject to considerable review by scholars in the current context of the hybrid media ecosystem (Chadwick, 2013), the category of public opinion identifies a relevant issue also with reference to the metamorphoses connected to the digital transition. In this category, however, currently it is possible to identify shifts in the meaning of some essential notions that are placed at its foundation, until the emptying of the original meaning. Linguistic and conceptual shifts so marked as to configure, at times, those that can be considered as authentic postmodern paradoxes.

2. Paths of public sphere and public discourse

Indeed, it can be said that «publicity» (inseparably linked to that of public opinion) constitutes precisely one of the most polysemic – as well as ambivalent – cultural and linguistic category of modernity. It accompanies the genesis of which, placing itself at the very sources of the “unfinished” «modern Project» (Habermas, 1962). Publicity is a foundation and an attribute of public opinion, “invented” and codified in the Age of Enlightenment, with the decisive contributions of Immanuel Kant and Jean-Jacques Rousseau (and formerly the influential theoretizations by John Locke and David Hume). A notion that, observed in the many manifestations of political communication – from electoral advertising to political journalism, from debates and television talk-shows to political-electoral marketing – has involved a variety of analysis, studies and methodological approaches, from political science to philosophy, from Michel Foucault’s lectures at Collège de France, in the 1970s, on the relationship between «discourse, truth and power» (Foucault, 1966) to Umberto Eco’s reflections on the media and mass culture (Eco, 1965), passing through the deconstructionism developed on the basis of the Heideggerian and Derridian theses.

With the affirmation of the bourgeoisie as a social class that aspired to hegemony, during the eighteenth century, an intense theoretical debate developed on the rights enjoyed by individuals and on the limits of State power. That is absolutist State, object of Thomas Hobbes’ anticipatory doctrine, which based its action on the rule of «silence and secrecy» (Rolando, 2011), destined in fact to identify a long-term permanence in the history of public administrations and to distinguish a topic which has gradually become more relevant in the discussion around the prerogatives of citizenship. Public opinion – also to be understood as a system of beliefs about public affairs (confirming its nature as an eminently polysemic category) – was essentially born in conjunction with the modern notion of a democratic and representative political regime, which the English philosopher John Locke defined as «government of opinion». It was the development and continuation of that «government of laws» which Locke has identified as one of the main ideas of the conceptual apparatus of liberalism; criticism of the cultural order and privileges determined by the status of birth also developed on his thrust.

Interests and opinions thus gradually ceased to be attributed to the class of belonging to be attributed to individuals, opening the way to the condition of bearers of individual rights, and of concepts of life and the world that were not unitary and not attributable to a grouping static and unchangeable along the time. Before these theoretical and political acquisitions, a nucleus of public opinion was discernible in the academic communities of the savants (the reference, as

a matter of course, is to extremely small and small numbers of people), who acquired, in the second half of the seventeenth century, of new editorial tools through which the linguistic monopoly of Latin was broken (Pettegree, 2015). One of the first reflections on the subject was the one developed by Locke in *An Essay concerning Human Understanding* (1690), where he attributed to public opinion a function of control within society, establishing the existence of a distinction between the «moral law» (of which public opinion was the depositary) and the «civil law», an emanation of political power. In this way, the importance of publicity – the function of controlling citizens with regard to the established power – began to assert itself. In the *Essay*, Locke stated the existence of a law of opinion and reputation that united all individuals by regulating their attitudes and behaviors. In his thinking, in this way, the conception of the limitation of power coming from constitutionalism and the long-standing one of good governance (the one practiced by the rulers of the community who knew how to be just and upright) met with the extremely original idea – conceived in the age of modernity – of the importance of the consent of the people. It was the new dimension of democratic legitimacy that will identify the source of inspiration and the thrust placed at the foundation of the eighteenth-century liberal revolutions, with which the category of public opinion, definitely formulated by the Enlightenment, will enter fully into Western political theory (also throwing a theoretical seed of future political communication). Reflections that were taken up and continued, in a perspective favorable to the privileged role of elites and optimates, by another prominent exponent of Anglo-Saxon empiricism, the skeptical and radical philosopher of the Scottish Enlightenment David Hume (1711-1776), according to which the public sphere coincided with the space (and forum) of the excellence. Just Hume – considered by some scholars the initiator of the modern doctrine of political legitimacy (Pupo, 2020) – was the creator of the famous principle according to which «every government is based on opinion» which, under the banner of some revision, will result the conceptual background of the doctrine of the founding fathers of the United States of America. It was during the decades preceding the French Revolution, as argued by Giovanni Sartori (Sartori, 1987), that the category of public opinion was defining and structuring itself for a twofold reason. On the one hand, engaged in the program of propagation and diffusion of the *Lumières*, the Enlightenment thinkers and supporters worked to form and influence the ways of thinking (the «opinions») of a smaller audience (the bourgeois classes) and, on the other hand (in very wide and extremely vast), the revolutionary ruling groups proposed, after 1789, to give life to a democratic nation and, therefore, inhabited by a people able to express their opinion (especially in political matters and public affairs). And it is precisely this cultural and political

context that prepares and lays the foundations of the category of public opinion, a construction that takes place in a “concordant” way starting from different sensibilities and approaches. From the «spirit of the laws» of Montesquieu (where «spirit» referred to the «spirit of the constitution», without any reference to that of the «people» and its metaphysical and irrationalistic structure which will dominate Romanticism) to the *volonté générale* (the general will) of Jean-Jacques Rousseau (the first to use the phrase *opinion publique*), which found its ideal declination ground within communities of a limited dimensional scale (marked by methods of direct democracy) and, nevertheless, again, it did not possess any metaphysical attributes, revealing itself on the contrary to be markedly rational, abstract and intellectualized, and clearly distant from any form of “vitalistic voluntarism”. As Sartori noted, the conception of public opinion was thus fully produced (and for the first time in the proper sense), since the two attributes of «dissemination among publics» and «reference to public affairs» were given together and at the same time.

The Locke’s differentiation was taken up by Immanuel Kant with reference to the public use of reason in all fields and spheres. In the famous paper *What is the Enlightenment* (1784), Kant was part of an intense controversy that developed in the cultural world of the time, and described the advent of the Enlightenment as the exit of humanity from the “state of minority” that it had inflicted on itself. The German philosopher asked for freedom for the public use of reason, which is not declined in the fact that decisions are taken collectively, but in the use of rational opinion that is autonomous and independent of any conditioning coming from authority. The idea of Kantian publicity was not identified with the pure saying something in public because, in a context of divergence of faculties and opportunities, the holders of power are in a position to make any declaration and announcement without having to pay consequences. Instead, he wanted to establish a public sphere of communicative action and a model of ideal communion of knowledge and discussion whose protagonists would prove to be equally autonomous (and rational); a paradigm that will form the foundation of the different visions of communicative rationality developed by Jürgen Habermas and Karl-Otto Apel. Kant reflected on publicity not in terms of a criterion of political orientation, but as opposed to politics. In another famous and subsequent text – *Perpetual peace* (1795) –, having meanwhile witnessed the epochal rupture of the French Revolution, the philosopher placed the formal character of the rules of public law in publicity. In Kant’s thought, public opinion thus ended up identifying a pillar of democracy, without coinciding entirely or tout court with representative institutions, and instead proposing itself towards them in terms of stimulus and in the name of a critical role (as evidence,

once again, of the distrust of bourgeois civil society towards the legacies of the absolutist State). Once configured as a hegemonic class, and once a paradigm and model of society had been established, it was the bourgeoisie itself that multiplied the ambivalences and ambiguities of the polysemic (and, one might add, “polypolitical”) category of publicity. As in the case of the Panopticon’s “public” and transparent prison, the easily and permanently controlled prison stemming from an idea by Jeremy Bentham - and carefully studied in terms of an original surveillance device by Foucault (Foucault, 1975). A manifestation, referring to the category of publicity, of that «logic of paradoxes» (Bencivenga, 2022) that runs through the thinking of modernity and identifies, above all, one of the most evident components of the current late phase of postmodernity.

Scientific and academic literature has systematized the link between the publicity of politics and the birth (and, subsequently, consolidation) of the public sphere; and, under the banner of different accentuations and declinations that reflect the various disciplinary approaches and methodologies, it has widely emphasized the juxtaposition in its genesis between bourgeois social classes, Enlightenment thought and political journalism (Rospocher, 2013).

In this regard, we could cite the work, significant for the communicative sciences, of the sociologist Judith Lazar (Lazar, 1995), who has identified three stages of development of public opinion throughout the history of the West (always underlining the controversial nature of this concept).

The first era coincides with the Enlightenment and the spread of its message of tension towards progress and the struggle against the obscurantism of the Ancien régime; it was the stage of formation of the bourgeois public sphere; hence the assimilation of this category to a multiplicity of concepts and narratives, from a pillar of democracy to a forum for criticism of power, and its presentation as the embodiment of the underlying values (starting from individualism and universalism) of liberal revolutions. A phase in which public opinion identifies itself *tout court* with the bourgeois classes and their galaxy of gazettes and periodicals (with the media par excellence engaged in publicity public affairs and issues worthy of note for public discourse), lounges, cafés, clubs and clubs, where dense discussions and “necessary conversations” intertwined (to use the expression of Sherry Turkle, 2016) from which the French Revolution of 1789 arose. It was a context in which the typology of interactions and relationships turned out to be typically interpersonal.

It should be noted that with reference to the philosophical profile of the relationship between democracy and public opinion – the union of the terms “opinion” and “public” as a single political concept occurs within the liberal doctrine – some scholars have made a subdivision in the course of the Eighteenth

century between two traditions (Grossi, 2004) which ended up being conflicting and incompatible. The first, expressed by English and French Eighteenth-Nineteenth-century liberal thought (and to which physiocratic economists are also attributable), considered public opinion as an essential component of the process (and flows) of democracy as an intermediate space between the electorate and the legislative power and as an area of mediation for representation (source of legitimacy for the institutions of Parliament and the government). The second tradition was a direct offspring of the Enlightenment of the philosophes (in particular of its radical orientation) and of the Revolution of 1789, and identified public opinion with an “enlightened public” and a narrow intellectual class that performs a critical and pedagogical guide in the direction of general emancipation, oriented both towards the state and the popular classes.

To return to the Lazar tripartition, the second stage, temporally located between the Nineteenth and early Twentieth centuries, saw the consolidation of collective movements (trade unions and mass parties) and the correlated structuring of a popular and class public opinion, in which communication was once again of an interpersonal type, while the main form of expression of politics (and that par excellence of a “community” type of publicity) coincided with the demonstration in the square (and the rally). The last phase outlined by Lazar, whose original characteristics were already visible during the first half of the twentieth century, and which then became unstoppable with the second, is that of the «mediatization of public opinion», the result of the progressive strengthening of cultural industry and the expansion of a collective imagination largely oriented by the logic of the vertical and top-down mass media. The media (and, in the first place, generalist television) take on an incontrovertible force in orienting and directing ideas and judgments, while at the same time a process of professionalization of the specialists in the formation of public opinion takes shape (from the commentators of the newspapers – the “pundit” – to the pollsters). Another interpretative key in the academic literature that observes public opinion as the recipient of the communicative actions of politics is – which has become classic – the study in taxonomic and classifying terms of the typologies of electoral campaigning. Among most relevant works in this field are those (considered as classics) by Pippa Norris (2000) – with the tripartition in pre-modern, modern, and postmodern electoral campaigns – and by Jay G. Blumler and Dennis Kavanagh (1999), and valid above all for the analysis of the long pre-Internet period and before the extension of the use of digital media as a function of consensus-building. A historical phase dominated, in terms of *longue durée*, by the so-called «premodern» electoral campaign, which developed from the mid-nineteenth century to 1950. It was a phase characterized by a static electorate, within a general context marked

by stable voting behavior linked to social and group divisions and political cleavages and subcultures deeply rooted in time flow and geographical space. A collective condition characterized by exchanges of opinions and unidirectional and circumscribed flows of information, strongly verticalized (often according to an ex-cathedra pedagogical logic that inspired the officials of mass political organizations and formations) and inserted within the framework of the deep crystallization of ideological narratives and political cultures. Then it was the turn of the so-called «modern» electoral campaign, in which generalist television plays a central role (from the 60s to the 80s). In general, the communicative revolution of the Twentieth century also makes itself, in part considerable, co-responsible for the more general process of mediatization of politics (Bennet & Entman, 2000), which redefines its forms and contents. The politician finds himself unable (and willing) to disregard the attention of the mass media and the visibility that they guarantee him in a phase of crumbling of traditional social classes and irreversible abandonment of ideologies, and consequently – increasingly accentuated – construction of consensus for means of personal image. The appeal to public opinion as a modality of legitimation assumes from here on a variety of formulas that gradually break away from the usual representative forms of liberal democracy to oscillate in the direction of models of neoplebiscitarianism and (self-defined) “direct democracy”, inspired from the nineties of the twentieth century to the paradigm of disintermediation.

3. The platformization of public sphere

In the cultural debate of the last twenty years, the reading of neoliberalism and its paradigm of «individualistic ideology» (Urbinati, 2012) has spread as the result not exclusively of the anthropological ideal of the homo œconomicus elaborated by the doctrines of rational choice, but of an overall interpretation based on the notion of «Hyper-Enlightenment». Its roots lie in that component of the period of the Enlightenment in which – according to scholars such as Armand Mattelart (2002) – the public sphere was formed in a substantial association with the “ideology of information”, determined by the affirmation of statistics and mathematics as tools capable of guaranteeing impartial reasoning for the management of societies. And, also, on the impulse of that utopian component of the modern project, which Mattelart has defined as the «geometric utopia of the revolutionaries».

Niklas Luhmann’s theory of functional differentiation of European societies (Luhmann, De Giorgi, 1996) describes public opinion as an extremely numerous and potentially endless succession and chain of

communications. In this interpretation it is the development of an autonomous political functional subsystem (which the German scholar identifies with the modern State) that gives rise to the public political sphere. The decisive element therefore does not coincide with an increase in the rationality rate of public opinion, but with the increasing level of contingency of the totality of subsequent communication. The basic Luhmannian postulate is that the formation of functional subsystems is found to be based on communication and observation of the first and second level of intrasystemic communication. Thus, there were a plurality and a multiplicity of pre-modern public spheres, which somehow return, under the banner of that return of certain aspects of premodernity within postmodernity underlined by various scholars – or within «neo-modernity», as they prefer to argue others (Mordacci, 2017). Modernity was characterized by connected public spheres, which in the phase of digital capitalism (Srnicsek, 2017) marked by platforms and social networks find themselves separated and fragmented as before the Enlightenment.

The technological evolutions that led to the de facto hegemony of social media (Bianco, 2019) and the increasingly accentuated logic of contamination of the hybrid media system have considerably questioned the notion of the Habermasian public sphere in the direction of its «platformization» (Van Dijck, Poell & De Waal, 2018; Sorice, 2020). In addition to a sequence of transformations that have overturned its boundaries – it should be remembered in this regard that the public sphere is precisely a spatial type metaphor (Dahlgren, 2000) – and several of the same constitutive characteristics. The current “fourth phase” of media studies (Sorice, 2020) – which investigates the forms of web 3.0, the platform society and the condition of post-truth – has analyzed the paths of the massive transition from legacy media to the fragmentation of broadcasters and of the publics at the various stages of development of the Web. It has highlighted phenomena that have a global diffusion and value similar to the increasingly horizontalized information and communication technologies that are supplanting the hitherto mainstream mass media in the preferences of use and fruition (and that are activating re-intermediation methods frequently not perceived by the public in all their scope and extent as well as in their final implications). In the wake of the spread of the effects of what was still called by some observers the “digital revolution”, literature at the turn of the decade of the 2000s highlighted the dilution and incessant fragmentation of the public sphere (Nieminen, 2008), and outlined the notion of “public horizons” (Volkmer, 2014) which, in the age of “reflective interdependence”, would open up the possibility of dynamic flows in the direction of building a «global public sphere». A conception, according to some scholars, characterized by veins of optimism to which is juxtaposed – and contrasted with – the nowadays

prevalent reading of the birth, within the fourth phase of communication of a “post-public sphere” (Davis, 2019; Schlesinger, 2020), with a pronounced transitional character (and, therefore, characterized by high instability). The hybrid media system (Chadwick, 2013) has imposed a major twist in the direction of post-representative politics (Keane, 2013), a scenario in which the media directly encompass various mechanisms of representation. An ambivalent context, in which the structural crisis of political organizations and intermediary agents gives space to innovative and original ways of political surveillance (and monitoring democracy) and, at the same time, intensifies without interruption (and without stopping) the decline of public participation and democratic mobilization as well as distrust in representative institutions; both processes associated with the evolution of communication technologies. The challenge of building digital citizenship must necessarily deal with this ambivalence.

Liberal-representative democracies thus entered «the third era of public debate» (Bentivegna & Boccia Artieri, 2021), after that of institutionalization and that of spectacularization: the stage of disintermediation. Within which public democracy is converted into public democracy, characterized by the intensification of segmented communication oriented by individual preferences and personalized media diets. Some scholars (Palano, 2020) believe that the result is a “bubble democracy” that increases the level of incommunicability and polarization and the self-referentiality of individuals, making the idea of shared digital citizenship highly problematic. Nevertheless, the plural publics as central components of a multiplicity of spaces and spheres of communicative interaction, according to various sociologists of communication (Bentivegna & Boccia Artieri, 2021), are not irreducible to each other from the communicative point of view. Even in the face of the abundance of information and an increasingly personalized offer, a common space remains, determined by hybridization and media convergence and the model of affective public (Papacharissi, 2015). A space, also, for a pedagogical (Marinelli, 2021) and sociological re-conceptualization of the contemporary forms of public opinion and citizenship along the unceasing metamorphoses of the digital age.

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INVITED PAPER

Digital constitutionalism to the test of the smart identity

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Abstract

The law has become increasingly interested in issues related to algorithmic biases and decisions, particularly from the perspectives of the collection, use, and processing of personal data. The complex constellation of fundamental rights challenged by the new technologies is opening the door to an inedited concept of identity, citizenship, and city, shortening the distances between the world of the bits and the world of the atoms. Nonetheless, the legal issues at stake are profound and involve enforcing such rights and designing proper procedural mechanisms. In this sense, a crucial role is that of the courts since they have been and are called to find new stages of protection and guarantees. Therefore, with the aim to prove the necessity of a solid and by-design procedural mechanism, this paper is going to analyze those issues through the lenses of the krasis between algorithms and freedom of expression, and algorithms and data protection, while taking as a meaningful example the difficult enforceability of the right to erasure in the context of the algorithmic society.

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1. Introduction

Between May 2017 and April 2019, the police in South Wales (UK) scanned approximately 500,000 faces while using automated facial recognition systems during public events. Technically speaking, FRT is

identifiable as a *deep learning* system and a *multilayered deep neural network*, which can be applied to many different uses: to unlock a device; CCTV cameras used to match a face with a watchlist of possible thieves; e-boarding in the airports; e-identification systems in the public administration. The applicant, Mr. Bridges, a civil rights activist, brought a judicial claim against the law enforcement body to assess the legal basis of the technology and its compatibility with the right to respect for private life (Court of Appeal, 2020). That technology was meant to capture live biometric images automatically saved in a dataset and compared with face images already collected and itemized in a watchlist. The Divisional Court rejected Mr. Bridge's claim. On a second stance, the Court of Appeal considered the issue and found that the use by the police of the facial recognition

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technology was unlawful on the ground that it was breaching the individuals' privacy and data protection rights. Remarkably, the Court found that the operation lacked a proper data protection impact assessment (DPIA), and it was insufficient to address the risks to some rights that the technology would infringe; not only on privacy but also it can produce a chilling effect on freedom of expression and freedom of association (§153).

Therefore, given «this particularly complex and difficult constellation of fundamental rights» (AG opinion, Case C-131/12, Google Spain SL, Google Inc. v Agencia Española de Protección de Datos, Mario Costeja González, ECLI:EU:C:2013:424, para 133), the challenges of new technologies and how they are complemented with the public purposes, i.e., security and public order, impose on the (digital) constitutionalist deep thoughts on the impact of such sphere in the life of citizens. Those latter ones, as a matter of fact, are rather smart citizens, since they live in a world in-between bit and atoms. Nonetheless, data, artificial intelligence, and sensors are creating an unprecedented dimension of the *res publica*, and, consequently, of the experience of being a citizen that extends the border of the atomic world. Moreover, traditional models of the city (and human living) are called upon to coexist with the network. This immensely happens, for instance, in the context of what is called the smart city, a new sphere of digital urban space is called the smart city: an umbrella term by which the further integration of digital and real space is usually understood. Beyond any dystopian scenario that such a context is capable of generating and causing one to imagine, and which is of no interest there, the core is to be found precisely in the substance that is enabling the intersection that is taking place between urban space and the network: data. The ceaseless flows of information that from Siberia to Tierra del Fuego enable our contemporary world to function in all its forms are at the heart of the city of the future so that its functioning is rooted in the combination of Internet of Things (IoT), big data, ubiquitous computing, and the cloud. All these elements are the fundamental architectures on which the (ideal) smart citizenship rests, and they are responsible for making it more open, optimizable, and, above all, controllable.

The COVID-19 pandemic has highlighted the relevance of online platforms in the information society. For instance, Amazon provided deliveries during the lockdown phase, while Google and Apple offered their technology for contact tracing apps (Privacy-Preserving Contact Tracing, *apple.com* at www.apple.com/covid19/contacttracing). These actors have played a critical role in providing services that other businesses or, even the state, failed to deliver promptly. Therefore, the COVID-19 crisis has led these actors to become increasingly involved in our daily lives, becoming part of our social structure. In other

words, their primary role during the pandemic has resulted in these actors being thought of as public utilities. Nonetheless, commentary has not been exclusively positive. The model of the contact tracing app proposed by these tech giants aroused various privacy and data protection concerns (see Daskal & Perauls, 2020). The pandemic has also shown how artificial intelligence can affect fundamental rights online without human oversight. Once Facebook and Google sent their moderators home, the effect of these measures extended to the process of content moderation, resulting in the suspension of various accounts and the removal of some content even though there was no specific reason for this (see also Dwoskin & Tiku, 2020). This situation has not only affected users' right to freedom of expression but has also led to discriminatory results and the spread of disinformation. Generally speaking, it is worth observing that the solidarity, both *infra* individuals and institution-wise, was expressed during the pandemic has also been mediated by the role of online platforms at the heart of individuals' lives and relationships.

Moreover, the increased use of algorithms to automate decision-making has sparked deep concern that such automated choices may produce discriminatory outcomes. The law has become increasingly interested in issues related to algorithmic biases and decisions, particularly from the perspectives of the collection, use, and processing of personal data. However, technological progress is, on closer inspection, putting the law in a corner from which the jurist is forced to question how AI systems integrate with the rationale of the norms for which they were intended. All without creating a context that can be to the detriment of the citizens themselves. An aspect that seems to capture the lawyer's attention is the risk that the algorithm can produce (and sometimes also reproduce) the social, racial, and gender biases in its decisions (Zarsky, 2016; Lambrecht & Tucker, 2019). Around the world, regulatory proposals are emerging to regulate artificial intelligence. Particularly, the European Union, since last April 2021, has been working on the European approach to AI with the proposal for a Regulation known as AI Act (Proposal for a Regulation of the European Parliament and of the Council Laying Down Harmonised Rules on Artificial Intelligence (Artificial Intelligence Act) and Amending Certain Union Legislative Acts, Brussels, 21.4.2021 COM 2021). This very experience requires digital constitutionalism (for a deeper inspection of the concept, see De Gregorio, 2022) to reiterate the necessary sensitivity to bridging the challenges of new technologies with the protection of fundamental rights traditionally guaranteed to analog citizens. The legal issues at stake are a lot and, therefore, they open the floor for a deeper discussion on the enforcement as well as on the procedural mechanisms of such rights, and, therefore, on the role of the courts in addressing these challenges has not lost any significance, even during the pandemic, in its

ability to resist interference from the public and private sectors. The question is whether courts will adopt new judicial frames or new strategies for dealing with the jurisdictional issue in order to address the increasing and troubling legal uncertainty surrounding new technologies. The next subsections provide an insight into the future challenges which courts will face in the field of freedom of expression and data protection. All these issues culminate in one specific and very discussed right, the right to erasure, that, in the context of AI, seems to exacerbate the challenges both to freedom of expression and data protection, being the link between the *habeas corpus* and *habeas data* (Rodotà and Conti, n. 14), since it is much entrenched with personal identity.

2. Algorithms and Freedom of Expression

The way in which we express opinions and ideas online has changed over the last 20 years. Courts have proved to have different approaches to the protection of freedom of expression online (this aspect is further explored in Pollicino, 2021). The Internet has been considered either as an opportunity by the US Supreme Court or as a threat by European courts (CJEU and ECtHR). This is no coincidence. The digital environment has indeed been a crucial vehicle for fostering democratic values such as freedom of expression (Benkler, 2006). At the same time, new threats have appeared on the horizon, leading courts to react to technology-driven changes.

At first glance, the characteristics of the Internet should have not entailed any risk for accessing information since pluralism was originally concerned with the scarcity of resources. On the other hand, in the world of atoms, one of the priorities in the media sector is to protect the pluralism of information. On the Internet, however, legal rules (and especially public law) were supposed to rely on the alleged self-corrective capacity of the market for information. Nonetheless, the evolution of the digital environment has challenged this paradigm (Valcke, Sukosd & Picard, 2015). Recently, the implementation of automated decision-making systems online has given cause for concern in terms of protection for freedom of expression.

The increasing implementation of these technologies by private actors such as search engines and social networks has led to questions as to how and to what extent automated decision-making technologies affect (or even determine) the paradigm of protection for freedom of expression online. This is not a neutral activity for the principle of the rule of law and the role of the courts as the actors called upon to express the last word when defining the boundaries of protection for rights and freedoms in the digital realm. The setting of a global private standard of protection of fundamental rights tends to create a hybrid paradigm, thus engaging

the role of courts as mediators of the boundaries between law and technology. In order to understand how automation influences freedom of expression, it would be sufficient to consider closely the way in which information flows online. One example is particularly insightful in this context: enforcement of the right to be forgotten online. Search engines rely on automated decision-making systems, which help to organize and delist the vast amount of information they host. These private (and automated) systems create a need for data protection rights to be balanced against other fundamental rights, including, in particular, freedom of expression, as was made clear in the landmark decision by the CJEU in the *Google Spain* case (Case C-131/12 *Google Spain SL and Google Inc v Agencia Española de Protección de Datos and Mario Costeja González*, ECLI:EU:C:2014:317. See Lynskey, 2015).

This decision is indeed paradigmatic of role acquired by a private actor managing a search engine to make decisions in relation to personal data, and especially to expressions. Google enjoys broad margins of discretion in deciding whether to delist information. In fact, when search engines receive a request from a data subject, they are required to decide whether to uphold or dismiss it, thus balancing and enforcing fundamental rights online (Bassini, 2019). The primary issue is that this balancing is usually performed by artificial intelligence systems, which decide to organize and delist content. The involvement of these technologies in this field establishes another layer of complexity for freedom of expression since this fundamental right is not only balanced by a private actor like a search engine but is also subject to decision-making by automated systems, the outcome of which is not always reasonable.

These considerations could also be extended beyond the right to be forgotten online. Artificial intelligence systems help to interpret legal protection for freedom of expression by de facto setting a private standard of protection for fundamental rights in the digital environment (Klonick, 2018). It would be sufficient to focus on social media such as Facebook or YouTube in order to understand how freedom of expression and artificial intelligence are intertwined in the information society (Balkin, 2018). In fact, in order to organize (Gillespie, 2018) and moderate billions of items of content every day, platforms rely on artificial intelligence to decide whether to remove content or to signal certain expressions to human moderators. The lack of transparency and accountability within decisions concerning freedom of expression online means that what happens away from the screen cannot be measured. The implementation of machine learning technologies does not allow decisions taken in relation to expressions that are still private but that involves the public at large to be scrutinized. Absent any regulation establishing legal safeguards, online platforms will continue to be free to assess and remove speech

according to their own opaque purposes (De Gregorio, 2019). Nonetheless, while US law still ensures a broad frame of protection for the Internet in general, and social media in particular, as, for instance, happened in *Packingham* (*Packingham v North Carolina* 582 US 2017), these challenges have instead led EU lawmakers to react against the power held by online platforms. By codifying some of the safeguards which the CJEU has identified in recent years in cases concerning freedom of expression online, the EU has tried to provide an initial answer to this dilemma. The adoption of the Copyright Directive can be taken as an example of a paradigm shift in that it not only considers platform liability, but also takes on board the lessons of the CJEU (Directive (EU) 2019/790 of the European Parliament and of the Council of 17 April 2019 on copyright and related rights in the Digital Single Market and amending Directives 96/9/EC and 2001/29/EC). It is no coincidence that the Copyright Directive has emphasized how obligations towards online content sharing service providers cannot overcome the ban on general monitoring (art. 17), which was firmly asserted in *Scarlet* and *Netlog* (Case C-70/10 *Scarlet Extended SA v SABAM* [2011] ECR I-11959; Case C-360/10 *Belgische Vereniging van Auteurs, Componisten en Uitgevers CVBA (SABAM) v Netlog NV* [2012] ECR I-0000). Likewise, the creation of an economic threshold as a prerequisite for applicability constitutes another important example of proportionality, which also resulted from the need to protect the freedom to conduct business on the internal market. These examples of codification can also be noticed in soft-law documents adopted by the EU Commission in recent years in the field of hate speech and disinformation, for example (see also Pitruzzella & Pollicino, 2020). It would be sufficient to focus on the Recommendation on measures to effectively tackle illegal content online as well as the EU Code of Conduct on countering illegal hate speech online in order to understand how freedom of expression online has been taken more seriously also by lawmakers (the new “Code of Practice on Disinformation” was recently published and presented at the European Commission: https://ec.europa.eu/commission/presscorner/detail/en/QANDA_22_3665).

Within this framework, the Digital Services Act will contribute to the codification of new rules and safeguards, which are also derived from EU case law (in this regard, see De Gregorio & Dunn, 2022). This change of approach might at first glance suggest a new appropriation of control over the technological factor by politicians. The new content curation safeguards should limit the role of courts in extending or narrowing the boundaries of the legal system. On the other hand, the new standards of protection are likely to result in another phase of judicial activism due to the need to fill the gaps within a legal framework, which, in the meantime, has already been superseded by new

automated technologies. In other words, the courts have been far from marginalized, at least in Europe.

Nonetheless, the potential of artificial intelligence to challenge protection for fundamental rights is not limited to freedom of expression. The next subsection shows even more clearly how automated decision-making systems raise comparable challenges in the field of data protection and, consequently, encourage courts to shape protection for fundamental rights.

3. Algorithms and data protection

The *Google Spain* case could be taken as a relevant example also in the field of data protection. Indeed, as has already been observed, this case involves not only speech, but also personal data. Nonetheless, a closer look at the field of data protection can reveal other challenges for constitutional law in the information society, mainly due to the challenges to legal certainty and the unpredictability in relation to automated decision-making processes.

Over the last few years, unlike the US Supreme Court, the CJEU has shown that it clearly intends to take data protection seriously in the light of new challenges by building a European data protection fortress. Aside from *Google Spain*, as already discussed, the CJEU has had other opportunities to highlight the role of fundamental rights online.

In *Digital Rights Ireland* (Joined Cases C-293/12 and C-594/12 *Digital Rights Ireland Ltd v Minister for Communications, Marine and Natural Resources, Minister for Justice, Equality and Law Reform, The Commissioner of the Garda Síochána, Ireland and the Attorney General and Kärntner Landesregierung, Michael Seitlinger, Christof Tschohl and Others* [2014] ECR I-238) the CJEU stressed the relevance of the principle of the rule of law in avoiding the retention of personal data by public authorities for the purposes of fighting serious crime and its role in guaranteeing the limits and safeguards recognized by EU constitutional law. This was the reason why the CJEU invalidated the Data Retention Directive (Directive 2006/24/EC of the European Parliament and of the Council of 15 March 2006 on the retention of data generated or processed in connection with the provision of publicly available electronic communications services or of public communications networks and amending Directive 2002/58/EC). The disproportionate effects of its measures and the lack of safeguards in relation to data processing could result in the surveillance of the ‘entire European population’ (*Digital Rights Ireland*, n 54, 56).

Likewise, in the Schrems saga (Case C-311/18 *Data Protection Commissioner v Facebook Ireland Limited and Maximilian Schrems*, ECLI:EU:C:2020:559; Case C-362/14 *Maximilian Schrems v Data Protection Commissioner*, ECLI:EU:C:2015:650), the CJEU went

even further in order to ensure that the need to respect EU law is not negated due to the transnational exchange of personal data across the Atlantic. It is possible to consider how the parameter of adequacy is interpreted in two ways. First of all, moving from adequacy to essential equivalence could be considered a threat to the rule of law, as an extensive interpretation may reach beyond the literal wording of the provision. Nonetheless, it could also be argued that the need to ensure effective protection for the fundamental rights of privacy and personal data in the information society has led the CJEU to extend the boundaries of fundamental rights protection in order to avoid frustrating constitutional values and, *de facto*, to set aside the principle of the rule of law.

Nonetheless, the CJEU has not solved all of the issues. As is the case in the field of freedom of expression, it is possible to consider the codification of judicial advice. More specifically, the GDPR constituted a new step in the evolution of EU data protection law (Regulation EU 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC - General Data Protection Regulation). In contrast to its approach under the Data Protection Directive adopted in 1995, which sought to achieve minimum harmonization, the EU shifted towards full harmonization by adopting the GDPR. This was not simply a formal change since the adoption of the GDPR not only avoids (potentially divergent) national implementation and fragmentation but also extends its effects horizontally into the private sector. Nonetheless, the GDPR still maintains a certain degree of discretion for Member States, which has led some to question the overall nature of the GDPR as a regulation (see, in particular, GDPR Arts 6, 9). Besides, the adoption of the GDPR does not imply that codification has solved the problem in the field of data protection and that the courts have no other roles that could be applied in place of the new EU data protection law framework. On the contrary, the courts will play a critical role in shaping a legal framework, the boundaries of which are still flexible and indirectly call for (judicial) interpretation.

This becomes evident if one focuses on issues arising in relation to new forms of automated processing that affect legal certainty and undermine the democratic safeguards that EU data protection law aims to protect. The lack of transparency and accountability in automated decision-making naturally challenges the aim of EU data protection law to ensure a transparent and fair framework for data subjects in relation to the processing of their data. Artificial intelligence is in fact proving to limit the possibilities for data controllers and subjects to carry out checks in relation to decision-making processes (Pasquale, 2015). It is no coincidence that this system clashes with the general principles of

the GDPR (Art. 5 GDPR). Specifically, the principles of lawfulness, fairness, and transparency require that personal data are processed lawfully, fairly and in a transparent manner in relation to the data subject. Nonetheless, the implementation of machine learning systems does not always allow data controllers to respect this principle. The black box effect limits the ability to look inside and understand how data inputs result in a particular output (Zarsky, 2017). Besides, the principles of purpose limitation and data minimization clash with the potential reuse of personal data for different goals by automated systems (Pasquale, 2015).

Even more importantly, the principle of accountability introduced by the GDPR requires data controllers to demonstrate compliance with the general principles mentioned above (Art. 5 (2)). For instance, the GDPR expressly requires data controllers to adopt appropriate technical and organizational measures that are designed to implement EU data protection principles in an effective manner and to integrate the necessary safeguards into processing. In addition, data controllers are also obliged to implement appropriate technical and organizational measures to ensure that, by default, only personal data that are necessary for each specific purpose are processed (Art. 25). Nonetheless, the GDPR also clarifies that, when assessing these obligations, it is necessary to take into account of “the state of the art, the cost of implementation and the nature, scope, context, and purposes of processing as well as the risks of varying likelihood and severity for rights and freedoms of natural persons posed by the processing” (Art. 24 GDPR).

The EU principles of privacy by design and by default are clear examples of the margins of discretion that a data controller can exercise in order to implement legal safeguards. Even if the data controller’s responsibility is considered, the GDPR stresses that the implementation of technical and organizational measures that are capable of demonstrating compliance with the GDPR should still be read taking into account the nature, scope, context, and purposes of the processing activities of data as well as the risks of varying likelihood and severity for the rights and freedoms of natural persons (Art. 24 GDPR). Within this context, the courts will play a crucial role in adjudicating claims that seek to scrutinize data controllers’ accountability, which would otherwise be free to decide to what extent they comply with the GDPR. With this in mind, it is likely that the courts will play a critical role in interpreting the relationship between the GDPR’s principles and norms and the implementation of artificial intelligence technologies. Similarly, the role of courts can also be understood by focusing on the rights of data subjects, especially the right of individuals not to be subject to a decision based solely on automated processing, including profiling, which produces legal effects concerning him or her or similarly significantly affects him or her (Art. 22). This

right of data subjects has been analyzed primarily from the perspective of the right to explanation (Kaminski, 2019; Roig, 2017; Wachter et al., 2017; Malgieri & Comandé, 2017; Goodman & Flaxman, 2017).

Scholars have pointed out possible bases for the right to explanation, such as those provisions requiring that data subjects receive meaningful information concerning the logic involved, as well as the significance, and the envisaged consequences of, processing according to Articles 13 - 15 GDPR. In addition, the new rights provided for under the GDPR (including data portability and right to erasure) have been pinpointed as offering some legal grounds for broader control by individuals over the automated processing of personal data. This catalogue of guarantees can be better framed having regard to Recital 71 of the GDPR, which provides as follows: “in order to ensure fair and transparent processing in respect of the data subject, taking into account the specific circumstances and context in which the personal data are processed, the controller should use appropriate mathematical or statistical procedures for the profiling, implement technical and organisational measures appropriate to ensure, in particular, that factors which result in inaccuracies in personal data are corrected and the risk of errors is minimised, secure personal data in a manner that takes account of the potential risks involved for the interests and rights of the data subject, and prevent, inter alia, discriminatory effects on natural persons [...] or processing that results in measures having such an effect”.

Within this context, transparency and accountability play a pivotal role. Since ensuring full transparency may prove to be difficult in this context, due to the protection afforded by legal systems to algorithms (eg through the legal protection ensured for trade secrets), courts (and data protection authorities) are likely to shape the meaning of transparency and accountability within automated decision-making systems. More specifically, this right of data subjects raises various interpretative issues, even beyond the debate on the right to explanation. Indeed, it is not easy to ensure legal certainty within this framework where there is no definition of the expression ‘solely on automated processing’ or of ‘legal effects concerning him or her or similarly significantly affects him or her’, as affirmed by the same Recital 71 of the GDPR.

The lack of clear definitions constitutes a clear challenge, which the courts will need to deal with, considering the extensive implementation of artificial intelligence technologies and the multiplicity of situations in which these systems can have legal effects on individuals. The GDPR has tried to establish some limits to the application of this right. Specifically, data controllers can rely on various exceptions where processing is necessary for entering into, or performance of, a contract between the data subject and a data controller; is authorized by Union or Member

State law to which the controller is subject, and which also lays down suitable measures to safeguard the data subject’s rights and freedoms and legitimate interests; or is based on the data subject’s explicit consent (Art. 22 GDPR). Nonetheless, the GDPR also allows Member States to limit the application of this right of data subjects (Art. 23). This is an issue that reaches beyond technology and affects the entire structure of the GDPR. Despite its status as a regulation, it leaves the Member States broad margins of discretion at the domestic level (Malgieri, 2019). Within this framework, the role of judicial interpretation is likely to provide assistance in making policy decisions, leading to a further extension of judicial power over political power.

4. The case of the right to erasure

In the previous sections, it was given a brief overview of the main issues related to the relationship between algorithms, freedom of expression, and data protection. All these rights and issues come at stake when considering the realization of the right to erasure, as protected under art. 17 of the GDPR, in the context of AI (Floridi et al., 2022) and, particularly, machine learning (Black & Murray, 2019).

The right to erasure (or right to be forgotten) relies upon the assumption that someone’s past does not clutter up someone’s present. Therefore, the substantial “immortality of data” implies that these, if not updated, are destined to remain “frozen” at the very moment they are entered into the data life cycle. In an *onlife* landscape such as the one described, in which the information entered tends never to change, merely accumulating in a non-organic way, there is a risk that a person’s identity has no way to ever evolve because it is crystallized, immobilized in many single instants of one’s life.

This is why the right to erasure appears to be a vital tool for the future of contemporary society. It is also a very interesting procedural mechanism in the middle of the two souls of European privacy. Indeed, the Charter of Fundamental Rights of the European Union 2012/C 326/02 protects the right to privacy under Article 7 and the protection of personal data as enshrined in Article 8 (privacy and protection of private life as protected under art 7 relates to the management of personal information. Then, data protection, under article 8, provides safeguards for individuals while maintaining control of their data). The latter recognized the constitutional status of the right to data protection and also resulted in a shift from a mere economic dimension, as protected under Directive 95/46/EC, to a more comprehensive concept (as mentioned, R. Post underlined these dual conceptualisations of privacy, in particular under the lenses of the Google Spain judgment. Data privacy recalls a concept of fair

processing of information and adequate measures of personal data protection, the former refers to the idea of dignity and protection of personal identity and private life. Hence, Post's conception of the right to be forgotten is distinguishing between data privacy, as protected under article 8 of the CFEU, and dignitary privacy, as protected by article 7 CFEU).

Before examining the premises for submitting an erasure request, it is crucial to distinguish between the right to erasure and the right to be forgotten. Those are frequently confused, and the GDPR does not help since it puts together the two under the same article. These two souls clearly emerged in the ECJ famous judgment known as Google Spain (as it is known, this right was much developed in the well famous case Google Spain SL, Google Inc. v. Agencia Española de Protección de Datos - AEPD, Mario Costeja González, Grand Chamber, 13 May 2014, C-131/12. It is not the purpose of this paper to delve into this judgment. For a more in-depth analysis, this paper refers back to Pollicino, 2021), and were transposed in article 17 of the GDPR, which protects the right to be forgotten. However, this right, as developed from the looked (or under-examined) conflicts by the Court of Justice (see Pollicino & Bassini, 2014), is not meant to grant the erasure of information but their deindexing or de-listing (see Werro, 2009). In fact, the demand was not to erase data but suppress certain hyperlinks from the public result.

Therefore, the right to erasure as protected by the GDPR has a different meaning, at least on the paper. Article 17 of the GDPR grants the data subject the right to obtain the erasure of the data from the controller. The data controller proceeds with the erasure when some legal requirements are met. Namely, under European data protection law, deletion rights can be actioned in situations where the data has been processed illegally, when the consent has been withdrawn, or data are no longer necessary to fulfill a series of obligations (see article 17 par. 3 lists the grounds under which the processing is still considered necessary). Hence, the goal of the right to erasure is to re-balance power between data subjects and data processors. The data subject herewith becomes a right holder over his personal data (Tamò & George, 2014). When a data subject asks for erasure, the most reasonable circumstance is (or it should be) when data are improperly gathered, as established under article 17 para. 1 lett. d) of the GDPR (see also Guidelines 5/2019 on the criteria of the Right to be Forgotten in the search engines cases under the GDPR part 1 adopted on 2 December 2019). However, as explained, granting such a result is not as easy as it may seem when data are processed within AI systems. Moreover, in this sense, the right to erasure goes hand in hand with the already mentioned minimization principle. It states that data should not be retained for longer than is necessary. However, also this latter aspect should need a reloading

in order to make of the data minimization a practical tool and not just a hollow principle, as pointed out by Solove (2022).

This aspect should not be confused with the right to rectification or objection (Ausloos, 2016). The right to erasure is a weapon in the hand of the data subject; the data retention obligations, instead, are requirements to which the data processor is bound independently from the data subject's request.

On the opposite stance, the right to be forgotten (some scholars refer to it as the right to oblivion, Tamò & George, 2014) is not about removing data, but, as it was premised, it is connected with the right to control one's information. Hence, the right to be forgotten requires removing personal data from information tools or search engine results if an individual makes a valid request. The difference is not only semantic but logical. On the one hand, the right to erasure is a bureaucratic request to have data subject's data deleted or destructed; on the other hand, the right to be forgotten, profoundly linked with the expression of one's identity, is a request to be left alone (not by chance the referral is to the very first concept of privacy, as elaborated by Warren & Brandeis, 1890). It involves control over information privacy rather than the exercise of compliance data protection rights. As a result, the European privacy souls are reflected as protected under the Charter of Fundamental Rights of the European Union.

In fact, the right to be forgotten is not really about removing data. Nevertheless, it is a request that addresses the prohibition of search results to show a given piece of information and, more broadly, information dissemination. Hence, under the GDPR formulation, there is very little space for a right to be forgotten which means *oblio* (oblivion) since article 17 only involves a right to erasure. The intention of the European legislator, by putting under parenthesis the referral to the right to be forgotten, seems to give voice to both the perspective, at least in the *ratio legis*.

Out of the theoretical conflict, the main problem concerning the right to erasure (or the right to be forgotten) relies on the complexity of real-life tech and compliance environments. As it was previously announced, the practical realization of this right seems quite far from being achieved. The vagueness of Article 17, the comprehensive circumstances under which this right does not apply (para 2 and 3), and the technical neutrality of the norm, are just some of the issues at stake when it comes to the right to erasure.

Lastly, the fact that the word itself "erasure" does not clarify what the data processor demands to comply with the data subject's request (Villaronga et al., 2018). This is not a compliance problem only, but it also exposes the data processors to Authorities' sanctions (furthermore, regarding this latter aspect, the European Data Protection Board recently published the 'Guidelines 04/2022 on the calculation of

administrative fines under the GDPR', open to public consultation, adopted on 16 May 2022). This aspect has at least two chilling effects. On the one hand, it can harness innovation and tech investments in the European market; on the other, it leaves space for even more opaque data processing and the adherence to middle-ground solutions that are unsatisfactory from either compliance or protection of fundamental rights. The risk relies on the reproduction of algorithmic shadow, meaning "the persistent imprint of the data that has been fed into a machine learning model and used to refine that machine learning system" (Li, 2022). Hence, even if data are deleted, at the state of the art of the current technical and regulatory framework, the machine can reproduce that same result since the act of deletion is not attacking the set on which it has been trained. Therefore, the following paragraph will further point out the main legal clashes in enforcing the right to erasure in machine learning systems.

4.1. "Lost in translation": a primer on machine unlearning helplessness under article 17

Machine learning outcomes are the result of statistical inferences (Floridi et al., 2022). When machine learning systems are involved, another aspect that makes the request for deletion difficult is identifying the data set that should be ultimately deleted. As a matter of fact, the programmers of contemporary machine learning systems create sets of data to be used as training data. On the base of this data set – which can be filled with both personal and non-personal data – the machine is requested to run the algorithm on the training data and to achieve a given goal by finding common patterns and producing a model that can be further deployed to achieve the ultimate goal and outcome. Hence, in this complex pattern, some questions emerge. When the data processor receives a request for erasure from the data subject, which kind of data is to be deleted? From which datasets? And, more importantly, how to actually obtain the erasure? Notably, in the case of different datasets, it is natural that personal data may be involved both in the training set and in the analysis set. It is to be said now that there are no crystal-clear answers to these questions (the issue will be further analyzed in the second part of the research project, also by running some empirical research in collaboration with data scientists). Some technical remedies are proposed, such as anonymization of data, functional encryption, selective amnesia, and model breaking [the author is primarily relying on the findings proposed by Villaronga et al. (2018). Other technical measures are studied in the following papers, (Cabral, 2020; Greengard, 2022)]. However, none of them seem to tackle the core of the problem: to clarify the extent of the right to erasure in the machine learning perspective.

Particularly, as mentioned above, there are some very technical specificities in the governance design of AI

that are hard to reconcile with the GDPR. Another huge issue is to be found in the current lack of legal certainty as to how AI can be designed in a manner that is compliant with the regulation is not just due to the specific features of data protection rights. Moreover, this tension between GDPR and machine learning happens since the latter are designed to render the (unilateral) modification of data difficult. This matter is hard to reconcile with the GDPR's requirement that personal data be erased when specific circumstances apply (this aspect does not emerge only about machine learning but also with blockchain technology, as pointed out by Michele Finck in the study conducted for the European Parliament. Directorate General for Parliamentary Research Services, 2019).

Hence, there are three main relevant conceptual uncertainties threatening both data subjects' rights and processors' obligations.

First and foremost, many uncertainties rely on the term "erasure." Deleting data from machine learning data sets is burdensome since it implies retraining the entire model. It does not "address the underlying problem of making sensitive data disappear or become completely untraceable" (Greengard, 2022).

Secondly, it is challenging to demonstrate that the retrained model is fully corrected. Namely, it has been cleaned up from the wrongfully obtained data, and the biased are not reproduced. Technical factors and governance design thus burden the difficulty of complying with Article 17 GDPR. Indeed, even if there would be a means of ensuring compliance from a technical perspective, it may be organizationally tricky to reach out to all the datasets.

Thirdly, because of a certain degree of unpredictability and autonomy is frequently challenging to find who the liable party in the case of damage caused by artificial intelligence applications is. In particular, it is to look at those situations in which the outcome of the processing carried out by the artificial intelligence is not fully controllable *a priori* (in this regard, in fact, there is a part of the literature that reflects on the establishment of a new AI liability, see *ex multis* Bassini et al., 2018). Moreover, according to the principle of accountability is the processor's duty to identify "taking into account state of the art, the costs of implementation and the nature, scope, context, and purposes of the processing, as well as the risk of varying likelihood and severity for the rights and freedoms of natural persons, the controller, and the processor, shall implement appropriate technical and organizational measures to ensure a level of security appropriate to the risk" (see article 32 of the GDPR. Moreover, it is to note that the right to erasure obligation imposed is an obligation of means and not an obligation of ends). Hence, the legislator delegates to the data processor the burden of identifying how to fulfill the requirements dictated by the rule, dropping them into the concrete case, and taking responsibility not only for implementation but

also for evaluating the risks. Those aspects emerge when the processing is not linear and involve data controllers and sub-controllers since, often, their contracts establish the execution of some data subject's rights, including the right to erasure. Therefore, the logic of accountability is challenged not only on the crowded level of responsibilities arising from the regulation but also in the case of assigning responsibilities to the presence of automated decision-making (see, in particular, Grozdanovski, 2021). Lastly, Article 17 reflects a sense of data memory that relies on humans, not the somewhat different machine memory.

All these aspects that have been listed here involve several uncertainties in interpreting and applying GDPR, especially the right to erasure, posing a strong interpretative work on the courts. This creates a deficiency in the norm that states the European status of privacy as the First Amendment (Petkova, 2019) and provokes a burden on the data processors, typically private actors, which are demanded to find a way to achieve this goal, technically and legally. As was previously mentioned, this opaque situation also affects the rights of the data processor. As a matter of fact, and, particularly with regard to facial recognition systems, it is possible to observe a trend followed by many European – and not only (see the Federal Trade Commission sanction in the case *Everalbum, Inc.*, also *d/b/a Ever and Paravision*, decision and order docket no. c-4743/2021) – authorities that are sanctioning companies that collected face data asking for their deletion. Since, as noted above, it is highly complex to ensure erasure of some kind, such a sanction seems to go to exacerbate those opacities that already in themselves put the rights of individuals at risk, going to undermine the true *ratio* for sanctions: namely, to be effective, proportionate, and dissuasive (Article 29 Data Protection Working Party, 'Guidelines on the application and setting of administrative fines for the purposes of the Regulation 2016/679', adopted on 3 October 2017).

5. Digital Constitutionalism in Action: Which Remedies can be Invoked against the Emergence of Digital Private Powers?

In the light of the context set out above, in which the judicial enforcement of fundamental rights is strictly connected with the new challenges of digital constitutionalism, one particular question needs to be addressed (and possibly answered): which remedies should be available to achieve the aims of this new round of modern constitutionalism, with specific regard to the rise of new private powers in competition with public authorities?

Two possible remedies can be identified. The first concerns the possible horizontal application of

fundamental rights vis-à-vis private parties. The second focuses instead on the path that could be followed in the new season of digital constitutionalism and will explore, in particular, the possibility that a constellation of new rights could be identified to deal with the new challenge posed by algorithms. In other words, the Easterbrook dilemma between the 'law of animals' and the 'law of horses' will be considered from both sides. On the one hand, the horizontal effects doctrine focuses on existing instruments applied to new (digital) legal challenges. On the other hand, calls for the introduction of new rights arise out of the opposite trend, which seeks to rethink categories by providing new substantive and procedural safeguards.

The suitability of these two remedies will be assessed by considering each of them in turn, starting with the issue of the possible horizontal application of fundamental rights. It is evident that, in order to understand the feasibility of such remedies in the context of new digital challenges, it is important to take a step back and explore briefly the theoretical foundations of the issue.

A good starting point could be Alexy's assumption that the issue of the horizontal effect of fundamental rights protected by Constitutions (and Bills of Rights) cannot be detached in theoretical terms from the more general issue of the direct effect of the same rights (Alexy, 2002; Romeo, 2018). In other words, according to the German legal theorist, once it is recognised that a fundamental right has a direct effect, that recognition must be characterized by a dual dimension. The first, vertical dimension concerns the classic relationship of 'public authority vs individual freedom', while the second, horizontal dimension focuses on the relationship between private actors, but also, as mentioned above, the much less classic relationship between new private powers and individuals/users.

The problem with Alexy's assumption, which is quite convincing from a theoretical point of view, is that the shift from the Olympus of the legal theorist to the arena of the law in action risks neglecting the fact that the approach of courts from different jurisdictions might be quite different as far as the concrete recognition of the horizontal effect of fundamental rights is concerned. This should not come as any surprise because the forms and limits of that recognition depend on the cultural and historical crucible in which a specific constitutional order is cultivated.

As far as the US is concerned, the state action doctrine apparently precludes any possibility to apply the US Federal Bill of Rights between private parties and consequently any ability for individuals to rely on such horizontal effects, and accordingly to enforce fundamental rights vis-à-vis private actors (Gardbaum, 2003; Tushnet, 2003; Huhn, 2006). The reason for this resistance to accepting any general horizontal effect on the rights protected by the US Federal Bill of Rights is obviously that the cultural and historical basis for US

constitutionalism is rooted in the values of liberty, individual freedom, and private autonomy. The state action doctrine is critical to understanding the scope of the rights enshrined in the US Constitution. Indeed, were the fundamental rights protected by the US Constitution to be extended to non-public actors, this would result in an inevitable compression of the sphere of freedom of individuals and, more generally, private actors. For instance, such friction is evident when focusing on the right to free speech, which can only be directly enforced vis-à-vis public actors.

Historically, the state action doctrine owes its origins to the civil rights cases, a series of rulings dating back to 1883 in which the US Supreme Court recognized the power of the US Congress to prohibit racially-based discrimination by private individuals in the light of the Thirteenth and Fourteenth Amendments.

Even in the area of freedom of expression, the US Supreme Court extended the scope of the First Amendment to include private actors on the grounds that they are substantially equivalent to state actors. In *Marsh v Alabama* (326 US 501, 1946) the US Supreme Court held that the State of Alabama had violated the First Amendment by prohibiting the distribution of religious material by members of the Jehovah's Witness community within a corporate town, which, although privately owned, could be considered to perform a substantially recognizable 'public function' in spite of the fact that, formally speaking, it was privately owned. In *Amalgamated Food Emps Union Local 590 v Logan Valley Plaza* (391 US 308, 1968), the US Supreme Court considered a shopping center similar to the corporate town in *Marsh*. In *Jackson v Metropolitan Edison Co* (419 US 345, 1974), the US Supreme Court held that equivalence should be assessed in the exercise of powers traditionally reserved exclusively to the state. Nonetheless, in *Manhattan Community Access Corp v Halleck* (587 US, 2019), the US Supreme Court more recently adopted a narrow approach to the state action doctrine, recalling, in particular, its precedent in *Hudgens v NLRB* (424 US 507/1976).

This narrow approach is also the standard for protecting fundamental rights in the digital domain and, consequently, the US Supreme Court would seem to restrict the possibility to enforce the free speech protections enshrined in the First Amendment against digital platforms, as new private powers. More specifically, and more convincingly, it has been observed by Berman that the need to call into question the implications of a radical state action doctrine (Berman, 2000) can lead, in the digital age, to the transformation of cyberspace into a totally private 'constitution free zone' (Bassini, 2019, p. 182). Balkin has highlighted a shift in the well-established paradigm of free speech, described as a triangle involving nation-states, private infrastructure, and speakers. In particular, digital infrastructure companies must be

regarded as governors of social spaces instead of mere conduit providers or platforms (Balkin, 2012). This new scenario, in Balkin's view, leads to a new school of speech regulation triggered by the dangers of abuse by the privatized bureaucracies that govern end-users arbitrarily and without due process and transparency; it also entails a danger of digital surveillance that facilitates manipulation.

Shifting from the US to Europe, the relevant historical, cultural and consequently constitutional milieu is clearly very different. The constitutional keyword is *Drittwirkung*, a legal concept originally developed in the 1950s by the German Constitutional Court, which presumes that an individual plaintiff can rely on a national Bill of Rights to sue another private individual alleging the violation of those rights [The *Lüth* case concerned a *querelle* about the distribution of the anti-Semitic movie *Jüd Jüss* in a private location. Following the conviction, Lüth appealed to the German Constitutional Court complaining of the violation of her freedom of expression. The German Constitutional Court, therefore, addressed a question relating to the extension of constitutional rights in a private relationship. In this case, for the first time, the German court argued that constitutional rights not only constitute individual claims against the state, but also constitute a set of values that apply in all areas of law by providing axiological indications to the legislative power, executive, and judicial. In the present case, the protection of freedom of expression develops not only vertically towards the state, but also horizontally since civil law rules must be interpreted according to the spirit of the German Constitution. German Constitutional Court, judgment of 15 January 1958, 1 BvR 400/51]. In other words, it can be defined as a form of horizontality in action or a total Constitution (Kumm, 2006). It is a legal concept that, as mentioned, has its roots in Germany and then subsequently migrated to many other constitutional jurisdictions, exerting a strong influence even on the case-law of the ECJ and ECtHR (*X and Y v The Netherlands*, App no 8978/80, Judgment of 26 March 1985).

It should not come as any surprise that a difference emerged between the US and European constitutional practice as regards the recognition of horizontal effect on fundamental rights. As noted above, individual freedom and private autonomy are not constitutionally compatible with such recognition. On the other hand, however, human dignity as a super-constitutional principle supports such recognition, at least in theory (Dupré, 2016).

However, as mentioned above, it is also worth reaching beyond the debate on horizontal/vertical effects of fundamental rights in the digital age in order to propose an alternative weapon for the challenges that will need to be faced during the new round of digital constitutionalism. Most notably, it is necessary to propose a frame that describes the relationship between

the three parties that Balkin puts at the heart of the information society: platforms, states, and individuals (Balkin, 2012). In other words, a digital habeas corpus of substantive and procedural rights should be identified, which can be enforced by the courts as they are inferred from existing rights protected under current digital constitutionalism (De Gregorio, 2019, 2022). While substantive rights concern the status of individuals as subjects of a kind of sovereign power that is no longer exclusively vested in public authorities, procedural rights stem from the expectation that individuals have to claim and enforce their rights before bodies other than traditional jurisdictional bodies, which employ methods different from judicial discretion, such as technological and horizontal due process.

If, on the one hand, this new digital *pactum subjectionis* requires new rights to be recognised and protected, it is also necessary to understand how their enforcement can be effective, how they can actually be put into practice. In other words, it is necessary to couple the claim for a new catalogue of substantive rights with the need for certain procedural guarantees that allow individuals to ensure that these ‘quasi-legal’ expectations can actually be met. Therefore, it is necessary to speculate also on the ‘procedural counterweight’ to the creation of new substantive rights, focusing on the fairness of the *process* by which individuals can enforce them. In fact, since speculation has hitherto focused on the exercise of powers, there is no reason to exclude from the scope of procedural guarantees those situations in which powers are vested in private bodies charged with the performance of certain public functions (della Cananea, 2016).

Digital platforms can be said to exercise administrative powers that are normally vested in public authorities. However, considering how rights can be exercised vis-à-vis these new actors, vagueness and opacity can still be discerned within the relevant procedures. Among others, the right to be forgotten clearly shows the lack of appropriate procedural safeguards, since steps such as the evaluation of a delisting request and the adoption of the relevant measures (whether consisting of the removal of a link or confirming that it is lawful) rely on an entirely discretionary assessment, supported by the use of algorithms. Therefore, the merely horizontal application to the fundamental right to data protection enshrined in Article 8 EUCFR does not prove to be satisfactory. Moreover, the notification and take down mechanisms implemented by platforms hosting user-generated content do not entirely fulfil the requirements of transparency and fairness so as to render the status of the user/individual enforcing his/her rights vis-à-vis these platforms comparable to the status of citizens exercising their rights against public authorities. It is argued that the time is ripe for filling this gap.

Procedural rights will play a pivotal role in ensuring that these new substantive rights are actually protected

and rendered enforceable vis-à-vis emerging private actors. Within the context of research into big data and predictive privacy violations, such as the case of the right to erasure witnesses.

6. Conclusion

In the right to erasure and the right to be forgotten saga, the European Court played a crucial role in defining a high standard under EU Law to protect fundamental rights of privacy and data protection by distinguishing the latter’s protection from the former. However, it is now time to consider the risks of such an approach. Risks are reflected by the mentioned issues on stretching the stitches of the right to erasure within machine learning systems. Unlike the past, the current challenges do not seem to be controlled under the previous framework but, on the contrary, it poses new issues that must be solved with new perspectives (Custers, 2022). It is definitely not possible to treat machine memory as human memory.

In light of the analysis so far, there seems to be little doubt that the right to erasure has many legal – and technical – issues being applied in the case of personal data processed by machine learning systems. Therefore, the *krasis* between the data protection framework, the protection of individuals’ private lives, and the safeguard of economic rights are incredibly challenged by the need and the novel relationship created by AI. At the state of the art, the two systems are “lost in translation,” and this missing bridge directly threatens the individuals’ human rights and the safe development of machine learning systems (a new duty of privacy loyalty as in the words of Richards & Hartzog, 2020). The European data protection laws, abstractly the best possible model, often turn out to be inadequate in providing adequate protection and ineffective. This is all the more so when confronted with artificial intelligence applications in which the *a priori* determinability of computing processes is not apparent. The purpose of processing is often unclear. Hence, the reloading of the right to erasure is the vessel of a new culture of privacy that sheds light on the need for a new model that considers these challenges from another perspective.

This cultural evolution is the necessary and natural continuation of the transition between the proprietary model based on informational self-determination (*ius excludendi alios*) (Soro, 2021), to another paradigm based on the promotion and free development of personality, including in all social formations it takes place.⁹⁷ This revolution must necessarily rethink the relationship between data and artificial intelligence and, therefore, the dichotomy of personal and non-personal data, seeking to understand how the latter can provide valuable information that makes up an individual’s identity. Only by making this shift will it

be possible to make the substantive and procedural protections already provided for personal data protection – including the right to erasure – effective for AI. On the contrary, this crystallization will only impose models designed for different eras and technologies on a world where these metaphors no longer seem to belong, eroding the soundness of an entire mechanism at the expense of protecting fundamental rights. Within this framework, both the horizontal effect doctrines and new substantive and procedural rights seem to be promising candidates among the available remedies to be necessarily included in the AI Act. In the face of these challenges, the courts will likely by no means lose the predominant role over political power acquired in recent years. The challenges raised by new automated technologies can potentially operate as a new call for courts to protect fundamental rights in the information society.

Notes

The paper is the result of the idea of both the authors. However, para. 2, 3, and 5 are ascribable to Oreste Pollicino and para. 4 and 4.1 to Federica Paolucci. Paragraphs 1 and 6 are attributable to both the authors.

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INVITED PAPER

Digital citizenship and the end of an idea of world

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Abstract

The western idea of society, founded on a contrast between citizens and limited to the cohabitation of human subjects, just as the idea of citizenship is based on the fundamental rights of people, faced with the challenges of the pandemic, of the climate change and those posed by the latest generation of intelligence network, turns out to be inadequate. The digital citizenship of today is the research area in which to search for the overcoming of the Western political project and to begin a new culture of governance within complex networks characterized by interactions within an architecture that is no longer composed either of subjects nor objects. The present article, starting from the analysis of the digital protagonism of the non-human, present the possible meanings of the crisis of the western idea of the world.

KEYWORDS: Digital Citizenship; Non Human Networks; Digital Governance; Datafication.

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the hyperobject itself. These exist on profoundly different temporal ladders from those we are used to as human beings. Hyperobjects have already had a significant impact on human space, both at a psychic and social level. They are directly responsible for what I call the end of the world."

1. The protagonism of non-humans

At the beginning of the third millennium, we are faced with some events that seem to definitively alter our lives, imposing profound changes on us whose characteristics defy our understanding. These are events that appear to us as autonomous and in the face of which we find ourselves almost powerless, given their size and scope. It is not about external realities or events, as their impacts are also revealed within us, reaching all areas of our lives. Timothy Morton (2018) describes our contemporaneity as characterized by the advent of "hyperobjects":

"hyperobjects are non-local: any local manifestation of a hyperobject is not directly,

The intensity and proportions of these events force us to make qualitative changes. In our contemporaneity, we seem to be changing our living condition and entering another type of ecology within which we must learn to dialogue and interact with non-human entities and actors.

A first example is the pandemic which caused deaths, changed our daily lives, and paralyzed the entire world economy, generating fear and instability in all the populations on the planet. A virus, a small entity that lodges itself in our bodies, has produced a particular type of transformation that develops from within our organism and that produces effects on social relations, the economy, national and world politics and in all spheres of our reality. An invisible actor, not foreseen or contemplated in sociology manuals and economic

treaties, but extremely powerful and active, capable of acting, at the same time, at an economic, political, and social level, and also at an organic and biological level.

A second event that carries profound transformations is related to climate change; that is, to the process of global warming caused by CO₂ emissions, the greenhouse effect, caused by the impact of the energy model created by our economic structures of production and consumption. The rise in temperature and its consequences, such as the melting of ice layers and the rise of sea levels, as well as the advent of major climatic events, have become the horizon of our time. Finally, a third event that seems to characterize our contemporaneity is the sudden technological innovation that seems not to stop producing changes and transformations in our societies, in our habits and in our lives. The evolution of digital networks and the progressive expansion of forms of connectivity, which, after humans began to network things (Internet of things), data (Big data) and biodiversity (sensors and GIS), determined the passage of disseminative communicative forms for practices of interactions in automated environments and ecologies. If, in the first, communicative processes were narrated as practices of content transfer through media and communicative technologies, in the latter, the qualities of interactions, more than centered on the content of humans, become the result of inhabiting, no longer transmitted, but built in symbiosis with software and algorithms and, in part, developed autonomously by Big Data (Accoto, 2019).

The latest generations of networks and the digitized environments of interactions, platforms, blockchain, info-ecologies (Di Felice, 2020), refer us to a particular type of automatism that is no longer technical or mechanical, but the result of data processing and reproduction of data sequences (Campagna, 2021). In these contexts, we experience interactions with entities of different types (data, algorithms, software) that, instead of obeying our commands, offer us a dialogue and a relationship capable of providing us with an “ambience” and a particular “living condition” (Di Felice, 2016).

The virus, the weather, the latest generation digital technologies, express the advent of a protagonism of non-humans, which appears to us as a characteristic of our contemporaneity and which probably marks the arrival of a new type of common in which humans and non-humans interact and dialogue with each other.

The literature on the protagonism of the non-human interests several fields of knowledge. Within the scope of the history of philosophical thought, we find some first important examples in medieval thought, as in the case of the philosophical writings of S. Bonaventura, who considered each element of creation, nature, stones, plants, as part of creation, an emanation of God and bearers of the same dignity. But it will only be in the last few decades that some explicit examples of philosophical reflection on the argument have been

recorded. First, the work of Italian philosopher Mario Perniola who, in his text *The Sex Appeal of the Inorganic* describes the change in action in philosophical thought:

“Having exhausted the great historical task of comparing man to God and to the animal, which in the West began with the Greeks, what claims our attention now and raises the most urgent question is the thing (...) Upon the vertical movement, rising toward the divine or descending toward the animal, follows a horizontal movement toward the thing. It is neither above nor under us, but beside us, to one side, around us” (Perniola, 1994, p. 6).

A few decades later, Graham Harman, in his work *Object-Oriented Ontology*, inspired by a free interpretation of M. Heidegger’s thinking about the thing, invites us to think about the thing from its autonomous perspective:

“will be no further progress in philosophy or the arts without an explicit embrace of the autonomous thing-in-itself” (Harman, 2016, p. 44).

Even in the social sciences, born within positivism and heirs of the anthropocentric paradigm that characterizes the history of Western epistemology, in recent decades it is possible to find some signs that refer to the protagonism of non-humans. First among the others is the proposal of the actor-network theory presented by Bruno Latour and others. It describes an aggregative idea of the social, inspired by Gabriel Tarde’s microsociology, characterized by a broad reticular morphology capable of including non-humans, considering them full members of society:

“Whoever joins, who speaks, who makes decisions within a political ecology? We now know the answer: it is not nature, nor human beings, but well-articulated beings, associations of humans and non-humans” (Latour, 2007, p. 71).

More recently, some pioneering studies have shown the protagonism of the plant world, highlighting the relevance of the plant universe not only for its contributions to climate balance and the transformation of carbon dioxide into oxygen, but also for its original forms of intelligence and adaptive and organizational capacities (Macuso, 2016; Coccia, 2017).

Also in the legal world, the protagonism of non-humans has gained significant space, leading the debate to the beginning of qualitative changes. In 2017, the high court of Uttarakhand (Nainital India) conferred the legal status of a living person to the Ganges and

Yamuna rivers, considering them as entities with the same rights as the populations living between their shores. Consequently, the different tributaries and the entire ecosystem that extends from the mountains to the sea were also declared “juristic/legal, persons/living entities”. In the same year, New Zealand passed a law recognizing the legal right to life of the Whanganui River, the largest navigable river in the country. Similar paths were taken by the new constitutions of Ecuador and Bolivia, recognizing mother earth and biodiversity (Pachamama) the legal right to life and prosperity.

2. The *datificati* multinaturalism

The idea of a social extended to non-humans finds an important basis in anthropology and ethnographic studies carried out in extra-European contexts and, therefore, in areas of populations and cultures that carry non-Western epistemes. Such studies show how, especially in the Amazon, the conception of a “multinaturalist” social is widespread (Viveiros de Castro, 2009) in which human and non-human entities interact, composing a complex and changing network of relationships. In such cultures, the distinction between human and non-human is internal to each existent. This aspect makes the set of relationships the expression of a multinaturalist, emerging and changing complexity:

“the ethnography of Indigenous America contains a treasure of references to a cosmopolitical theory that imagines a universe populated by different types of agencies or subjective agents, human and non-humans – gods, animals, the dead, plants, meteorological phenomena, often also objects and artifacts – all provided with the same basic set of perceptual, appetitive and cognitive dispositions, or, in short, a like soul” (Viveiros de Castro, 2009, p. 31).

In almost the entire body of literature produced, in different areas of knowledge, on the role of non-humans and the forms of these new types of expanded social and composed of other actors, whether these things, climate, rivers, biodiversity, hyperobjects, the tangle of these relationships are presented as a physical architecture that composes a morphology of a common narrated as an exclusively material, organic and inorganic complexity.

After being represented, at the beginning, as a process of virtualization, in recent years, after its evolution, digitization has come to be seen as a process of transfiguration of reality (Di Felice, 2020) and, above all, through the spread of the Internet of Things and sensors, as a

“new organicism, a new holistic vision and an active interconnection between human and non-human agents” (Accoto, 2017, p. 28).

If, as seen, the digitization process became a process of network extensions that connected, after people and computers (social network), things (internet of things), biodiversity (sensors) and territories (geographical information systems), *datificati*, based on the alteration of all types of surfaces in data and on the automated connection of these, presents itself as a process of changing the world.

Far from being a type of virtualization, that is, the production of a digital copy of material reality, *datificati* presents itself as an ontological rupture. This rupture is based on the supremacy of the position regarding the thing:

“the position allows the thing to participate in its own existence only as a potential activator of the same position (...) within an ontology of positions, no single, autonomous existence is allowed. Things are reduced to the role of simple activators of positions” (Campagna, 2021, p. 44).

In addition to moral judgment, the passage from a world made of things and matter to a world of positions implies, in addition to a departure from the idea of nature, whether understood as the creation and emanation of God or as pure and autopoietic complexity, the assumption of the passage gives an essentialist and ontological dimension of reality to that composed of events and possibilities. The material dimension is no longer the only possible way of accessing the world:

“From this perspective, the environment becomes an ecosystem that happens and evolves through sensing technologies. The environment is not something external that we measure through sensors. Sensors and environment become one. The programmability that we insert into environments through the presence of sensors, code and machine intelligence becomes part of this new ecology” (Accoto, 2017, p. 51).

We start to inhabit a new common made not only of physical realities, but also of data, a world of info-realities, that is, of materialities, biodiversities and surfaces, at the same time physical and connected, that communicate and interact with each other, through the process of *datificati* [In another context, I described this process through the metaphor of transubstantiation, used in Catholic theology to describe the process of changing the host and wine into the body and blood of Christ (Di Felice, 2017). In fact, according to the perspective of Catholic doctrine, during the Eucharistic

prayer and the laying on of hands, performed by the priest, the wine and the host change their substance, actually transforming themselves into the body and blood of Christ, while maintaining their original form. The datificati process that today interests all aspects of our reality, cities, viruses, forests, the body, etc., approaches this condition that is expressed through a profound alteration without an external and visible change]. Our ecologies thus become info-data-ecologies, our communities become info-data-communities and our common become an info-data-common. Our datificati social approaches a tangle composed of trans-organic networks of entities and surfaces that compose and express a different complexity from the systemic complexity of social relations proposed by sociology, which reduce social dynamics only to the set of relations between human subjects.

3. Digital co-worlds: from history to hyperhistory

The advent of this new type of common, datificati, no longer composed only of subject and objects (Di Felice, 2020), implies a redefinition not only of the morphology of the social, but also of the idea of action, that is, of the idea of the act and, finally, in the same sense of history. If, in an ecology of networks, acting is no longer the subject-actor, but a tangle of “actants”, humans and non-humans that, when aggregated, produce an action (Latour, 2007), how to define a datificati act, that is, the result not only of associations, but of an alteration of the original substance itself? Overcoming the sociological idea of social action is based on the understanding of a new type of action that takes place in connected environments and, therefore, in areas in which, instead of producing an action of an actor towards the external, a “connective act” (Di Felice, 2017) as a result of changes in the statute originating from the connected entities. These changes do not arise from an act, but are caused by the datificati process and the connectivity between info-entities. A net-activism (Di Felice, 2017) that produces, therefore, at the same time, an alteration of the environment and of the entities that inhabit it not by the effect of an action, be it individual or aggregative, but by the initial alteration of the qualities datificati of substances and connected surfaces; a change without action that allows a qualitative transformation of each part, hybridizing it through datificati and the internal processing that such a condition entails. The overcoming of the subjective idea of action (Perniola, 1997; Eco, 1995; Latour, 2007) leads us to rethink the idea of history as the single narrative of the actors' actions and as the emergence of the evolution and decline of the set of civilizations. In reticular, connected, datificati and multinaturalist contexts (Viveiros de Castro, 2009) changes and transformations are always the result of an interacting

complexity and a “*becoming*” (Haraway, 2016) and never the result of the solitary action of a main actor.

How, then, to narrate a story that is not only human? A first important example in this direction was carried out at the beginning of the last century by the German scientist Alfred Wegener, through the theories of continental drift and the studies of the movement of tectonic plates. Because of these discoveries, our planet has an evolutionary history, within which the history of human civilizations constitutes only a small part. This perspective was then deepened by geological studies, recently arriving at the Capitalocene theory developed by J. W. Moore (2015) which differs from that of the Anthropocene (Crutzen, 2005) precisely because it describes a transformation of the geological epoch not only produced by the action of the human. Moving from a merely human storytelling, in which all other species and all other entities are reduced to raw materials or insignificant objects, leads us to look for another perspective:

“It is urgent, therefore, that I go in search of nature, of subjects and words, of other stories, the one not yet told, the story of life”
(Le Guin, 1999).

It is in this direction that several authors point to the need to move from the narration of the history of humans to that of other stories, including the history of things (Appadurai, 1986), the history of plants (Mancuso, 2020), the history of biosphere (Lovelock, 2016) and Geohistory (Latour, 2017). The rethinking of the history of humans, understood as an autopoietic and isolated species, finds a rethinking, from the interactions with digital technologies and computerized architectures of intelligences in the work of the French philosopher M. Puech (2008) who describes the co-evolutionary dimension of the human and the technique and defends the need to think of a symbiotic evolution between the human, the technique and the nature.

More recently, Luciano Floridi starts to define our time as characterized by the advent of hyperhistory, that is, as that time in which

“the development and well-being of humanity began to be, not only linked to, but above all, dependent on the effective and efficient management of the information's life cycle (...) At the beginning of the third millennium, our historian of the future could conclude, innovation, well-being and added value are no longer linked to ICTs to become dependent on them” (Floridi, 2017, p. 6).

Just as the passage from prehistory to history was accomplished by the advent of the technology of the alphabet and writing, digital technologies would be responsible for the beginning of hyperhistory. The idea

of a hyper-multinaturalist and datificati history moves its steps, from the interdependence of evolutions and transformations between the various surfaces, whether they are organic or inorganic. This perspective implies a linguistic change, an alteration that is capable of naming and narrating the hyper-complexity and hyper-dependence of these datificati ecologies. Heidegger M., a philosopher critical of metaphysical reason and Western thought, in opposition to the term “world” preferred to use the term “co-world” (“mitwelt”). As an alternative to the word human, the term “being-with” (“mitsein”), going so far as to describe the habitable condition that characterized the constitutive interdependencies of being, as ecology, through the use of the term “being-there-with” (mitdasein).

4. Organic trans governance and the end of an idea of the world

Digital citizenship has historically been thought of as the set of technological and relational possibilities that allow the intensification and improvement of relations between citizens and government, allowing the implementation of transparency practices and improving the population's access to data and decision-making processes. Alongside this double interpretation that comes, on the one hand, the technological improvement of communication and the organizational architecture of the public administration and, on the other hand, the digital increase of the active participation of citizens in the decision-making process and political activities

(Cardon & Granjon, 2010; Pitteri, 2007; Gallino, 2007; Di Corinto & Tozzi, 2002), the idea of digital citizenship is also linked to a set of legal discussions that are concerned with the need to offer rules and regulations in the digital sphere with the aim of ensuring the defense of privacy, individual freedoms and that manages to limit new types of online crimes (computer fraud, cyberbullying, violation of privacy, terrorism, fake news etc.) and, at the same time, build an appropriate law for the regulation of the network itself, ensuring equity and access to all.

Alongside these important approaches, the contribution that we are developing within the scope of research at the Atopos international center at the University of São Paulo (USP) and at the Latin American Digital Citizenship Observatory, aims to reflect on the impact of new ecologies of connectivity and datificati process, in the morphology of the social and in the western idea of world.

Contemporary forms of citizenship that, as seen, extend to new actors, have not only become something different from what we think, but are the product of a process of connecting “all things”, of a process of altering the reality in data and the result of automated processings thereof. The contribution that my book on

the argument makes, summarized by the term oxymoron digital citizenship, is the idea that this new type of architecture of the social, this new type of common, rather than being based on forms of aggregations between humans and non-humans, connect them through digital networks and transform it through data processing. That is, not only are algorithms, big data, actors, and entities that intervene and that contribute to the realization of an emergent, hyper-complex and networked action, but the very morphology of the common happens through an interaction of data, software, platforms and digital networks. In other words, the idea of digital citizenship describes the digital “nature” (the-nature) and the informative specificities of these new ecologies, produced by the datificati process, altered by data processing, and expressed by the set of interactions in computerized environments.

Faced with the advent of new actors connected by the last generations of networks and the datificati qualities of interactions, the western idea of citizenship, based on the contract between citizens, limited to the living together and action of human subjects and based only on the fundamental rights of people, inappropriate results.

Interaction ecologies such as digital platforms, blockchain, geographic information systems (GIS) express the forms of a new type of common, distributed and composed of info-entities and diverse data-surfaces and describe, at the same time, the advent of a particular type of trans organic ecology. The multiple process that produces, on the one hand, datificati, that is, the transformation into data and the automated processing, of various surfaces and entities, and, on the other hand, the creation of digital platforms and architectures of interactions, distributed and trans organic, needs of a reflection on governance very different from that inspired by the western tradition for the democratic participation of the polis and its parliamentary evolutions.

Beyond the idea of a natural contract (Serres, 2019), that of the parliament of things offered by B. Latour (1991) or that of cosmopolitics elaborated by I. Stengers (2005), the idea of a trans organic quality of contractuality itself of the datificati citizenship approaches a dimension that overcomes the exceptionalism of the human species and its hypothetical absolute or political power over nature, emphasizing the trans organic dimension that connects the different forms of existence. In this regard, the term *simpoeisis* becomes useful to describe such type of interactions without externality:

*“simpoeisis is a simple word that means with doing. Nothing is created by itself, nothing is really auto-poietic or self-organized (...)
Earthlings are never alone (...) Smpoeisis is the most appropriate word for complex,*

dynamic, reactive and situated historical systems” (Haraway, 2016, p. 55).

A recent example of the trans organic and datificati qualities of citizenship processes is the management of the recent pandemic. If we try to describe the set of interactions that took place, their qualities and the particular type of governance that developed from them, their properties will become clearer. The origin of the pandemic is due to the spread of a virus in the host body, a non-human entity capable of generating profound changes in behaviors, relationships, economic activities on a large scale. From the action of the virus, before or after, all parliaments and governments in the world housed their decision-making powers in the hands of a team of scientists, composed of infectious disease specialists, doctors, data analysts, experts in crisis managers, etc. These specialized teams, in turn, made their decisions, which they communicated and followed up with the parliaments to make them laws and regulations applied, consulting the big data that, in addition to monitoring in real time the progress of the spread of the virus, carried out projections and simulations on the immediate evolution of the pandemic. If we accepted to use the metaphor of parliament, we should recognize that during the pandemic the deliberative process and governance passed through interactions and debate between non-human entities, viruses, big data, vaccines and scientists and politicians, all members of the same assembly. But the datificati and connective nature suggests that the metaphor of parliament is perhaps not the most appropriate, given the trans organic and multinaturalist nature of such a process.

If at the beginning of the third millennium we lost the illusion of control over the world and technique, perhaps it is not a great loss, as we would be starting what J. Lovelock defines the age of hyper-intelligences (2020). This is the meaning that must be attributed to the end of the world. More than an improbable science fiction, the end must be related to the crisis of the idea of the world that we build in the tradition of Western thought and that narrated the human as the superior and rational species, separating it from technique, nature and all entities that nowadays connect and act and that we can listen to, observe and with which, through computer languages and data intelligence, we start to connect.

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INVITED PAPER

Webfare: humanity's greatest asset

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“Man’s needs have become human needs, and the other person, as a person, has become one of man’s needs” Marx rightly said. However, he mistakenly thought that these values were mystified by the bourgeois society bent on production and acquisition. Indeed, the communist revolution, with the sole exception of China today, does not seem to have taken any significant step towards reintegrating human values. Instead, the great technological and social transformation that has been unfolding for the past few years, involving the increasing production of documents relating not only to our thoughts, but to our deeds and lives, has made it possible to transform simple living into not only a political but also an economic source of value. This is an entirely new resource, which has arisen thanks to the fact that the Internet is about recording rather than communication. This is the salient characteristic of the digital over the analogue world: in the latter, information is communicated and can subsequently be recorded (which, however, almost never happens). In

the digital world, on the other hand, the recording of action precedes and makes information and communication possible, which produces an unprecedented growth in the archive of human activity.

This creates a capital that consists of the recording of all human life forms. This new and unforeseen capital is the capital of the 21st century, not financial capital. And since we do not like the word ‘capital’, because we associate it with the vicissitudes of a peculiar form of capitalism, which privileged the individual and saw wealth as a reward and a sign of divine favour, I’ll call it “humanity’s greatest asset”. This is an asset whose worth grows bigger the more people share it, and which rewards not asceticism, hard work and selfishness, in a game where there are necessarily only a few winners, but need, desire, curiosity – all that brings people to the Web. Humanity’s greatest asset thus creates a wealth that comes from everyone and must return to everyone in terms of culture, and, to those in need (for example, the many who are losing their jobs due to automation but still produce value on the Web), in terms of support for growth.

If it is disputable, to say the least, that “where the danger is, also grows the saving power”, as Hölderlin wrote (we have countless testimonies of dangers without salvation), in this specific situation one could say that this is indeed the case. The shrinking number

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of jobs caused by increasing automation, the dystopia of a humanity left destitute and frightened, feeling like it's left behind of the course of the world, the far-from-dystopian experience of a humanity that can only see itself as a victim of a biopolitical tyranny, and not as an active subject of history – all these things call for a change of pace. In order to interrupt a downward spiral leading to a competition between losers (between the disgruntled classes of the West and the alternative mythologies of Eurasia and Islam), what we need is a Webfare system able to socialise, even for the West, the enormous value that humanity produces on the Web, not only through a taxation of platforms, but above all through an alternative capitalisation.

This is the point. In order to reduce the gap between those who have too much and those who have too little (they have more than they used to, although this, as is natural and right, is no consolation), it is not enough to tax the platforms fairly. We need to devise a strategy for the alternative capitalisation of the data produced by humanity, creating intermediate bodies that (armed with the European law that allows it) demand their members' data from the platforms, valorising and reselling them (thus generating a market). They can thus redistribute value not just for the benefit of their members, but in support of the enormous part of humanity that has no money but produces data. Let me try to outline the theoretical horizon and the technological resources of this collective asset.

1. From the tyranny of nature to the tyranny of merit

Nature is not democratic: humans are born ugly or beautiful, stupid, or intelligent. The assertion that humans are all equal is infinitely less credible than the assertion that beavers are all equal, and only someone dangerously prone to confusing being with ought could have argued that humans are born equal and that what makes them different is society. Note that the same thinker has also argued that humans are born free and yet are everywhere in chains, an argument in which the confusion between fact and law is, if anything, even more acute. Society, far more than the greed of the few, is born out of the desire to make up for differences in nature, and partly succeeds in doing so; unfortunately, in this attempt, it brings about an even greater injustice – that between having and not having.

Ever since agriculture took hold in the “fertile crescent”, humanity has distinguished between the privileged, who have access to education and goods that are passed down through generations, and the others, those who have nothing. This is one of the most odious, unjust and seemingly insuperable distinctions that characterise the human condition, which so far has only found partial remedies (e.g. the fact that the number of illiterate people is rapidly decreasing). Sometimes,

though, the cure is worse than the disease, replacing the inequitable division of wealth with an implacably equal division of poverty, which is the glaring result of 20th century communism. This is no longer the case with 21st century communism, whose problem is not poverty (China is developing at a dizzying rate) but freedom (platforms are nationalised, and used as merciless control instruments).

The traditional answer to social injustice is naturalisation: the claim that genders, races, or castes are not a social construct but a natural one, if not the result of a divine design. No one would accept this solution anymore; or, rather, no one would accept it formally and in principle. Our everyday lives, however, are filled with cases of dominance or subalternity: no one is truly surprised by the existence, in the global south as well as in our own backyard, of those who, so to speak, are called “dispossessed”. And if we accept *de facto* what we reject *de iure*, it is because the law has not yet managed to correct the fact. Philosophers, of course, have come up with a wealth of metaphysical systems of morals and theories of justice that, by their mere evidence or sublime eloquence, with the goodwill of their readers, are supposed to change the world order. Lacking the material resources to feed their ideas, however, they have merely confirmed Talleyrand's saying that it is good to cling to principles, since sooner or later they collapse, leaving our hands free.

Revolutionary movements certainly tried to remedy the naturalisation of injustice, but often the cure turned out to be worse than the disease. In his *Reflections on the Revolution in France*, Edmund Burke observed that the French Revolution had devised many bizarre reasons to justify the holding of sovereign power, including the so-called “general will” (what could that be? Probably a close relative of the “common sense of decency”). Such views made one regret the traditional English justification for ruling by birthright. Now, this may seem to be a reactionary tirade, and it is; yet half a century later and from an entirely different source, Honoré de Balzac's *Le Curé de village*, we read pages and pages of criticism of the technocracy of the Ecole Polytechnique. Balzac described it as a factory of resentful people lacking social solidarity, convinced that they owed everything to their own merit and hard work, who consequently thought that everyone else was less worthy and deserved their own misfortune.

Fast-forward another hundred years and we come to 1958, the year of publication of *The Rise of the Meritocracy* by the English sociologist and politician Michael Dunlop Young. Despite its title, this is a Swiftian satire of meritocracy, rightly accused of arousing a number of negative feelings: selfishness and condescension in those who believe to be deserving because they have done well thanks to their own efforts; resentment in those who, despite their efforts, have not had the success they hoped for; and frustration and social hatred in most, who are forced to watch this

noble competition from afar, from a life of manual labour. The outcome is this: while members of the subaltern classes traditionally had a thousand ways to justify their condition (bad luck, inherent social inequity, lack of education...), meritocracy subjects them to an infallible judgement: the subaltern classes deserve to be so. By proposing a formal equality that is not accompanied by any substantial equality (it is obvious, in particular, that the educational career of the son of a Peer of England, or even simply of a clerk, has an almost unbridgeable initial advantage compared to a child of immigrants), meritocracy becomes a vehicle for the worst of injustices, confirming that the road to hell is paved with good intentions.

Half a century later, we come to the present day, after Brexit in England, the Trump presidency in the United States, the announced abolition of poverty in Italy, the widespread proliferation of anti-vax positions (both as a full-fledged movement and in the armed wing of Doubt and Precaution, an oxymoronic attempt to provide a scientific version of alchemy and astrology), the electoral clash between Marine Le Pen and Macron in France and the military clash between Putin and the rest of the world in Ukraine. This climate is usually analysed as an inexplicable regurgitation of populism, but it is actually a reaction to what philosopher Michael J. Sandel has stigmatised as the *Tyranny of Merit*. One can say many things about the current Prince of Wales, but one cannot deny that he is painfully aware of the merely hereditary nature of his privilege. This has often not been the case with American democratic presidents and British Labour leaders in recent decades, from Clinton (Bill and Hillary) to Blair up to Obama. These are all clever rulers inclined to surround themselves with technocrats and PhD holders (only Merkel beat them, with seven ministers out of thirteen with a doctorate, though one of them was accused of plagiarism in his thesis), and prone to preaching to their nations that the system works well – so much so that they are in government.

It is not surprising that, as soon as they have the chance, the nations in question vote against them, especially if (as the British recklessly did with Brexit and Renzi with the constitutional reform) they hold a referendum. It would be strange the other way around. What would we say about a Pope who said he rose to that position through hard work and merit? It is much better to invoke the Holy Spirit: no one gets offended, and above all one does not expose oneself to the obvious argument that even in the most meritocratic of careers, money, family and fortune matter, and that, since no one can choose their parents, there is no merit in being born handsome, intelligent, with a quick wit or good business sense. And what about others? It should be noted that the scarcity of resources and lack of social recognition does not only affect the occupational sphere, but people's entire lives. Rousseau claimed that morality is the sublime science of simple souls, but the

saying that Schopenhauer approvingly attributed to an Englishman he knew appears much more truthful: "I am not rich enough to afford a conscience". This seeming *boutade*, this ostentation of cynicism, encapsulates social progress as such: the goal to enable the whole of humanity to afford a conscience, providing it with not just formal, but substantial rights.

To do so, one must abandon the illusion that man is born free and yet for some reason ends up in chains, or that man is born good and ends up, again inexplicably, implicated in an ethnic cleansing operation. We are not born full of goodness and altruism, and it may well be that we never find ourselves in the material and cultural conditions to exercise these virtues. Therefore, it is on these conditions that one must focus first. For the human animal, like any other animal, is not naturally good or bad, and in this respect is no different from any other animal; however, unlike any other animal (being the only one that can be educated), it must be put in the conditions to be able to afford a conscience, and only then can it decide whether to be good or bad. These conditions are not heaven-sent, but depend on the distribution of value. Contrary to the claims of those nostalgic for fireflies or the frugality of hunter-gatherers, poverty does not generate virtue, but oppression and war. And only economic, social and technological growth can guarantee the conditions we need for human flourishing.

2. From production to consumption

Now, this growth is already happening: it is simply a matter of intercepting it, socialising it, and humanising it. In the last few years, in fact, a situation has arisen that can mitigate the tyranny of merit, not because humans have become better, but because machines have become more efficient. The world has changed thanks to increased automation, as artificial intelligence records human life forms to enable machines to act as if they had a soul. It's almost hard to believe that thirty years ago one had to own a television, a radio or a newspaper to express one's ideas, be they good or bad. But this is only the most obvious, almost blatant aspect of the digital revolution. The essential point is rather this: the real revolution brought about by the Web is not the possibility of expressing one's ideas, whether right or wrong (therefore, by simple statistical law, mostly wrong), but rather the fact that while we express them, or even simply while we are reading, buying a ticket, scrolling through posts, walking, searching for a restaurant or a hotel, using the navigator for directions, etc., these acts – which unlike our ideas are all true – are recorded. And once they are recorded, they can be compared with the acts of millions of other humans, describing not the insincere ideas of what we think or believe, but the true facts of the things we do.

Thus, the Web is interesting precisely because it records instead of merely communicating or informing, and this recording is the basis of the production of algorithms and archives. On the one hand, these allow for the automation of production through the mimesis of human life forms recorded on the Web, as well as the refinement of distribution through the analytical knowledge of our needs and behaviour. On the other hand, they enable the profiling of social reality by recognising the correlations between consumption, political inclinations, predilections and predispositions of various kinds which, mind you, do not concern individuals, cognitively uninteresting, but ideal types. It's all about recording the human comedy, or more precisely the human drama (δρᾶμα i.e., "action"): indeed, what is recorded are precisely actions, not necessarily tragic but often comical and usually anodyne – ordering a taxi, booking a room, shopping online, and so on. Hence the evidence that is beginning to shine through this umpteenth technological revelation: useless as appendages of spades, lathes, and typewriters, humans are irreplaceable as appendages of knives and forks, cinemas, concerts, novels, and of course many other less commendable, but exclusively human, entertainments. Acknowledging this fact and drawing the logical consequences for the benefit of the few has been the great merit of commercial platforms; it is now up to us to draw the ethical consequences for the benefit of the many.

The first point to make, which is of capital importance, is that the enormous wealth of the Web is the result of the mobilisation of humanity. This is an unforeseen situation. Ninety years ago, Keynes prophesied that automation would make it enough to work fifteen hours a week, and that we had to think about how to occupy that enormous amount of free time. That prophecy was fulfilled in a peculiar way, because many people do not work at all, since automation has taken away their jobs, but are still busy for fifteen hours *a day*, tapping away on their computer or smartphone, producing value. A possible mindfulness exercise proposed by our smartwatch might sound like this: where does our feeling of hyper-occupation come from when we are not at work or even if we are unemployed? Probably from the fact that we are always otherwise occupied, mostly teaching machines about humanity. We are not idle, it just seems that way. Instead, our fingers keep swiping and tapping, we read, write, consult, click, like and comment. In fact, we are active online: we are not merely exploited deposits, but the bearers of acts, preferences, needs and desires. Hence the solution to the mystery of our business: of course we are tired, it would be odd if we weren't, yet we do not toil and we most certainly are not alienated, because there is not a moment in our connected lives when we are not mobilised and stimulated.

The machines that are stealing our jobs rely precisely on that "being human" that for Keynes was the other

side of labour: the time of life as empty and unproductive, to be occupied as best we can to avoid the brutalisation of a humanity freed from fields and workshops. But, as we have seen, today our time is not empty, it is full. Suffice it to say that boredom has disappeared: and of course, humans complain about this too, see Pamela Paul's *100 Things We've Lost to the Internet* – after all, Dostoevsky confessed he missed his days in Siberia. Granted, the disappearance of boredom generates value but does not solve our problems, because just as there were once many ways to be bored, there are now countless ways not to be. Discipline at work and in the military was a relatively simple, though very tiring, way of not getting bored. Refraining from posting nonsense, not eating too much, exercising, and behaving decently with others are things that require enormous discipline; therefore, we have quite a lot to do to occupy the time freed up by automation. But first we must answer the question: who is paying for all this? What benign deity lets us have our Pilates class when we are unemployed? Who supports our consumption?

The answer is: consumption itself. There is a point we must consider in order to open our eyes about the present. The moment consumption is recorded, it is capitalised and becomes a potential source of value: this is the epochal transformation that can comfort us as we look to the future. And perhaps this can also shed light, retrospectively, on the prejudices we fell victim to even in the recent past. The criticism of consumerism has in fact blinded us to the nobility and humanity of consumption (i.e., of need), which is what characterises us as organisms embedded in a techno-social context – the context that makes us human. So, if we think about it carefully, every criticism of consumption is made in the name of another kind of consumption, considered (rightly or wrongly) more appropriate: don't stuff yourself with crisps, burn calories; don't numb yourself on Netflix, read Goethe or the Gospel... The fact that acts of consumption often take place in solemn rites (dinners after coronations, consumption of bread and wine during mass) shows that tradition sees much further and deeper than a conformist outlook. The first gesture of a newborn human is the consumption of milk, just as the last gesture of Christ on the Cross was the consumption of the Roman legionaries' drink of water and vinegar, the *posca*. I quote from John 19:30: "When Jesus therefore had received the vinegar, he said, It is finished: and he bowed his head, and gave up the ghost." *Consummatum est*: Christ died while consuming, or rather, when he finished consuming, he died. As long as there is life there is consumption, that is, satisfaction of needs and metamorphosis of matter into spirit. Hegel observed this when he described the digestive process as a spiritualisation, through which matter is transformed into energy. In our case, and this is the cornerstone of my proposal, recorded consumption is transformed into value, alleviating the tyranny of merit.

3. From ability to need

“Full of merit, but poetically, man dwells on this earth”, Hölderlin famously wrote, but it is not at all clear what he meant by “poetically”. I doubt that he meant, literally, a reference to “making things” (ποίησις), because there is nothing particularly noble about beating on the anvil with a hammer. Or rather, such an activity is only worthwhile for a human if a machine cannot do it: as soon as it becomes automatable it becomes unworthy of a human, who becomes a sort of prosthesis of the anvil and the hammer, called upon to give them physical energy, rhythm and precision. The age of *homo faber* is only one epoch of humankind, which was preceded by the hunter-gatherers (who, by the way, have never entirely disappeared) and which, sooner rather than later, is destined to come to an end. When it does so no one will miss it, even though all modern thinking, born at the time of industry, has perpetuated an identification between humanity and production that proves to be particularly inadequate for understanding the present. One may recall that according to the Gospel of John “in the beginning was the Word”, while for Goethe, at the dawn of the industrial revolution, “in the beginning was the deed”. Well, it is worth noting today that “in the end there is consumption”, because without consumption no production, be it of junk food or lofty doctrines, makes sense.

Let us consider three points. First, what makes automation possible? As we have seen, the recording of human life forms on the web. Machines must behave like humans, and to do so they must tap into the great catalogue of humanity that is the Internet. Second, what is the one thing that cannot be automated? Consumption, which for hundreds of thousands of years would vanish into thin air, whereas now it is recorded and offers access, in addition to automation, to the inestimable economic benefits of profiling, which for the first time in the history of the world make a planned economy actually possible. A final question: what drives this huge system? Automation? Obviously not: machines alone are pointless, as their value derives from a human's appreciation and need. Rather, the alpha and the omega of automation (today) and the economy (always) is consumption – i.e., humanity.

Machines exist only as a function of humans, their needs, their mortality, and this applies primarily to the universal machine called artificial intelligence. The transition from production to consumption ensured by automation thus entails an axiological shift that gives a peculiar role to needs. Needs, in fact, insofar as they cannot be automated and insofar as they guarantee automation and define its purposes, constitute the only truly essential fact on which to build a policy aimed at the acquisition of substantial and not merely formal rights. This is because, while we are all different in ability, we are all equal in need, which is the one place

where nature is democratic – in every other respect, as I mentioned at the beginning, it is shockingly meritocratic.

It is hard to overstate this transformation. The principle “from each according to his ability, to each according to his need” (enunciated in the Acts of the Apostles, taken up by Marx, and curiously thought by many Americans to be written into the US constitution), in a society focused on production, will always tip the scales in favour of ability, and needs will be taken care of, at best, by charitable agencies. It is precisely the ancient democratic nature of consumption, i.e. of need, combined with modern productivity, that has brought about an epochal change in the way we look at the world. As long as abilities have been distinct from needs, the latter have always taken second place. But in a world where production is increasingly automated, needs, which cannot be automated and which constitute the ultimate goal of production, become decisive – indeed, they are the only thing that matters. Thus, at a time when the Web seems to be interested not in what we do as bearers of intelligence and skills, but in what, rightly or wrongly, we desire, focusing on needs is no longer a wish, but the most fundamental economic law.

That's the big news: *for the first time in the history of the world we have an apparatus that systematically and programmatically values humans not for their merits but for their needs*. This was already the case with the market: it doesn't matter who buys my products, if a genius or a cretin, so long as they buy it. But the Web enforces this principle not at the end of the process, but from the beginning. For the Internet, and for its goals of automation and profiling, it is necessary to intercept not creativity or strength, not beauty or intelligence, not virtue or wisdom (that is, what makes humans different), but the common thread that makes us the same, even before death: need, or more precisely imbecility, the constitutive lack that determines our recourse to technology. It is therefore a matter of recognising the value that humans produce on the Web, which would not exist without their needs. And this gives humans incalculable power in the face of technology, and its current manifestation, called the Internet. But we need to understand this, we need to open our eyes and abandon the idea that the only way to qualify as political subjects is to be victims, because victimhood is just resignation: you don't help migrants or delivery riders by pitying them, but by creating a different world.

4. From Calvinist capital to Catholic capital

Hölderlin's verse on merits is even more emphatic than that on the coincidence of danger and salvation; or at least it is exaggerated, since both merits and poems are scarce. There is only one place in the world where this principle applies, and fortunately this place is just a

click away. On the Internet, in fact, one produces the same value by learning Sanskrit, counting one's steps, looking up a recipe, buying a ticket, watching a football match or a porn film... The result is always incalculable value. This value, however, does not consist in the financial wealth of human beings (it only speaks of the difference between having and not having, and can be so aleatory as to be informatively uninteresting). Likewise, it does not consist in the labour force that humanity can provide, and which fortunately appears less and less necessary thanks to the growth of automation. Contrary to what was thought a couple of decades ago, it is also not a collective intelligence (collective intelligence, unlike mass imbecility, does not exist; and the Web is largely the realm of fake news).

Rather, this new capital generates a different commonwealth from the one envisaged by Hobbes: it's a wealth that does not differentiate between rich and poor, beautiful or ugly, intelligent or stupid, because even those who have no money, and to crown their misfortune are also ugly, wicked and stupid, generate (provided they are connected) a wealth of data. And their data is more valuable (because it is more representative of the average) than that produced by the richest, most beautiful, virtuous and smartest being on earth. It is important understand this, in order to avoid projecting onto this human capital the false views of web-apocalyptic, who see it either as the continuation of previous forms of capitalisation (as such necessarily linked to the exploitation of the many and the presumed merit of the few), or as an instrument of totalitarian control, or, again, as the dangerous utopia of a world fuelled by the rarest and most unreliable of human endowments – intelligence. Let us therefore consider the characteristics of this capital.

It is *ontologically new*, because acts that have characterised the human life form (walking, watching, consuming, liking, fearing) for millions of years, and which have hitherto left no or very few traces, usually only in solemn circumstances, are now being recorded and transformed into documents. This is both a qualitative and a quantitative change: the anthropic mass has never been as high as it is today (a circumstance that potentially turns what is to all intents and purposes the root cause of the environmental crisis into a possible resource), and all these life forms are now recorded, whereas previously they would have left no trace, or, to be poetic, they would be lost in time, like tears in rain. These are acts of which we are rarely aware - who has ever paid attention to when and where one Googled a restaurant? These are acts we often have no memory of – during a phone call I may cough three times and may well not notice. Or else, these are acts that we know we perform but are careful not to quantify - who, before the Internet, would have ever counted their steps? In very many cases, we would never have recorded such acts without the Web – think of

measuring our biorhythms. Recognising this capital is much more epoch-making than the discovery of a new continent or a space conquest: it is an increase of the objects and meanings that make up our world.

It is *technologically renewable*, because digital documents and data, just like ideas, can be shared. This is the basis of a great political and economic resource. In a classical economy, if I, a producer, demand the return of what I have produced, I can only do so through a revolution, and the result is usually the replacement of private industries with bad socialised ones. But in a digital economy, if I, a data-producer, ask for my data back from a platform, I do not harm the platform's economy, and I come into possession of a good that, combined with that of other humans, will allow me to create value to be redistributed with humanistic aims, achieving the main ethical goal of philosophers and all humans of goodwill, but through an *increase* in economic resources.

It is *epistemologically rich* because it constitutes the largest repository of human life forms that has ever existed and which, if interpreted with appropriate machines and ideas, can give us far greater knowledge about the human world than we have about the natural world, yielding enormous advantages. In fact, contrary to what the obscurantists who, as in the Matrix, claim that ignorance is a bliss, humanity and knowledge go hand in hand, and we are all the more human the more we feed on the tree of knowledge. In this way, we witness what would once have been called an “epistemological divide”. The classical opposition between nature as the realm of necessity and society as the realm of freedom must be turned on its head: the more we deepen our knowledge of nature, the more it manifests chaotic and unpredictable phenomena; the more we learn about human behaviour through the data generated by our behaviour, the more unsurprising and uniform these behaviours turn out to be. And if quantum physics describes nature as a largely random field, big data transforms humanity into a domain as predictable as the phases of the moon.

It is *teleologically, i.e. ethically, fair*, because, as I said, instead of being a sign of the individual's divine election, as in the Calvinist genesis of bourgeois capital, this capital is catholic in the etymological sense of the word, because it is universal, and is worth more the more it is shared among all humans, regardless of wealth, intelligence, race or faith. This generates a valorisation system that does not privilege the individual and labour, but collectivity and consumption, with what some may be inclined to see as a repressive desublimation, because they do not realise that this is an enormous new possibility. Hence a completely new purpose for philosophical and social reflection: to design a capitalisation system operated by humanistic platforms that is alternative and non-competitive with respect to liberalist platforms, which for their part have had the undisputed merit of having

intercepted this new source of value. In other words, if the revolutionary drive comes from capital, being revolutionary does not mean fighting against capital, but imagining alternative capitalisation processes.

5. From Welfare to Webfare

What processes am I talking about? I will try to describe them. The logic of this alternative capitalisation rests on a simple consideration. Data, just like ideas, can be shared and reused as much as one wants, and demanding data from commercial platforms does not mean demanding that they stop using it – far from it. Besides being impossible, depriving platforms of data would be unfair, because in order for that data to even exist, platforms have invested in research and development, as well as having understood their value before we did. A different path has to be followed: once we have rendered unto Google the things that are Google's, the same data that Google and other platforms capitalise on for liberal purposes can be capitalised on for humanistic purposes. This is a much more robust course of action than tax devolution systems, which merely address a percentage of an existing value. In this case, a whole new value is introduced.

These intimately political acts do not need any formal political support. Rather, politics may be directed towards taxing platforms (both liberal and, albeit to a lesser extent, civic), as well as compensating for the imbalances that will naturally arise from the choices of intermediaries and intermediary structures. Conversely, in a Webfare system, those who have no money but produce data would not receive subsidies, charity, or a citizenship income, but would be paid for the work they do as data producers. In this way, the redistribution of value would be democratic, returning the profits of humanistic platforms to those in need. The latter, instead of taking revenge on the elites, exasperated by the latter's arrogant belief in their own merit, would thus be able to appreciate the practical advantage of the fusion of technology and humanism for social purposes. That is, they would actually be able to take advantage of the social lift which, to be such, must help not those who can climb ladders quickly while counting the calories they burned, but those who cannot.

In order to achieve this, it is necessary to find intermediary agencies that can combine platform data with their own specific databases. For example, one could enable a healthcare company to capitalise on its customer data by aggregating it with customers' social data, with respect to which it would act as an intermediary with Internet platforms. The healthcare company would thus obtain much more meaningful correlations that would be transferable to pharmaceutical and biomedical companies, to whom today they are generally given away; this, in turn,

would make healthcare spending sustainable for our increasingly elderly population. To make another example, one could transform a bank into an intermediary institution that is also active in the field of digital capital, to be reinvested locally and for humanitarian purposes. Or else, one could correlate the structured data of a library or university with data on user and student behaviour in order to optimise services. The point is to not only redistribute to humanity the capital it produces, but to enrich and enhance this capital, not by just doing what commercial platforms do, but by doing more and better than them.

Here is a great new opportunity. Welfare as Keynes envisioned it required making choices: for example, between social security and health care. The former was rightly favoured, but this weakened the latter. Webfare starts from a completely different premise: instead of drawing its resources from existing value, which is something given, like a blanket that is either too short or too narrow, we can make use of an entirely new capital. This is what the social, economic and philosophical imagination will have to concentrate on in the years to come, mobilising, together with the intermediate bodies, researchers and universities to support those intermediaries in the elaboration of capitalisation criteria – something of which, fortunately, neither Silicon Valley nor Shanghai own the exclusive right.

INVITED PAPER

How social media could teach us to be better citizens

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In 1995, social scientist Robert Putnam proposed a broad and wide-ranging critique of American civic life. (Putnam, 1995) Further developed in his influential book *Bowling Alone* (Putnam, 2000), Putnam argued that America was experiencing a sustained decline in civic life, one that might spread to advanced democracies around the world. His argument was multifaceted: not only were Americans voting less, they were also participating less in voluntary organizations, in churches and religious organizations, in labor unions and work organizations. Charity, once a space for social engagement, was becoming a financial transaction, with mailing-list fueled “professional” charities supplanting local volunteering.

The overall result of these changes: less social capital. Putnam worried that the horizontal bonds of social

connection - what sociologist Mark Granovetter (1973) termed “weak ties” - would have less room to form in a society where we retreated from private spaces into our homes. In turn, we should expect our lives to become less resilient and more fragile. We would miss our weak, horizontal connections when we looked for a new job, for friends in a new city, or even seeking a kidney donor, a key example in Putnam’s book.

Putnam’s book struck a cultural nerve, influencing not only a cottage industry of academic studies to support or challenge Putnam’s conclusions, but spawning at least one long-standing business: Meetup.com. Scott Heiferman, an internet advertising executive, was living in a building close to the World Trade Center during the 9/11 terror attacks, and met his neighbors for the first time on their roof as they watched the tragedy unfold. (Botsman, 2018) The experience of building real-world connections with his neighbors led him to Putnam’s book, and to founding Meetup, an internet service focused solely on helping users make real-world connections around shared interests, meeting at coffee shops to talk about their corgis or their Casio keyboards. “The core idea was to figure out how to help people use the internet to get off the internet”, Heiferman told reporters.

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More than two decades after the initial publication of *Bowling Alone*, some of Putnam's predictions have proved incorrect. Reviewing the book on the twentieth anniversary, Alexandra Hudson (2020) observes that some declines that concerned Putnam have slowed or even reversed. Voting in US presidential elections hit an all-time low in 1996, as Putnam was writing his book, but recovered significantly in subsequent decades, recently exceeding participation rates in the 1950s and 1960s, a time of civic engagement Putnam celebrates. Other declines have proved more lasting: participation in labor unions in the US has collapsed since the 1980s and continues to shrink, despite some high-profile organizing successes (American Presidency Project, 2016, <https://usafacts.org/articles/labor-union-membership/>); Americans who are unaffiliated with a church or organized religion continue to grow. (<https://www.pewresearch.org/religion/2021/12/14/about-three-in-ten-u-s-adults-are-now-religiously-unaffiliated/>).

Hudson suggests that Putnam's observations of civic decline might reflect a change in how civic engagement takes place, rather than a collapse in civic and social capital: "Putnam's method, which might be summarized as assessing how America had changed since the early 1960s, tells a story of decline only if the American workplace of the 1960s was the ideal." Instead, we should consider the possibility that new institutions emerge, displacing those we've relied on in the past in a process she terms "civic churn":

"If we avoid treating the America of the mid-20th century as the norm and instead look at both the condition of long-standing social and civic institutions and the emergence of new ones, we would find that American society never stops innovating and experimenting with new forms of common action... This 'civic churn' - a term that describes the creative destruction of American civic institutions and activity - is nothing new. When Tocqueville traversed America examining our norms, institutions, and culture, the national benevolent associations and temperance societies he encountered were relatively new developments. Responding to social and demographic changes related to the increasing integration of the country as a single nation, these groups replaced older civic assemblies like craft guilds and town meetings."

Perhaps the most transformative social change in the years since Putnam published *Bowling Alone* has been the widespread adoption of the internet as the underlying infrastructure for most of our social interactions. When Putnam gave the lecture that grew into *Bowling Alone*, there were less than 40 million internet users worldwide - the number had grown to 300

million globally by the time his book was published (Internet World Stats, 2022), but in 2000, the internet was still mostly a world of static websites and simple shopping portals. Facebook was not founded until 2004, Twitter in 2006, Instagram in 2010. Now 72% of American adults use at least one social media site, and social media usage is even more pervasive for young adults, with 84% of Americans 18-29 using social media. Usage is particularly high in the US, where many of these platforms are based, but social media is used by the majority of EU citizens (57%), and many developing nations experience heavy social media use. In the Philippines, 73 million of the nation's 109 million people (67%) identify as active social media users (Pew 2021).

Putnam was aware that the growth of the internet could lead to significant civic shifts, noting, "No sector of American Society will have more influence on the future state of our social capital than the electronic mass media and especially the Internet" (Putnam, 2000, p. 410). Putnam was not convinced that digital communities would strengthen social capital. For him, the key question was whether social networks led to active participation:

"Let us find ways to ensure that by 2010 Americans will spend less leisure time sitting passively alone in front of glowing screens and more time in active connection with our fellow citizens" (ibid.).

He urged software designers to "make the Internet social capital-friendly", hoping "technology can reinforce rather than supplant place-based, face-to-face, enduring networks."

The effects of the internet, and specifically social media, on civic life, or even just on social capital, would require a shelf full of books to examine fully. It's likely those books would disagree with each other as much as they agree. Reviews of literature on the Internet and social capital (Neves, 2013; Williams, 2019) find support for three different arguments: that online interactions have increased social capital, reduced social capital and that there's no relation between internet use and social capital. Press coverage warns of devastating effects on democratic society tied to political polarization and mis/disinformation on social networks. Broader scholarly works indicate that harms like polarization owe as much to broadcast and print media as to social networks (Benkler et al., 2018) and suggest skepticism about broad claims that social media is harmful for most individuals (Appel et al., 2020; Orben & Przybylski, 2019) As social media scholar Casey Fiesler puts it "Social media is good for a lot of people. Social media is bad for a lot of people. Both things can be true."

Perhaps it is helpful to focus on one specific aspect of civic life that Putnam saw as threatened by retreat from public spaces: civic learning. Putnam argued that

“associations and less formal networks of civic engagement instill in their members habits of cooperation and public-spiritedness, as well as the practical skills necessary to partake in public life” (Putnam, 2000, p. 410).

In other words, serving as the president for your local bowling league might serve as training for broader civic participation. The habits we learn from holding productive meetings, resolving disagreements between people working on a common venture, articulating our point of view and seeking common ground arguably are the skills we need to participate in a functioning democracy in ways deeper than giving to political candidates or casting votes.

Putnam relies on Alexis de Tocqueville, the celebrated observer of American civic life, to make the argument that these skills are learned, not inherited. Participation in associations transformed men, de Tocqueville believed: “feelings and ideas are renewed, the heart enlarged, and the understanding developed only by the reciprocal action of men one upon another” (De Tocqueville, 1899). As a result, Putnam believes voluntary associations are “schools for democracy”, where “Members learn how to run meetings, speak in public, write letters, organize projects, and debate public issues with civility” (Putnam, 2000, p. 338). Losing the associational life associated with spaces like the union hall and the social club likely has significance beyond the weakening of social fabric. Without this education in practical citizenship, individuals are less likely to learn the skills and capabilities they need to be efficacious citizens.

In 1954, Angus Campbell and colleagues theorized that political participation depended heavily on a citizen’s sense of efficacy – if she felt her voice, vote or action was unlikely to make a difference, she would be less likely to participate in civic processes. George Balch refined the concept in 1974, distinguishing between “internal efficacy” – a sense that one possesses the skills and understanding to make civic contributions – and “external efficacy” – the sense that one’s contributions will have influence on existing systems. The distinction is important especially as concerns marginalized populations – it is possible to have high internal efficacy as a trained civil rights advocate, but low external efficacy, facing a hostile and reactionary political climate. The social spaces Putnam celebrates likely increased both forms of efficacy: a member of the Elks’ Club was likely both to improve his speaking and organizational skills, and to meet people in positions of local political power, increasing his practical civic influence. Indeed, the power of these social clubs – which often excluded women from membership – led

to US Supreme Court challenges of their membership policies, arguing that women were damaged by not having access to the same influential networks men were admitted to. (Rotary Int’l v. Rotary Club of Duarte, 1987; Roberts v. US Jaycees, 1984).

Social media spaces provide ample opportunity for individuals to participate in conversations with one another, and these spaces tend to be less exclusive than the clubs Putnam celebrated. These conversations often have civic implications, sometimes centering around events in the news or public life, based on journalism shared on Facebook, Twitter and other networks. These conversations differ from those in physical shared spaces in several key ways, but one particular aspect deserves our attention here: in online spaces, we are very rarely in charge of making and enforcing the rules that govern our speech.

Facebook and other large social media platforms are, at best, “accidental” civic spaces. Their *raison d’être* is not to create spaces for civic conversation, but to capture information about user’s psychographic preferences, used to resell their attention to advertisers in an economic model Shoshana Zuboff (2019) describes as “surveillance capitalism”. While these spaces are routinely repurposed for civic purposes, they are governed by rules that rarely respect those needs: while using Facebook to organize the Tahrir Square protests that ultimately toppled Hosni Mubarak, Wael Ghonim routinely lost his ability to log into Facebook because he was operating the group under a pseudonym, counter for Facebook’s policies (it is not hard to imagine why it might be helpful to use a false name while organizing a political revolution) (York, 2022).

Corporate accountability advocate Rebecca MacKinnon refers to platforms like Facebook as “internet monarchs”, who make decisions about the rights of their users with absolute power and without meaningful checks and balances. Her 2012 book, *Consent of the Networked*, advocates for companies to issue a Magna Carta, a recognition of basic rights that citizens have even within a monarchy, a reference to the foundational political document establishing rights in the English monarchy. Unfortunately, in the decade since she raised that idea, very little accountability has actually emerged. Facebook has announced, with great fanfare, an advisory board that can review some of the company’s content moderation decisions, either because users have appealed a decision, or because the company has referred the case for further consideration (given that 524,000 cases have been referred to the board, the company’s selection of cases for consideration is likely to be very important) (Olson, 2021). For all the criticism Facebook’s oversight has received (for a perceived lack of independence, for serving as a “fig leaf” for Facebook’s opacity) (Ingram, 2020), many large platforms have done even less to make their moderation decisions visible to their userbase.

In the 1990s, as “user-generated content” – where users create their own content, hosted by a website that makes money by serving ads alongside user content - became a viable business model for websites, business leaders made a critical decision: they decided to treat moderation of content as a customer service task. I was one of these leaders, and I created our terms of service and the team that enforced them without entertaining the thought that my users should have a significant voice in crafting the rules for their online behavior. MySpace, Facebook and other subsequent social networks – the modern generation of user-generated content businesses – repeated the mistakes I and my peers made, and amplified the problem further. Seeking cost reductions, platforms outsourced content moderation to overburdened workers in low-wage nations, who make hundreds of content decisions a minute, following complex rules dictated from corporate headquarters. These workers often do not work for the platform companies themselves, but for contractors, and often have little agency in identifying rules that may be unclear or problematic (Gray & Suri, 2019).

In other words, I and others involved with designing the structure of contemporary social media mistakenly decided that content moderation should be a customer service problem. We missed a critical opportunity to make it a space for governance.

Consider an alternative model: the governance of forums on Reddit, commonly called “subreddits”. Like Facebook, Reddit is an ad supported platform that hosts user-generated content. Unlike Facebook, most content moderation decisions are made by tens of thousands of volunteer moderators, who vastly outnumber the company’s less than a thousand paid employees. Moderators put in dozens of hours a week to ensuring their communities within the rules they have set, sometimes holding polls to determine what rules the community wishes to set for itself. They work not because volunteer moderation is a path to a paid job, but because the work itself is satisfying. As Reddit moderator Robert Peck explains, “It’s fulfilling to be needed and to be skilled. We don’t own the site, but we consider its spaces ours” (Peck, 2019).

Peck and his comrades may not be getting paid, but they are likely gaining key civic skills. They are learning how to resolve conflicts online, to listen to the concerns of the people they govern, to apply rules fairly. In the case of subreddits that hold polls on governance issues or elect moderators, participants as well as moderators gain civic experience from participation. Research from the Civic Signals project suggests that frequent users of Reddit rated the platform more positively on questions of promoting inclusion, thoughtful conversations and sense of belonging than heavy users of other platforms rated the platforms they used on these metrics (Stroud & Pariser, 2021).

Without participation in the ways Reddit moderators are involved with governance of their communities, we may experience changes of mind or heart from encountering other views, but we do not gain the sorts of civic experiences we gained in the process of managing real-world civic spaces. In most online communities, we are not permitted to do the hard organizational work that Putnam and de Tocqueville rightly celebrated and we do not gain the associated skills in the process. Instead of engaging in the challenging work of determining what sorts of behavior are permissible in the spaces we belong to, and how we handle violations of those rules and norms, we are subjects of an opaque and distant regime. Existing social media teaches us how to be subjects, not civic actors.

There is another option: we could build and govern the spaces we use the most. Science fiction writer Naomi Novik has been deeply involved with the “fan fiction” community for decades. Fan fiction is the practice in which amateur authors extend works created by professional creators – a fan of Harry Potter, disappointed that JK Rowling wrote only seven books in the series, might write stories that extend and expand the characters and universe. Because fan fiction authors build on materials that are copyrighted and sometimes trademarked, user-generated content platforms are sometimes reluctant to host fan fiction material. Frustrated with arbitrary decisions by platforms that did not understand the culture of fan fiction, Novik and dozens of allies launched a new platform: An Archive of Our Own (Fiesler, 2016).

This new archive – commonly known as AO3 – was designed and programmed by fans, for fans, and now hosts over 9 million fan works, with almost five million registered users and more unregistered visitors. It is the centerpiece of a community organized around an association called the Organization for Transformative Works, which maintains a legal defense team for fans threatened with legal challenges, a peer-reviewed journal about fanworks, and other projects central to the community’s needs. Participants in AO3 and OTW have gained experience in programming and design as well as organizational management and governance, and hundreds of activists and scholars of fandom have developed their competencies within the framework of the community. The decision to create a fan-led community produced not only one of the most successful examples of a purpose-built social network, but an inspiring and instructive social movement.

Not all communities will have millions of enthusiasts to draw from in building their own infrastructures. A new project in The Netherlands offers another model for community social networks. Pubhubs, launched by computer scientist Bart Jacobs and media scholar Jose van Dijck, builds small social networks around existing social institutions like primary schools, neighborhood football clubs, or local governments. Parents whose

children attend the same schools can easily create a social network where they can debate issues, plan events and cooperate, without participating in the surveillance economy that underlies an alternative platform like Facebook. While the project is currently charitably funded, Jacobs and van Dijck are both members of Public Spaces, a consortium of publicly funded Dutch organizations who are building open source alternatives to restrictive commercial software. It is possible that Pubhubs will become a core part of the infrastructure provided by social organizations like schools and clubs, a digital public infrastructure used to build and strengthen social ties (Monterie, 2021).

Pubhubs will be launched in early 2023, and it is not yet clear how communities will govern themselves. One option would be to include in the software a toolkit for democratic governance, like Policykit, created by Amy Zhang and colleagues (2020) at the University of Washington. Using Policykit, community leaders can hold elections and polls within a social platform, allowing platforms to move away from the benevolent dictator model and towards participatory governance (arguably, any online platform is subject to arbitrary control by whoever physically controls the webserver – she or he can always pull the plug on a project). By basing online communities in real-world communities that already practice some degree of self-governance, Pubhubs seems a likely platform to experiment with participatory online civic spaces and strengthening of civic skills through online engagement.

As scholars work to determine whether online platforms are negatively affecting democratic participation, and legislators propose legislation to limit misinformation and increase platform transparency, we should work towards another goal as well. We should shift our use of social platforms towards ones that communities own and govern. We should make this shift not just to limit the power and profits of existing internet monarchs. We should make this shift because participating in social networks we ourselves govern could turn online spaces into Putnam's "schools for democracy".

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INVITED PAPER

**Reconnecting *Civitas* and *Urbs*: making tourists
and remote workers as temporary urban citizens**

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Abstract

Ancient Romans posited a strict correspondence between the city as a physical concept - what they called *urbs* - and the society that inhabited it - the *civitas*. This conceptualization rested on an assumption that went largely unchallenged for centuries: most people live where they belong. What happens, then, when the social and technological conditions of the contemporary world severs these ties? Tourists criss-cross the planet seeking leisure, high-powered workers extend their careers across continents, and migrants flee their homes in search of new opportunities. To rebuild a coherent notion of urban citizenship, one that allows communities to flourish, this perspective article sketches a model of “variable citizenship,” that could account for different categories of people who have been cut off from conventional modes of belonging. With this new, flexible model of citizenship, supported both by digital tools and design projects that reclaim the importance of physical, shared public spaces, we can reconnect the *urbs* to the fast-moving *civitas* of our time.

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For centuries, most Western societies rested on a couple of assumptions that can no longer be counted on. First: most people live where they belong. Second: the sense of belonging is inextricably tied to one’s birthplace. With individuals staying in the same places for years or generations, community and civic participation were easier to foster. In other words, there was a relatively straightforward correspondence between one’s physical location – what the ancient Romans called the

urbs: the built-up component of a city – and the people who rightly inhabit it – the *civitas* (Romano, 1993).

In the last few decades, an increasing number of people, in different life circumstances, have experienced a severance of the *civitas-urbs* correspondence. Multiple social, economic and technological factors have created this situation. International business interests, more affordable air travel, and digitization, coupled with generally less rigid regional and national borders, have facilitated new connections between distant places, prompting more and more people to look beyond their immediate surroundings – be it for leisure or for work, to satisfy personal ambitions, or to flee from undesirable political or environmental conditions. Under the pressure of millions of individuals’ uncoordinated decisions, the ultimate outcome is that so many of the *civitates* of our world have been pried apart from their *urbs*.

Nowhere is this happening as dramatically as in big cities, the pivotal nodes of the globalized economy (Sassen, 2001). Our metropolitan centers are filling with tourists, globe-trotting commuters, remote workers, and ever-growing numbers of migrants. These groups travel across the planet under extremely different circumstances, but they share the common experience of not fitting into the communities where they arrive. Their physical presence, multiplied by the thousands, challenges the correspondence between *urbs* and *civitas* - being in a certain place does not automatically imply being part of its civic society.

The possibility of millions of human beings coming from faraway places to live together might sound to some like the realization of a cosmopolitan utopia. Undoubtedly, the possibility to decouple one's place of birth from one's destiny has been liberating for multitudes of individuals. However, when looking at this issue on a collective scale, the mismatch between *urbs* and *civitas* generates a series of fundamental social issues and provokes profound social tensions. In different contexts, it can fuel phenomena as diverse as political polarization and social resentment, urban fragmentation and segregation, or distrust in civic institutions. Populist politicians have been the first to skillfully and selfishly exploit the layperson's sense of unease and fear vis-à-vis this changing reality; how can this vulnerability be repaired?

When we consider the history of cities, we find that the underlying principles are simple. Cities emerged 10,000 years ago, and they succeeded because they brought together a large population with a shared, vested interest in a common space. In these ancient urban centers, we can see the rudimentary basis of citizenship as a simple exchange: civic contributions for civic freedom. Those with the formal or informal status of "citizen" are afforded certain rights and advantages, from access to markets to the power of the ballot. As a medieval German adage went: "the air of the cities makes you free," and no wonder. Cities would offer far broader horizons than the countryside where peasants struggled to make a living. However, becoming a citizen was not just a question of breathing: that privilege was earned by following certain rules and making critical contributions, from taxes and economic participation to membership in community institutions. It is easy to make these contributions when one lives in a place long-term; a job becomes available, a church surrounds you with holy community, the tax collector knows where to find your door. However, cities have always been less well-equipped to handle new and short-term residents — neither the visitor nor the city she visits is agile enough to collect civic dues and dole out civic privileges. The *civitas* and *urbs* fail to click together, and the newtimers are legally and socially

excluded from the rights and responsibilities of citizenship. This failure of connection comes in political, economic, and cultural terms.

How can we restore the staying power of citizenship in a world where the experience of rootlessness has become so widespread? Some might dream of a return to the past, when everyone stays in the place where they were born for their entire life. But that is simply not possible: the globe has become deeply bound together, and no realistic return is in sight. Accepting that present trends are likely to continue, a possible solution might lie in rethinking our understanding of the very idea of urban citizenship, with the objective of mending the recently-formed rift between *urbs* and *civitas*.

In this text, we sketch a form of "variable" urban citizenship: legal and cultural paradigms which acknowledge the reality of a highly mobile global population and bring these transient *civitates* back into the embrace of the *urbs*. To do so, we must think nimbly about the kinds of ways that people can be incorporated into their communities, even if they are new or temporary residents. To flesh out this idea, we will apply it to two groups of people for whom a form of variable citizenship could apply: tourists and remote workers. We imagine policies at the level of the city, focusing on the idea that citizenship is first and foremost lived at the level of one's physically proximate community. While our speculative model touches upon issues studied by multiple disciplines, our first focus is a possible role of designers in reconnecting the *urbs* and the *civitas* through their action on physical space.

First, let us consider the tourist, an individual whom is often imagined as the exact opposite of a citizen. Tourism is a lucrative business, and it has boomed in the era of cheap air travel. The birth of the post-war world is very much the birth of a world of tourists. Global travel has skyrocketed: from 25 million tourists in 1950 to 1.4 billion in 2019 (Roser, 2022). The fragile, local balance between *urbs* and *civitas* can be tragically disrupted by this colossal human flow.

Tourists certainly bring in money but rarely have attachment or commitment to the long-term well-being of the places they visit. "To be a tourist is to escape accountability," American novelist Don DeLillo famously wrote:

"Errors and failings don't cling to you the way they do back home. You're able to drift across continents and languages, suspending the operation of sound thought. [...] You don't know how to talk to people, how to get anywhere, what the money means, what time it is, what to eat or how to eat it" (DeLillo, 1989).

DeLillo observes that tourists are granted “immunities and broad freedoms” in exchange for their cash; this empty transaction is a perversion of the mutually beneficial exchange that defines citizenship. At their worst, hit-and-run tourists disrupt local public life, disrespect local customs, warp local economies, and price long-term residents out of their homes.

Resentment against tourists is boiling over. In the years immediately before the first outbreak of Covid-19 pandemic, young Catalan activists famously vandalized a tour bus in Barcelona, slashing its tires and spray-painting “tourism is killing neighborhoods” on the windshield. The conflict is especially nasty in cities where tourists outnumber long-term residents. In some cities – especially the ones that are losing population – tourists outnumber residents by a significant ratio. Calculations of the flows of urban visitors can get quite fuzzy, due to the difficulty of accounting not just for those who check-in at a hotel or Airbnb, but also for day-trippers. Some estimates have put the figure for pre-pandemic Venice at a staggering 20 million people per year, that is, roughly 350 tourists per resident of the historic city (Momigliano, 2020) – that number is around 20 in Barcelona (Abend, 2018) and 8.5 in Paris (Guillou, 2022).

How can cities control the torrent of tourists? The municipality of Venice decided to protect its citizens by charging a “tourist tax” (€3, which would eventually rise to €10) for day-trippers entering the city’s historic center (Giuffrida, 2022). If tourists do not contribute to the city’s life through community membership, Venice could at least extract more monetary value to undo the damage they cause. The funds raised by the tax would, according to the city’s mayor, go to cleaning and maintaining security, expenses that are currently upheld by Venetians alone. However, before the tax could be implemented anywhere, COVID-19 struck, bringing international travel to a halt. The planned tax in Venice has been repeatedly delayed, and is now scheduled to be implemented in 2023 (Buckley, 2022).

The tourist tax contains the rudiments of a citizen-like relationship – paying an extra tax to access the privileges of boating in the canals or strolling through the Piazza San Marco – but the attempt is a narrow one, relying entirely on money as the unit of account for civic goods that cannot be so easily commodified. Squeezing more money out of tourists could raise revenues in the short term, but it cannot address the structural issues that tourists create. Indeed, a more extreme version of the Venetian tax, a relatively small amount of money, might worsen the problems of gentrification by selecting only the wealthiest tourists. If Venice is trying to avoid being Disneyland, raising entrance fees might just turn it into Mar-a-Lago. The flimsiness of a purely transactional relationship was proven during COVID-19 – no tourist felt any roots that would have motivated them to stay in the city that depended on them.

One alternative to address the problems of tourism without the blunt instruments of commodification would be incentivizing tourists to settle in cities for longer periods. Almost inherently, a tourist who stays for a few weeks or months rather than a few days becomes more accountable, more like a citizen. Instead of visiting a restaurant once, a longer-term tourist might become a repeat customer who leaves kind tips and makes good conversation with wait staff. She might learn to speak at a proper volume, and support a broader range of commercial activities than hotels, gift shops, and tour buses. This would not only be good for the city, it would enhance the experience of travel itself. Rather than moving towards the pessimistic vision of French philosopher Paul Ricoeur, who decried how, in the modern world, everywhere “one finds the same bad movies, the same slot machines, the same plastic or aluminum atrocities” (Ricoeur, 1955) visitors might actually enjoy spending longer periods of time in different cities. We call this model “pace tourism,” and we believe it could help reconnecting *urbs* and *civitas* in tourist destinations around the world.

The potential of pace tourism is already visible in extant programs that encourage long stays. Consider another case in Italy, the southern city of Matera, named European Capital of Culture in 2019, which decided to rebrand its tourists as “temporary citizens” (Melucci, 2019) and invite them to help contribute something to the town. As a result, tourism boomed – without some of the seemingly inevitable tradeoffs. One could also consider study abroad programs and traveling fellowships employed by university students across the world. Anchored by host families and other schools, these semester or year-long stays are transformative without being transactional.

As these examples show, other contributions, beyond the financial, can qualify someone for a form of citizenship without requiring long-term residence. Instead of a monetary tourist tax, what about a civic contribution tax that could come in many other forms? For example, one could become a temporary citizen of Venice for one year in exchange for help with maintenance on its palazzos and stuccos. Young graduates could share digital skills to assist startups; retired members of *Ingénieurs sans frontières* could work to restore the canals. Temporary citizens can become one with the *urbs* with projects that focus on the space itself, giving them the chance to inscribe their lives into the stones themselves – joining with Venetians who have done so for centuries. Moreover, they would learn local customs: their language skills would grow beyond an introductory manual, and they might graduate from visiting restaurants to learning how to cook local cuisine for themselves.

Municipal governments could take action in bringing pace travel to their cities, leveraging the power of online platforms. They could create roles for

volunteering and temporary employment, and they could incentivize companies like AirBnB, or smaller operators, to offer discounts for longer stays. Apps, now ubiquitously embedded with location-based services, can also be programmed to provide incentives based on length of stay and degree of local engagement. These digital tools could be paired with lower-tech strategies, like adding a minimum stay stipulation to certain tourist visas. The ultimate objective would be to transform tourists from lucrative annoyances to honored, valued guests.

Another key group to consider is international commuters and remote workers. This demographic travels the world not just to spend money, but first and foremost to earn it.

Fifty years ago, urban theorist Melvin Webber predicted that “for the first time in history, it might be possible to locate on a mountain top and to maintain intimate, real-time, and realistic contact” (Webber, 1968). In 2020, his prophecy came true. Since the first weeks of the COVID-19 crisis, many white-collar workers have discovered that they can do their jobs from anywhere. Connecting digitally with their colleagues, billions of people climbed up the steep, steep sides of the mountaintop.

Once again, this new arrangement puts into question the correspondence between *urbs* and *civitas*. Linking technological progress to social changes, Spanish sociologist Manuel Castells (1989) famously wrote about the emergence of an unprecedented “Space of Flows.” According to Castells, information technology and early digitization has created a society where wealth, and power increasingly bypass physical space. This logic challenges the traditional logic of the “Space of Places” where localities hold a central position in societal organization.

When Castells elaborated his theory, many experts shared the opinion that the positive effects of the “Space of Flows” would outrun any possible negative outcome. In contrast to that, a less optimistic scholar was American historian Christopher Lasch. In *The Revolt of the Elites and the Betrayal of Democracy* (Lasch, 1995), a collection of essays published shortly after Lasch’s death, the author decried how a threat to American democracy came from its elites, which “have removed themselves from the common life”. While the reasons for these phenomena were manifold, among them was the fact that executives and other high-powered professionals were now operating in a global information market, which allowed them to embrace a regime of international mobility. As a result, these individuals were not tied to any specific location anymore, founding themselves detached from any obligations to the local community. Lasch predicted

that in the long run, this dynamic would increase political polarization and provoke a detriment of democratic processes and civic trust.

When the book was published, Lasch estimated that the “elites” made up roughly a fifth of the population of the United States. Since then, and especially with the unexpected acceleration in remote working adoption ushered in by the pandemic, the number of people who had the possibility to leave the physical workspaces and retreat in isolation increased. This group disproportionately comes from the sector of knowledge workers, and while they still may not amount to a majority of residents, as tourists sometimes do, it has reached a size that was unimaginable until a few years ago.

Despite some of the hypothesis mentioned, it was not entirely clear that remote work could necessarily rip apart our civic fabric – that is, until the COVID-19 pandemic gave us the data to confirm the danger. As this massive, unprecedented shift occurred, we gained a once-in-a-lifetime chance to study exactly what effects remote work would have on the individual and societal level.

First, let us characterize social networks using terms developed by the sociologist Mark Granovetter. He divides relationships into two types, the “strong ties” we maintain with friends and family and the “weak ties” we form with casual acquaintances (Granovetter, 1973). Strong ties yield dense, overlapping networks; your close friends are often close friends with each other. But our weak ties are in many situations even more important, because they connect us to a far broader range of people and completely separate social circles (or “bubbles”, to say it in more Internet-friendly terms). Those individuals are more likely to introduce you to new ideas, challenge your preconceptions, and make you aware of the world outside your strong ties. They help us find job opportunities and adapt to new innovations. To put it simply, weak ties are the glue that hold us together as a broader community. Granovetter posited that weak ties are indispensable to a healthy civic life. They are key agents for maintaining trust, enthusiasm, and mutual understanding among people of different beliefs. Without them, a society begins to decohere.

From the outset of the pandemic, our Senseable City Lab at MIT began to study how remote work affects the formation of weak ties. Using anonymous data from the Institute’s email servers, we found that students, professors, and administrators began to exchange more messages with a smaller group of contacts. In other words, strong ties were becoming stronger and weak ties were falling away (Mazzarello & Ratti, 2020). This finding fits the anecdotal experiences of many people who were locked down: we dedicated more time to our families at home and to our close friends online. In that same period, our acquaintances slipped through the cracks.

Why does the Internet sever weak ties in a way that physical space does not? The key factor to consider is the inevitability and serendipity of the physical world that is impossible to recreate online. The Internet allows us to cherry-pick what to see and whom to talk to, a habit only fueled by the digital algorithms that reinforce our connections with those who most agree with us. Needless to say, in shared offices, buses, or sidewalks, we can't screen out weak ties with one click. Indeed, we run into people and ideas we'd never expect. For these key interactions to take place, we need the common ground of an *urbs* to create the weak ties that bind a *civitas* together.

Yet remote work is clearly here to stay. Short of a Luddite temper tantrum that forces employees to stay in the office and ignore new technology entirely, how can we re-incorporate remotely working employees into physical communities? We will need to devise a host of arrangements that coax them back into the social vitality of physical space. The key will lie in adjustments to urban infrastructure, and places to work in particular. The physical office retains its crucial importance in favoring the formation of weak ties, as other shared urban spaces do.

Lasch attributed a part of the *Betrayal of Democracy* to the loss of "third places" – a term coined by urban sociologist Ray Oldenburg in the 1980s (Oldenburg, 2005) to indicate those spaces beyond the home and workplace that foster spontaneous conversation among citizens of different social classes. This, in turn, echoes the definition of "social infrastructure" provided by Eric Klinenberg (2018) in "Palaces for the People". In his words:

"Infrastructure' is not a term conventionally used to describe the underpinnings of social life. But this is a consequential over-sight, because the built environment – and not just cultural preferences or the existence of voluntary organizations – influences the breadth and depth of our associations. [...] What counts as social infrastructure? I define it capaciously. Public institutions, such as libraries, schools, playgrounds, parks, athletic fields, and swimming pools, are vital parts of the social infrastructure. So too are sidewalks, courtyards, community gardens, and other green spaces that invite people into the public realm. Community organizations, including churches and civic associations, act as social infrastructures when they have an established physical space where people can assemble, as do regularly scheduled markets for food, furniture, clothing, art, and other consumer goods. Commercial establishments can also be important parts of the social infrastructure, particularly when they operate as what the sociologist Ray Oldenburg called 'third

spaces,' places (like cafés, diners, barbershops, and bookstores) where people are welcome to congregate and linger regardless of what they've purchased. Entrepreneurs typically start these kinds of businesses because they want to generate income. But in the process, as close observers of the city such as Jane Jacobs and the Yale ethnographer Elijah Anderson have discovered, they help produce the material foundations for social life" (Klinenberg, 2018).

Although many remote workers come from the private sector, municipal governments cannot leave the effort of creating physical spaces for them to inhabit to the discretion of private co-working firms or spacious cafes with high-speed internet connections. Services and establishments such as WeWork and Starbucks cafes are not necessarily spaces that will create the diversity of encounters and weak ties that are fundamental to the *urbs-civitas* balance.

What forms of public social infrastructure can help to enfold remote workers back into the *urbs* around them? Based on the concept of a *civitas* and *urbs* requiring physical proximity, we should focus on engendering citizenship in whatever place a remote worker spends the most time. The nightmare scenario we wish to avoid is a desolate "Zoomtown," where everyone spends their days on a computer, participating only in the life of some other place.

How can we imagine a civic space for remote workers? From a designer's perspective, a starting point could be the template of the public library, an institution which developed in the late 19th and early 20th century with aspirations to help all citizens educate themselves. It would be a mistake to think that the digitalization of many archives and books has rendered libraries obsolete. In fact, as time has worn on, they became places where people around the world already gather for much more than reading. WiFi, public access, and other amenities make these attractive, democratic alternatives to private co-working spaces. Now, with the goal of citizenship in mind, architects and planners should strive to imagine further ways to make libraries even more relevant.

From a functional point of view, amenities like conference rooms, fab labs or spaces for training, and office supply stores have already been incorporated into large-scale libraries around the world, such as the Oodi National Library of Finland, which opened near Helsinki's Central Station in late 2018 to celebrate the country's centenary of independence (Angelopoulou, 2018). Similarly, the extension of the Taiwan National Library, designed by CRA-Carlo Ratti Associati and Bio-Architecture Formosana (BAF), investigated the future role of the library in a digitized society. It centered on the concept of "Library as a Town". The new infrastructure would accommodate a variety of

functions, including a book museum and a joint archives center (Morgan, 2018).

Other changes would be programmatic, and should aim to bridge the needs of the local communities with those of the traveling citizens of the digital era. Libraries could offer services to workers on the move like language courses, tax advice, social events, and opportunities to enroll in volunteer work. Indeed, they could eventually aspire to become like embassies or community centers for the liminal lives of “variable citizens,” helping them to become more closely tied to the local community and one another. Moreover, so long as libraries also maintain their vital, present functions, they could become a space of social intercourse for permanent and transient populations.

Variable citizenship is much easier to imagine than to implement. While we can fantasize about working around the rigid systems of nation-states, embracing the prospect of “mayors ruling the world“ (Barber, 2014), it will be difficult to tackle issues of taxation, suffrage, government benefits, and more. Moreover, the merits of these proposals do not generate political will to be achieved. Green cards, visas, and even passports might attract political firestorms. For all of these reasons, any creation of a variable citizenship scheme should be implemented gradually.

In fact, the practical advantages of developing variable citizenship to establish new correspondences between *urbs* and *civitas* might extend beyond the categories of tourists and remote workers. There is a third population that dwarfs the two mentioned here: migrants.

Earlier on, we argued that migrants and tourists, while moving for obviously very different reasons, face similar criticisms about a failure to engage with the local cultures. Here, a robust model of variable citizenship, perhaps developed against lower-stakes populations such as tourists, could help teach an *urbs* to integrate them. While this essay will not engage in the complex task of sketching an extra declension of the variable citizenship scheme that could apply to migrants, this would definitely be worth further exploration, especially as international human flows are poised to increase, further exacerbated by climate crisis-induced conflicts and displacements.

The increasing number of people on the move in our digitized, highly-connected world – from tourists to remote-working professionals – is posing fundamental challenges to our cities’ social cohesion. In general terms, this tension can be brought back to the severance of the historic correspondence between *urbs* and *civitas*. The speculative proposal of a “variable citizenship” approach, outlined in this essay, aims to restore this balance, albeit in more flexible ways. Under

the constant weight of shifting crises, technological changes, and human movements, we must redesign the tools of urban citizenship, while also designing physical spaces that favor social encounters and encourage fruitful exchanges between the more stable populations and the temporary residents. From shifting municipal policies to building next-generation community centers, we have means to enact a revolutionary, necessary change in how we imagine who belongs where. Ultimately, we may eventually shift the age-old assumption – that people should live in the city where they belong – into its inverse: people can always come to belong where they live.

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Educating to Digital Citizenship: conceptual development and a framework proposal

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Abstract

This article discusses the meaning of digital citizenship and aims to outline a framework for an education that wants to develop it. The hypothesis is that two ages can be identified in the historical definition of the concept and that today there is a conceptual gap in this regard. With tools borrowed from media archeology and theories of technical innovation, the article moves on a theoretical level by discussing this hypothesis and coming to outline a first draft of the framework.

KEYWORDS: Digital Citizenship, Media Literacy, Digital Education.

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1. Introduction: Digital Citizenship and Education. A conceptual gap

This article's goal is to reflect on what the concept of digital citizenship suggests today to education in terms of redefining rights and duties, behaviors and values. Our hypothesis is that in this regard there is a conceptualization gap between the still widespread representations of digital citizenship and the way in which it is already concretely acted in the information society. In a few words, the digital citizenship that is the subject of educational discourses is no longer the same form of citizenship that people experience in their daily lives. The gap is between an idea of digital as a parallel world (the "Matrix model" of the "first age" of the concept) and as an extension of the world (the "Kingsman model" of the "second age", the current one).

In the first case, digital is thought of as something that goes hand in hand with the physical dimension and

from which one can enter and exit. In terms of citizenship, it finds expression in the theme of teledemocracy, of life on the screen (Turkle, 1997) and suggests the idea that we are called to live a dual citizenship, on and offline.

In the second case, however, digital becomes the ordinary reality of things, hybridizes objects, overlaps like a layer (Lanier, 2011) all the practices of individuals. This is the post-digital phase, the phase of onlife (Floridi, 2014) of platforms and algorithms, of machine learning. In terms of citizenship, it finds expression in the various forms of hybrid reality that invite us to think of a single citizenship of which digital is an integral part.

Focusing on this conceptualization gap, means for education to register some new challenges that the new idea of citizenship in the digital age is launching.

2. Materials and Methods: Media Archeology, Social discourses, Innovation

The verification of our hypothesis passes on the methodological level by adopting two points of view: that one of media archeology (Parikka, 2012) and that one of the theories of the diffusion of technical innovation (Flichy, 2003).

As for media archeology, it takes its cue from the Foucaultian approach to knowledge and the

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reconstruction of its trajectories (Foucault, 1969) as well as from an ecological approach to the media, started by the reflection of McLuhan (1964) and Postman (2006) and today, archaeologically, rediscovered and put in relation with the reality of mediatization, of which the environmental idea of the media proves to be a powerful descriptor. Methodologically, an archaeological study of the media foresees three moments: the identification of a topic concerning the present moment (1); the excavation of the past, supported by the awareness linked to that topic (2); the return to the present, to illuminate the problem from which we started through what was found in the past (3).

As for the theories of the diffusion of technical innovation, the merit of Flichy (2003) is to show very well how it, especially in the phase in which a new technology is launched, makes use of accompanying social discourses. The task of these speeches is to overdetermine the meaning of the new technology and, through this work of symbolic enhancement, make it perceive its importance, or inevitability. The outcome of this important discoursivization is the affirmation of technology which, once given meaning, will begin to be adopted, like a self-fulfilling prophecy.

These two methodological assumptions, in our reflection based on theoretical research, can be applied in two directions.

The first direction is the archaeological recovery of the discursive apparatus that accompanied the first phase of dissemination of the concept of digital citizenship. Through the analysis of some authors who lived and characterized that phase (in particular Pierre Levy and Derrick de Kerckhove) it is possible to identify the ideas that originally marked the idea of digital citizenship: transparency and the absence of mediation.

The second direction is the analysis of this type of discourse in the light of the distinctive elements of the current communication scene, marked by mediatization and platformization. The outcome is twofold.

On the one hand we realize that transparency, contrary to what one might believe following a postmodernist line of reflection (Jameson, 1984; Vattimo, 1989), does not necessarily represent the trait of a better society. This is explained by the analyzes of Han (2012) from which it is clear that transparency is not a condition of social peace and involves a loss of depth to the advantage of obscenity understood as a total and hyper-real exposure.

The other outcome is the affirmation of an idea of digital citizenship that is completely different from that one imagined by Levy and de Kerckhove: not another dimension, a space parallel to that of material life, but an experience perfectly integrated with it; not a utopian positive situation, but a structurally dialectical one and suggestive of provocations.

3. Results: Analyzing the gap. Two different narratives about citizenship in the Digital Era

Pierre Levy (2006), in the essay to which we refer, bases his reading of “cyberdemocracy” on the idea of omnivision, that is the new type of visibility that, according to him, was gaining ground thanks to the spread of the Web and digital media: seeing all, being able to choose the direction of one’s gaze [Levy’s essay, like that one of de Kerckhove, is contained in a 2006 book, edited by de Kerckhove himself and by Antonio Tursi, which fixes and develops the themes of a conference entitled *Cyberdemocracy or postdemocracy?* which took place in Rome in April 2004 and was organized by the School of Communication of the La Sapienza University and by McLuhan Fellows International. In a book entitled just *Ciberdemocratie*, Levy (2002) had already focused on the themes that he summarizes and relaunches in this essay.]. Levy associates two distinctive characteristics with this kind of visibility: universal indexing and hypericonicity. Universal indexing means that everything points towards everything, that everything is tracked. The hypericonicity, on the other hand, alludes to the data of a single large image that contains all the other images: a fractal image that can be explored interactively at different levels of depth. On this new visibility, on these characteristics, a new idea of the public sphere is developed; according to the French philosopher, it would have been more inclusive, more transparent and, precisely for this reason, universal.

Cyberspace is more inclusive because it allows everyone to express their views and makes information more easily accessible. This possibility affects the transparency of society by changing it in the direction of what is now called de-mediation, or disintermediation. Levy writes: “Now ordinary citizens can, if they so wish, bypass journalists, doctors, lawyers, teachers or politicians and obtain political, medical, scientific or legal information for their own purposes” (de Kerckhove & Tursi, 2006, p. 11, our translation). And universality alludes to a system of communication without borders, multicultural, translinguistic, capable of breaking down and overcoming the borders between states.

de Kerckhove (2006), in his essay contained in the same book, returns to some of the themes of Levy’s reflection and amplifies them. He takes up the theme of the “symmetry of freedom of expression” and brings it back to the question of transparency: where communication is more vertical, where the flow of information is controlled by a few people, it is easier for opacity to prevail that is to choose not to make everything clear; on the other hand, where communication is horizontal, it is also transparent and more open to collaboration.

This transparent communication also shapes the idea of the State. The digital State (de Kerckhove speaks about

e-Government, indulging in an orientation of those years in which the suffix e- was frequently placed before nouns and adjectives to redefine them) is a “light” State, without bureaucracy, without ideology; it is a “naked” State. Tapscott & Ticoll (2003) speaking of naked corporations refer to organizations that “say what they own”: «They will look stupid, besides the fact that they will risk one of the main capitals: their reputation» (de Kerckhove, 2006; 65). As for Levy, the result is to link this transparency to a model of society conceived as a multicultural space of coexistence and tolerance: once again, horizontality and transparency suggest a little conflictual reality, the overcoming of borders points in the direction of dialogue and not of the confrontation.

From this brief analysis of the two essays from which we started (which can be considered to be representative of the totality of the speeches that were made in those years on the subject of cyberdemocracy), an idea of digital citizenship built on certain characteristics and skills of the citizen emerges:

- the habit of discussion and public debate. In the same years, the idea of the internet as a New Areopagus, as a New Agora, made its way: this is the theme of the Assembly of the Demos, in which the Greeks could speak directly, without intermediaries;
- the communication and intellectual skills functional to the New Economy and its needs. These are what are now called digital skills and are still presented as a passport for entry into the Information Society;
- the responsibility that is required by having to manage a wider freedom of expression and greater access to information. If there are no longer any intermediaries and if vertical control fails, it is clear that this void must be filled by the responsibility of individuals from a self-regulatory perspective;
- but above all, the idea that is derived from it is that one of a cyberdemocracy as a second dimension that is added (and it is hoped that it will be able to replace) the “real” one: I am a citizen of a State and, thanks to the internet, I am also Citizen of the Net. What is emerging here is the model of a dual citizenship: internet, digital, as a passport to access another civil and political reality, in some way an alternative, indeed an improvement, to the current one.

The developments in communication in the last twenty years allow us to think from an archaeological perspective on the theoretical themes that we introduced following Levy and de Kerckhove.

Today we are experiencing the “fourth wave” (Colombo, 2020) in the development of communication technologies; this is marked by the advent of Web 2.0 and platforms (Van Dijck et al., 2018). The outcome of this fourth wave is a redefinition of the meaning and role of the media, which are no longer isolable from the

contexts and practices that concern them. The “digital surround” that characterizes our societies means that the media are around and within us, “everywhere and everywhere”, as Adam Greenfield (2006) effectively suggested talking about Ubiquitous Computing.

The resulting society, an algorithm society, can be described at three levels (Eliott, 2019): technical (measurability); economic (the value); philosophical (artificial life).

On a technical level, it is a datafication society in which census, tracing and measuring become the functions of a real dictatorship of calculation (Zellini, 2018) which elects efficiency as the main category. On an economic level, this society is an information society in which value is data and a new form of digital capitalism is emerging (Zuboff, 2019; Eugeni, 2021); it builds its wealth on tracking the activities of individuals. Finally, on a philosophical level, this is a code society (Accoto, 2017) in which software dictates its conditions of thinkability to the world by replacing the opposition between real and virtual with that between the material and the programmable. The new phenomenon is the generativity of information technology: the code transforms the sense of place, modifies the experience of time, produces forms of artificial life.

As we understand, all this impacts on the conceptualization of digital citizenship. In fact, if in widespread discourse media and AI continue to be related to globalization and geopolitics, the present and future way of thinking of society itself in relation to the presence of the media changes radically.

Platformization and datafication highlight the risk of reducing freedom and privacy, of damaging trust in public institutions, of aggravating inequalities and divisions. If in the “early age” of digital citizenship, as we have seen, the idea associated with the development of the internet was rather that of an expansion of opportunities and of an enhancement of diversity, today platforms definitely aim at controlling intermediation and therefore the progressive orientation of behaviors and points of view in a single direction. The predictive analysis of algorithms is in fact prescriptive: they help us to determine the causes and consequences of our lives, but we are not really autonomous in our choices.

Again, as Turkle (2011) already suggested, the new communication scene is emptying emotional ties and requires a new psychology of commitment. The third level of technological mediation (Florida, 2014) thins the boundaries between biological life and artificial life and datafication tends to impose a new way of determining the value of the persons on the basis of the data they carry (Quantified Self).

As we understand, the way of thinking about digital citizenship changes. It no longer identifies the act of civilized living within a parallel, more transparent and less ideological space; digital has developed not in a world apart, but “inside” our world and has certainly brought opportunities, but without the optimistically

anarchic connotations that were thought of in the early 2000s. Today digital citizenship is simply citizenship, no more: the adjective digital has become superfluous, because it constitutes our idea of citizenship from within, modifying it and at the same time makes it something much more complex. Understanding this gap and thinking about the lines of education for this new condition of our civil life becomes an urgent task, which cannot be avoided precisely for the purpose of a correct development of this same idea of citizenship.

4. Discussion and Conclusions: Educating (for) Digital Citizenship

We begin to identify what is not working when we think to what it means educating for citizenship in the digital age. We can say: two strategies, there are two strategies that don't work.

The first consists in trying to keep the two citizenships separate, in not recognizing that digital surround role that makes it indistinct from our ordinary life. Indeed, building citizenship, in this perspective, means educating not to let oneself be "taken" by the digital. This line includes all the technophobic and Luddite options in contrast to technology, the radical option solutions for a digital free life, with the imprint of digital detox. As Elliott (2019) very aptly points out, these solutions are today's analogue of fast weight loss programs. The promise is to reduce digital addiction, but the result is often an intensification of this same addiction. In a world hybridized by the media, it is not possible to detoxify nobody from digital life. For better or for worse, digital technologies are omnipresent in contemporary society. Not recognizing it means refusing to think about contemporaneity.

The second strategy consists in translating citizenship into a system of skills and then reducing its development to a set of boxes to be ticked, as happens in *DigComp*. Behind this solution operates a neo-functional assumption that conceives the role of education in terms of social adaptation: building citizenship in the digital age would mean, then, promoting the development of those skills that make it possible to live and produce within a society characterized by the protagonism of digital. Many public policies and many institutional discourses push in this direction. What is not liked about it, is the complete absence of critical distance, the risk of homologation to the mainstream of thought, the dependence on the indications of the productive world. So, what could (digital) citizenship consist of today?

The background is certainly less optimistic than that of the "first phase" and presents a clear transition to the level of facts. Building citizenship, in this context, means realizing that technological development has now crossed all three thresholds identified by Jacques Ellul (1980a; 1980b) to set its limits. The first

threshold-limit is that of the totalizing reach of the media: pervasiveness and mediatization today say, from a media ecology perspective, that this threshold has been exceeded. The second threshold is linked to the power of the media to change behavior. Also in this case, what was said above about the power of algorithms and the importance of datafication indicates the overcoming of this second threshold as well. The third and final threshold relates to the disappearance of technology as an autonomous field. It is a classic theme of cognitive ergonomics and computer design; it dates back to when Donald Norman (1999) was already writing about the "invisible computer" and to the thesis of Dertouzos (2001) according to which the information revolution could only be said to have been completed when the computer disappeared as a device.

It is from this scenario that we need to imagine a framework for the definition and practice of digital citizenship today. It seems to me that this framework can be organized around three dimensions; each of them takes into account the awareness of some attention, the appearance of new "rights", the development of certain skills.

The first dimension is the critical one. It is the dimension of alphabets, of language (Rivoltella, 2021). It is a traditional dimension for Media Literacy, always struggling with texts to produce an intelligent reading, with respect to which to develop awareness.

Today, with regard to this aspect, some attention is required, specifically at least two. The first attention is to an increasingly self-referential information reality, which tends to eliminate the difference between the referent and its representation, with the result that realities and discourses overlap and merge, making it difficult to certify sources and to define truth (post-truth). The second attention is instead for data and algorithms. The novelty here is that they are not visible and have no textual form: that is, the two characteristics that traditionally had always made media analyzable disappear (Rivoltella, 2022)

In terms of citizenship, the right that certainly imposes itself is the right to transparency understood as explainability, or rather as: the possibility of reducing the opacity that normally surrounds data and algorithms by rebalancing the asymmetric power (Zuboff, 2019) that distinguishes the relationship between who owns the platforms and who accesses their services; but also as an opportunity to establish a hierarchy between sources, to distinguish between facts and speeches, to certify the reliability of information.

As we understand, specific skills are needed: knowing how to analyze content, knowing how to search and sift sources, not conforming to the opinion of most people (as happens in the echo-chambers of social networks), knowing how to protect own data.

The second dimension is the ethical one. It is the dimension of responsibility and resistance. Compared to traditional approaches to Media Literacy and the

A FRAMEWORK FOR DIGITAL CITIZENSHIP

Dimensions	Attentions	Rights	Skills
<i>Critical</i>	Autoreferentiality, Post-Truth, Invisibility, A-textuality	Transparency, explainability	Content analysis, searching and evaluating information sources, keep safe our own data
<i>Ethics</i>	Public and individual ethics, social responsibility	Accessibility, identity, digital address	Acceptance, mediactivism
<i>Aesthetics</i>	Audiovision, stereotypes	Originality	Taste, creativity

Table 1 - A Framework for a Digital Citizenship Education: Attentions, Rights, Skills.

construction of digital citizenship, here we move from working on the citizen as a spectator, to working on the citizen as a spectator and author at the same time.

In this case there are, once more, at least two attentions that are required. The first attention is to the fact that public and individual ethics end up coinciding. At the time of television, the call to responsibility concerned broadcasters: any violations of the self-regulation code involved reporting users to the Communication Authority who could order sanctions in response to these violations. Today the simple fact of owning a device connected to the network calls the individual user, even if he/she is a child or a teen, to the same responsibilities. The second attention is instead not to restrict the problem to individual responsibility: we are not only responsible for ourselves, but also for others. Here we have a transition from responsibility to resistance (Rath, 2017).

There are different forms of law attributable to this dimension of citizenship: the right to accessibility (we realized during the pandemic lockdown how much this is needed); the right to identity and digital domicile.

Once again, specific skills are needed: knowing how to estimate the effects of one’s actions, practicing hospitality (Silverstone, 2006) and responsibility, being mediactive and that is, with Sadin (2015), knowing how to exercise an “active intolerance”. But the responsibilities of companies in terms of visibility of algorithms also need to be solicited, as the *Stanford Report on Artificial Intelligence* (<https://aiindex.stanford.edu/ai-index-report-2021/>) asks, so that middleware solutions can be set up that can respect users’ freedom of choice.

The last dimension is the aesthetic dimension. It is the dimension of taste and balance. It is a dimension that has been neglected in traditional approaches to Media Literacy and which instead is regaining its space today in a time in which perception and layout have found their absolute centrality.

I would like to point out two attentions in this case too. The first attention asks to shift the focus of the analyzes

from the materiality of the texts to the perceptive experience of the consumer. More than in audiovisual, today we are interested in audiovision (Chion, 1994). It is the perceptive acts of seeing and hearing (as well as that of touching and being touched) that are solicited and call for the need for reflection, just as has always happened in the aesthetic theories of reception (Iser, 1978; Jauss, 1982a; 1982b). The second focus is on stereotypies. The public’s taste is guided by media models and this makes it difficult to free the creativity of expression through the media so that it does not depend on the most widespread mainstream models: those who do creative work with teenagers know this particularly well.

The right to authenticity, to originality, to dispense with the connection at all costs, not to conform to the logic that guides consumption, finds space here.

Developing skills to guarantee this right means knowing how to appreciate the quality layout, expressing oneself in original and pleasant forms, knowing how to recognize beauty, as Sadin still says (2015), inventing oneself relentlessly, making one’s life a work of art.

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Educating in platform societies: from Digital Citizenship to public values in a connected world

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Abstract

Digital Citizenship Education has become an increasingly relevant topic in recent years for governments and institutions around the world. DCE is presented in most cases as a new dimension of citizenship education that focuses on teaching students to live critically and safely in digital environments. The topic is closely related to those of media literacy, information literacy and education through digital technologies. Traditional Media Education tools have been updated over time to respond to far-reaching changes in media ecosystems and networked environments. This this did not result in a drastic overcoming of Media Literacy but rather an incorporation of new concepts that arise from the added dimension of networked interactivity. Ultimately, what emerges as prevalent from the analysis of the main discourses on “digital” societies and the need for “digital” citizenship education is that the overuse of the term “digital” leads to various misunderstandings and holds back the development of more adequate and epistemologically founded conceptual frameworks. With regard to citizenship education, the most important aspects to focus on are not about digitization itself but about public values in a connective world: networked life, the non-separability of offline and online, and the platformization of our societies and lives.

KEYWORDS: Digital Citizenship, Education, Media, Networks, Platformization.

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1. Introduction

The idea of *Digital Citizenship Education* (DCE) arises from the acknowledgment that most young people today were born and have grown up in the digital era. In the last two decades the Education Department of the Council of Europe – the continent’s leading human rights organization whose 46 member states include European Union countries – has been working to develop new policy orientations and strategies to support educators in facing new challenges and to empower future citizens by helping them to acquire the competences they need to participate actively and responsibly in a “digital society”. In most European

countries it is considered a duty for the authorities to ensure that these “digital citizens” are fully aware of the norms of appropriate behaviour when using constantly evolving technology and participating in “digital life” (CoE, 2017). In summary, as the council states in the section of its website dedicated to Digital citizenship and DCE, the focus is on knowledge, skills and understanding required for users to exercise and defend their democratic rights and responsibilities online, and “to promote and protect human rights, democracy and the rule of law in cyberspace”. The aim is to reduce the marginalization of those who are not “digital natives” or do not have opportunities to become “digital citizens” or “digizens”. Given the relatively low costs of technologies and network access, for the CoE working group the “digital gap” is more likely to be a gap in skills required to make advanced use of the technology than access to technology per se. DCE represents therefore “a new dimension of citizenship education” that focuses on teaching students to *work, live and share in digital environments in a positive way*. Schools are therefore asked to take care of the education of future citizens with particular attention to network environments and “digital life” in a “digital

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society”. It is appropriate to ask ourselves whether we can speak of “digital life”, “digital society” and “digital citizenship”, and how schools can really play a role in the development of knowledge, skills and competences that are and will be fundamental for people in the 21st Century.

2. The school and the media

During the 20th Century, educational institutions experienced a complicated relationship with the world of electronic communication and multimedia. Even in the so called “electronic era”, characterized by multimedia and an increased circulation of information, educational institutions have largely maintained the characteristics that had defined them in the previous era. In the “pre-electronic” society, the school had in fact functioned as an important channel through which the youngest could break the barriers that surrounded the family sphere by accessing information about the outside world (Meyrowitz, 1985). Between the 19th and 20th Centuries, communication systems, as well as arenas and places of public participation, began to change also under the influence of new technologies of electricity and simultaneity. With the spread of electronic media, radio and television above all, the conditions of the information ecosystem and the traditional relationships between physical environments and social situations have changed (Kern, 1983; Flichy, 1991). Control of the media environment has been added to the control of the physical environment, which has made social spheres defined by walls and gates a particular type of environment for interaction among many. Several scholars have highlighted the close connection between the form of the school system and the informative characteristics of the printing press as a medium, as well as the often-automatic fear and distrust of pedagogical culture towards multimedia (McLuhan, 1962; Ong, 1982; Eisenstein, 1979; Meyrowitz, 1985; Robinson, 2001). Pedagogy itself found it difficult to overcome the brainframes that took shape during the modern age, continuing to think of itself as a discipline modeled on typography and favoring the linear articulation of knowledge (Dewey, 1956; Maragliano, 2004).

The pedagogical implications of a conservative approach to the interpretation of non-typographic media often result in educational institutions built around a single salvific technology (Strate, 2012; Frasca, 2005; Harris, 1986). With the exception of some highly criticized proposals – such as John Dewey’s ideas about the educational function of images –, 20th Century education is therefore defined by difference on the distance from the daily practices of cultural consumption, from the multiple imaginaries connected to the diffusion of radio plays, cinematographic films, comics, television programs, videogames, communications networks.

Not infrequently, in the pedagogical field, we find ourselves contrasting the negative city of the world with the positive one of the educational set. A proposal that tries to keep together the world of education with the concrete one of the daily life of city activities is contained in *City as classroom* (McLuhan et al., 1977). In that book, inspired in part by Dewey’s proposals on progressive education, many of the problems of schools and universities are linked to a clash between different media environments and different media logics. Marshall McLuhan described the educational system of 20th Century as a dying and outdated system, oriented to past values and past technologies (1969), and in a 1959 address at a conference sponsored by the American Association for Higher Education, noted how Dewey correctly intuited the need to reform education in order to adapt to the new electronic media environment. According to McLuhan, the only limit to that intuition was that Dewey lacked the understanding necessary to create an effective program of curricular change, that could only be obtained by applying a media ecology or ecosystemic approach (Strate, 2012, p. 45). Media ecology is defined as the study of media as *environments*, and the word ecology implies the study of environments in their structure, content, and impact on people (Postman, 1970). Beyond academic publications and scientific literature, international and European institutions have tried to respond to the rapidity of change in media ecosystems, going so far in recent years as to explicitly mention – even in official documents – the need for an ecosystemic approach.

3. Media Education and networks

In the book *Media Education* published in 1984 by UNESCO, education is described not as an isolated subsystem, closed in exclusively on its internal components, but as something that is influenced by many processes that bring change to societies and to knowledge. In those pages it is described as ineluctable the requirement that education should take a different view of the mass media, take account in its content of the constantly swelling volume of messages they convey, and learn how to turn media techniques and technology to its own advantage. The book remarks that the coexistence of the two institutions – the “traditional school” and the “parallel school” of the media – is hardly peaceful. The school, according to authors, feigns ignorance of the media’s specific language, and fails to see how content and teaching methods are nothing “but an islet in the flood of information and demands for attention, in the form of sounds and images, to which the child is subjected on leaving the classroom” (1984, p. 7). Nevertheless, the school alone is seen by authors as capable of constructing the conceptual and interpretative codes with which information can be mastered and integrated: neither the media nor families can achieve the goal of a full

development of children's awareness. The origin of the term "media education" can be traced back to the 1970s, and following various elaborations it has been used over time according to three perspectives: education *to* the media, education *with* the media and education *for* the media. During the last forty years, together with the definition "Media Education", those of "Media Literacy", "Internet literacy", "Media and Information Literacy" (MIL) and "Digital Literacy" have also been used, and are among the foundations of what was initially defined as *e-citizenship education* and is defined today as DCE. UNESCO issued its Model MIL Curriculum in 2011 – at the time the only international curriculum that harmonized information, media, and digital competencies under the umbrella term of "MIL" – which has been updated over the years (2013a; 2013b; 2016; 2021a). UNESCO also proposed the so called *Five Laws of Media and Information Literacy*, the second of which states that "every citizen is a creator of information/knowledge and has a message: they must be empowered to access new information/knowledge and to express themselves". According to this approach, information, communication, libraries, media, technology, the Internet and other forms of information providers "are equal in stature and none is more relevant than the other". One key difference nevertheless is that Media Literacy-related initiatives were concentrated mostly on teaching youth to be critically engaged *consumers* of media, while the Internet-Information-Digital Literacy approach is more about enabling youth to *participate* in digital media in wise, safe, and ethical ways.

In the pedagogical field, it was Seymour Papert (1980) who firmly promoted - with little institutional response – the active use of digital technologies, but communications based on network codes and structures is different from all the other mediascapes we have known and used up to now. In fact, online environments can include all of them and add even more (that is adapting and constantly reshaping orality, writing, printing, audiovisuals, interaction). This does not imply a drastic overcoming of Media Literacy but rather an incorporation of new concepts that arise from the added dimension of *networked interactivity*.

Starting from the early 2000s, the Council of Europe has published several volumes dedicated to examining topics such as "Information technologies in schools" (2000), "Learning and teaching in the communication society" (2005), "Internet literacy" (2006), laying the foundations for the future work of European expert groups on these subjects. The Council has devoted a specific project to the impact of ICTs on education systems in Europe. The declared goals were to be able to understand and manage the increasingly fast change in European societies and to transform education systems so as to answer both the needs of those societies and the expectations of their individual members. These early publications also contained some practical fact sheets, each covering a particular topic on

Internet use. Not infrequently the dimensions of educating *to* the media and educating *with* the media have emerged as necessarily intertwined.

The very idea of DCE (CoE, 2017) therefore takes up the reflections that emerged in the 20th century on the need to understand and integrate the media into curricula and educational practices, and is made more urgent by the specific characteristics of networked media: participation, interactivity, user generated content, algorithmic logics and *platformization*. Internet and social media have opened up new possibilities for participation in what was called the "public sphere" in the age of the mass media, now *networked publics* (Varnelis, 2008; Ito et al., 2009). Ultimately, what emerges as prevalent from the analysis of the main discourses on our "digital" society and the need for "digital" citizenship education is that the most important aspects to focus on are not about digitization itself but about public values in a connective world: *networked life*, the *non-separability of offline and online* and the *platformization* of our societies and lives (Rainie & Wellman, 2012; Floridi, 2017; van Dijck, 2018).

4. Education and civic engagement

Civic engagement and digital citizenship are social and mediated processes, so they must be considered in the light of process indicators for those involved in educational processes, teachers, students and policy makers (Purvis et al., 2016). The literature also shows not insignificant differences in this area – in terms of learning, classroom climate and activities – between students from more advantaged backgrounds and those from more disadvantaged backgrounds. The education system, with the necessary support, can therefore respond to the goal of creating greater levels of equality in political commitment. In the medium and long term this involves structural interventions on the initial and continuing professional development of teachers and school managers: even in the context of digital citizenship, inclusive teaching must concern the development of learning environments in which all students, in addition to having access in all training activities, are involved in discussions and in democratic and civic participation paths (Tomlinson, 2014). The teacher who deals with civic education and citizenship must therefore develop deep knowledge of the students' background, in order to have the tools to allow them to reflect on the causes of the difficulties in accessing democratic and participatory activities, and to have their say in the classroom.

In the second cycle of the *International Civic and Citizenship Education Study* (ICCS, 2016) some useful measures have been identified to better understand strategic elements and factors for DCE. The project, promoted by the International Association for the Evaluation of Educational Achievement, aimed to work

on context variables related to contents and organization of the teaching of civic and citizenship education, and to report on teachers' experiences, teaching practices, environmental contexts, school and classroom climate, contributions from families and territories. Some references to the value of the Internet as a communication tool in civic participation, both for teachers and students, emerged from the study. The responsible use of the Internet was associated with the issue of privacy, the reliability of sources, knowing how to inquire about political or social topics and participate in related online debates, presence on social media, bullying and offensive content. The Standards and the framework for digital citizenship proposed by the International Society for Technology in Education also insist on these issues (Ribble, 2015).

In the European context, the implementation of DCE shows marked differences between the different macro-areas of the Union, and the scientific literature shows that even in the areas of Northern Europe – traditionally more attentive to changes connected to digital transformation and where the issue of citizenship is strongly present in national curricula, with schools well equipped as regards infrastructures and devices – there is a certain degree of uncertainty in the use of social media for the development of digital citizenship, both for teachers and students (Christensen et al., 2021). In the Norwegian curriculum the area of citizenship is not explicitly mentioned, and the theme of civic participation in the relationship with the media is declined within the discourse on democracy and national identity; in Denmark there is no reference to social media but the central role of the Internet for the acquisition of information and the development of relationships between people is emphasized; in Sweden the emphasis is on the opportunity to have up-to-date learning tools and digital skills, but the latter are not connected to the students' ability to influence society. The country that addresses the issue in a more complex way is Finland, where ICT competences – described both as an object and as a learning tool – are one of seven main transversal competences and are presented as essential civic skills: the ethical use of technology is described as crucial for the future of humanity and the environment, and social media is included in teaching practices and training pathways for work opportunities on cooperation, interaction, responsibility.

Most teachers regularly make use of web-based sources to design courses on citizenship, although research shows that very few of them work with students on social media, online forums or blogs. On the other hand, most students do not publish online content related to political or social issues and do not plan to do so in the future, but this aspect is linked in various ways to their offline engagement on the same issues. One of the most interesting results of the work *Developing Digital Citizenship and Civic Engagement Through Social Media Use in Nordic Schools* by Christensen, Biseth and Huang is the concept map that summarizes the six

macro-themes or factors that characterize the promotion of digital citizenship in schools through social media: 1) Societal values and ideas; 2) ICT, digital tools, and technology; 3) Handling of information and knowledge; 4) Teaching methods and learning; 5) Social media; 6) Civic engagement.

DCE must also be considered in light of the distance between the ideals of digital citizenship expressed in the formality of the curricular level and the substance of students' concrete practices. There are in fact some possible risks to consider: one is that formal curricula end up representing ideals that precede practice and remain distant from it; also, can be difficult to solicit in a formal context students who often see online spaces more as private environments for building and maintaining relationships and other types of online presence.

5. Rethinking Citizenship Education: an ecosystemic approach

Digital Citizenship should not be represented as a purely technical or virtual domain separate from other forms of civic engagement. In this sense, school curricula must consider online spaces like any other political space: *onlife spaces* (Floridi, 2017) in which young and old people can commit themselves to concretely develop citizenship paths also through interactions on social media. Digital citizenship and civic engagement represent not only skills but also ways of living: consequently, transformative processes (Dewey, 1916) must be at the center of Learning Design as well as definition and evaluation of the factors useful for the growth of conscious participation. In this sense, it is useful to work on the relationship between citizenship education and “digital” learning: the two dimensions in different European countries are often separated, even where there is equipment for online collaboration and a perceived high level of competence in managing online communication. These are clearly not simple skills: to be able to make the development of DCE tangible, the digital competences indicated in the European frameworks for citizens (*DigComp*) and for educators (*DigCompEdu*) and the full understanding of the “digital transformation” of society must be integrated into citizenship education programs and into teaching-learning activities in a broad sense. School practices and teacher training should be aimed at addressing, developing, and cultivating attitudes, values, civic knowledge and skills useful for young citizens who face an uncertain and ever-changing future.

An attempt in this sense can be found in the Italian Law 92/2019 on the introduction of school teaching of civic education: the guidelines indicate in the transversality of teaching a paradigm of reference different from that of traditional disciplines. What is defined as a

“transversal value matrix”, to be combined with disciplines to develop processes of interconnection between disciplinary and extra-disciplinary knowledge, can lead the way for a transformative, inclusive and “digitally augmented” education. In the European Union, moreover, the recommendations of the European Council and the specific frameworks on digital skills of citizens and educators have recently been reinforced by the Digital Education Action Plan (DEAP 2021-2027). The DEAP aims to go beyond the first Plan adopted in January 2018 with the long-term goal of creating a European Education Area and includes measures for inclusive and high-quality digital education and training. In this action plan, built on the basis of an approximately three-month public consultation, Strategic Priority Number 1 is to foster the development of a *high-performing digital education ecosystem* and refers to the need for teachers and trainers “to participate more effectively in the digital transformation of education and to understand the opportunities it can offer, if used effectively”. Digital transformation can be read as the reconfiguration of a complex ecosystem that includes all kinds of technologies and different brainframes related to different media and network environments. The term ecosystem is specifically used by the authors of the communication relating to the DEAP from the Commission to the European Parliament, in order to be able to frame the complexity of the phenomena that it is intended to govern. “Environment” and “system” are terms that refer to a network of relationships between different entities that interact in the same context: the students and teachers are clearly involved here, but also the environment, the school area and all the other figures involved in the learning processes, as well as environments, infrastructures, devices, software, and conceptual frameworks. The ecosystemic perspective, if fully adopted, is also useful for overcoming the rigid centrality of the human and of the subject-object dichotomy that still contributes to shaping scientific discourses and even the documents of the working groups of international experts. In interactive ecosystems, humans, data, climate, sensors, biodiversity and computerized territories have begun to articulate collaborative policies and solutions through dialogue with data and the connection between different types of intelligences. The very idea of citizenship, based on the fundamental rights of people should take into account the challenges of climate change and the evolution of the latest generations of intelligent networks (Accoto, 2018; Di Felice, 2019).

With reference to Dewey, civic education can and must be concretely transformative in order to allow and support future citizens in their civic engagement beyond conventional democratic activities and individual disciplinary knowledge. However, transformative education entails having transformative learning paths for both teachers and students: both have and will have to do with the reality of an uncertain

future and can be actors and subjects capable of having an impact on change. Students (and teachers) bring their “digital” lives and experiences to school and this aspect of reality is not sufficiently understood in our educational systems (McCowan, 2011). For the Council of Europe, *formal education must consider online and offline lives as part of a whole*. This acknowledgment was the starting point that moved the Education Department’s DCE project. To guide the work, three aspects of online life have been identified – being online, online well-being and online rights – on which to intervene to promote the fundamental principles of the CoE: democracy, human rights and the rule of law. These principles must be considered both for relationships and behavior in online environments and for offline relationships and behaviors: “each person’s responsibility as a citizen is the same” (CoE, 2019). The challenges that the online world presents to democratic citizenship are illustrated in the *Digital Citizenship Education Handbook*, designed to help educators, and interested people to better understand and face them. The handbook is based on the Council of Europe Competence Framework for Democratic Culture and on the acquisitions of the Education for Democratic Citizenship program and the *Internet Literacy Handbook* as part of a path to approaching citizens’ education for future societies. Although the Competence Framework shows the ultimate goals of digital citizenship in a way that is clearly understandable to educators, families, and policy makers, it lacked several essential ingredients to facilitate its practical educational adoption. The aim of the *DCE Handbook* – based on the work of the DCE Expert Group – is therefore to present information, tools and best practices to support the development of skills in line with the vocation of the CoE to empower and protect future citizens, enabling them to live together as equals, online and offline, in today’s democratic societies characterized by strong cultural diversity. The *DCE Handbook* was conceived as a practice-oriented publication aimed at teachers, parents, policy makers and platform providers. It describes in depth the multiple dimensions that make up each of the ten areas of digital citizenship (*digital domains*) identified by the DCE Expert Group and includes a fact sheet on each area that provides ideas, best practices, and further references to support educators in building skills that will be useful to students as they face future challenges.

6. Citizenship Education in platform societies

One of the preconditions for the development of “digital” citizenship paths is access to technology, without which – given the close integration of ICT into everyday life that is now *onlife* – even “non-digital” citizenship is now almost impossible. Starting from this aspect, it is worth reflecting on the use of the term

digital applied to the most diverse fields, including citizenship. A simple calculation of the occurrences of the term in the cited texts shows a repeated use involving phrases such as digital age, digital skills, digital education, digital teaching, digital pedagogy, digital competences, digital literacy, digital learning, digital economy, digital creativity, digital transformation, digital citizenship etc. Although there are important issues such as that of digital transformation, it must be recognized that with the overuse of the term “digital”, both positively and negatively, misleading automatisms have often come to life, with not insignificant consequences on public debate and institutional policies. Therefore, it seems more appropriate to work on continuing professional training and fundamental skills and competences: insisting on defining the latter “digital” – even if this has served in a period of transition like the one we are going through – now makes less and less sense. Over time, the adjective “digital” is destined to disappear, and the European *Digital Education Hub* envisaged by the aforementioned *European DEAP* will in all likelihood become a European *Education Hub*.

It therefore appears more appropriate to refer to contexts, relationships and high-quality educational content, relevance, inclusiveness, flexible and accessible learning opportunities, learner-centered design, and *infrastructure*. Each era has had knowledge infrastructures that have ensured the production and circulation of knowledge, and today that infrastructure is increasingly made up of networks. As emerges from almost all national and supranational documents, very high-capacity connectivity is fundamental for our societies, and consequently it appears a priority to guarantee a fast and reliable Internet connection for institutions and learners (UNESCO, 2021b, Principle 1; UNESCO, 2022). This aspect is only apparently material, since it is closely linked to far-reaching cultural changes (Accoto, 2018; Floridi, 2017; Weinberger, 2012; Castells, 1996; Rivoltella, 2008, 2020).

Citizenship is not something that is “also digital”, because a knowledgeable relationship with online environments is to be seen both as a means (useful for services, streamlining procedures, etc.) and as an end (enhancing creativity, skills, critical thinking etc.). It is therefore appropriate to move beyond digital literacy (Buchholz et al., 2020) and to seriously consider the abandon of the use of the term “digital” also in relation to Citizenship and Citizenship Education, because: *a*) it is often implicitly associated with a crude conception of information technologies as intrinsically “new” or innovative; *b*) it promotes a social representation of “digital” objects and the practices related to them as a completely simplified unicum, far from concrete reality; *c*) a full citizenship cannot exist today without access to network infrastructures, online information and knowledge, and online services of the public administration and the private sector. In the same *DCE*

Handbook, the authors never use the term “digital” in the list of ten areas defined as the basis for the work on digital citizenship grouped into the macro-areas: they instead use the term *online*, which more precisely specifies what is being referred to.

Finally, in order to design effective pathways that take into account all the principles indicated, it is crucial that teachers and students work on deepening their understanding of the dynamics and characteristics of the so-called *platformization* and the role of software, algorithms and AI in our societies. There are many scholars who in recent years have stressed the need to think about platformization, often on the level of law or on that of cultural and communicative studies. Less frequently, however, the topic has been raised by those who work in education and training, and this despite the obvious links to the broader topic of Digital Citizenship. The transformations associated with platformization (highlighted by scholars such as Van Dijck and others), in fact, are directly related to the concepts of *ecosystem*, *education* and *responsibility* of the actors involved.

The study of the dynamics and characteristics of platform societies (and the different role of platforms in democratic and authoritarian countries) is increasingly important in education, also to overcome a structural backwardness in both digital transformation and the debate – even in academia – on the consequences of platformization. Many of our cultural practices are strongly influenced by the automation processes of platforms, which overlap with known and more traditional elements such as social and cultural background, social class, experiences, etc. Software, algorithms and platforms do not simply respond to our tastes and choices but concretely help shape and influence them (Kearns & Roth, 2020; Finn, 2017).

Interacting with platforms and systems capable of making continuous decisions independently is already a reality in the daily life of European and global citizens. It is no longer conceivable, therefore, to think about education and citizenship without considering the understanding of phenomena that characterize and shape our lives: this is true for people as well as for companies, institutions, and especially for educational systems. Taking up the words of the *Rewired Global Declaration on Connectivity for Education* (UNESCO): “connected technologies are rapidly altering the ‘where’, ‘when’, ‘who’, ‘what’, ‘how’, and ‘why’ of learning” (2021b). Above all, it is no longer possible to learn all the knowledge necessary for the rest of life during the school years, *so the way in which one learns becomes more important than what one learns*, and this is even more valuable when one considers the rapid changes that our societies are facing and will face in the future. The actual networked ecosystem forces us to rethink not only our methods but also our teaching philosophies, which are still shaping education. As we all increasingly move toward a

communication environment of instant and infinite information, says anthropologist Michael Wesch, it becomes less important for students to know, memorize, or recall information, and more important for them to be able to find, analyze, sort, share, critique, discuss, and create information: “they need to move from being simply knowledgeable to being knowledgeable” (Wesch, 2009). In this regard, it should be noted that a different interpretation of the relationship between digital technologies and creativity could help to encourage the teaching of arts and music, vital for the development of the person but penalized over time in different ways in many European countries (von Gillern et al., 2022; EACEA, 2009).

In conclusion, it still appears necessary today to continue working on the basis of the four pillars for the reconfiguration of education systems illustrated in 1996 by the then President of the European Commission Jacques Delor in the UNESCO Report of the International Commission on Education for the 21st Century: *learning to learn, to do, to be and to live together*.

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A new digital divide threatening resilience: exploring the need for educational, firm-based, and societal investments in ICT human capital

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Abstract

The knowledge, skills, and abilities that human capital offers create tangible and intangible assets that equip organizations to thrive. In particular, in today's Industry 4.0 environment, training, recruiting, and retaining highly qualified ICT-ready professionals remains a problem for many organizations including educational, governmental, healthcare, and business organizations. The COVID-19 pandemic revealed the importance of digital assets to our economies, and it is also demonstrating that there is potentially a new digital divide with even worse implications for companies, economies, and society, which is threatening the resilience of business, governance, and society. In this paper, we respond to the question "how can we develop ICT human capital in our global economy in an equitable, inclusive, and purposeful manner such that not organizations thrive, but also to promote social justice and equity in our global economy?"

KEYWORDS: Human Capital, Knowledge-Based Economy, ICT, Open Education.

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1. Introduction

Human capital is broadly defined as the knowledge, skills, and abilities an individual brings to the workplace (Kucharčíková, 2011). Combined, knowledge, skills and abilities create both the tangible and intangible assets that one can contribute to not only their workplace, but also to the broader society and global economy (Abdurakhmanova et al., 2020). Organizations invest in employees so that they can

provide not only essential organizational functions, but also so they might develop emerging products and innovations that bring forth business wealth and prosperity. But in today's Industrial 4.0 environment, developing human capital in Information, Communication and Technology (ICT) is not only important for organizational prosperity, but we also argue that it is essential for human survival. Though our global economy demands ICT professionals who innovate across industries and borders, the development of ICT-skilled workers is lacking (Sima et al., 2020).

ICT human capital is created in several ways including through formal and in-formal education, firm-based learning, and government-sponsored investment. The rapid pace of change in technological advancements creates a challenge within formal educational settings (Klochkova, 2020). Corporations invest in human capital in order to effectively compete, and as such, sharing knowledge broadly is not a priority of the corporation. Government-sponsored ICT learning

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suffers from limited funding and falls behind in timeliness of delivery and broad application while private sector training mostly targets individuals who are already employed thus excluding those who are lower educated, which reinforces inequalities (Bach et al., 2020).

In the next sections of the paper, we explore tools, practices, and knowledge-sharing techniques that can advance development of ICT human capital across the world. We argue that the global economy cannot thrive in Industry 4.0 without specific attention to fostering the knowledge, skills, and abilities of today's workers. Especially in the light of the current needs that the pandemic crisis is highlighting, economic well-being worldwide as well as creating equitable access to technology for all people is vital for the health and well-being of our global citizens. Developing those who can develop others' human capital is a first step toward creating a world where ICT is not a limiting factor for a nation or community. Additionally, we focus on the human element of ICT including resistance to ICT, lack of resources to develop ICT human capital, and the opportunities and outcomes of creating a global ICT human capital development initiative.

2. Human capital in a knowledge-based economy

Human capital is defined as the knowledge, skills and abilities workers bring to the workplace, and it can be developed through formal education, work experiences, on the job training, and self-learning. Becker (2002) discusses human capital in economic terms and expresses that human capital is considered an asset in organizations. In fact, an organization can capitalize on one's human capital in Becker's terminology. Human capital is a vital asset in society because societies need workers to hold knowledge, skills, and abilities to effectively do their jobs, meet work demands, and bring forth revenues and profits into our shared economies. When societies lack human capital, they experience higher risk of economic downturn as well as general societal risk such as safety, educational quality, health, communication, and technical capacity (Aluttis et al., 2014; Šlaus and Jacobs, 2011). Therefore, it is essential that global and national markets attend to not only the economic benefits of highly skilled labor, but also to the global benefits especially in relation to the environment, educational attainment, health, equity, and justice.

Several components underpin human capital, including knowledge creation, knowledge sharing, and knowledge hoarding. Nonaka (1994) was a pivotal force in our understanding of knowledge creation as he described the dynamic influences that encourage the factors that link tacit and explicit knowledge in organizations. Building upon Polanyi's early work

(1958; 1966), Nonaka defined tacit knowledge as that knowledge held within a human being and is utilized in their thinking, problem solving, creativity, and interactions with others. Tacit knowledge lives within us and it cannot be utilized by others unless it is shared, or codified, in some manner. Explicit knowledge, on the other hand, is knowledge that exists outside the human being as it is explicitly expressed, created, codified, shared, stored, and retained by those outside of the human being. Explicit knowledge can be searched and located by others either within or outside the organization.

When organizations, governments, educational institutions, and societies foster the creation, sharing and storage of knowledge, they create both tangible and intangible assets for our global society. Tangible assets are those that can be counted, stored, patented, or purchased and impact economic well-being of organizations, cities, and nations. Tangible assets are explicit, meaning they can be utilized in economic, structural, and throughout organizations and society. Intangible assets, however, are those that cannot easily be counted. More like tacit knowledge, intangible assets might be the knowledge that exists in the minds of workers, the creativity expressed by workers, or the interactions that occur within an organization that drive business success. Nonaka's inventive work helps us to see that intangible assets can be converted to tangible assets if an expressed effort is made to do so through knowledge sharing and knowledge conversion.

Knowledge sharing and knowledge conversion are actions that encourage broader use of knowledge. Imagine a team working to solve a complex problem. Each of the team members brings tacit and explicit knowledge to the situation, and through team interactions, knowledge is shared. At a deeper level, team dialogue emerges, and the team begins to adapt existing knowledge into new solutions. In the thoughts of Nonaka, a symbiotic interaction of conversation, dialogue, and eventually naming new knowledge through metaphors, the team continually fosters knowledge creation, knowledge sharing and knowledge conversion. New knowledge is linked with existing knowledge, and the team begins to document, codify, and experiment with this new knowledge. In an open and trusting organizational system, knowledge becomes an asset that is fostered through interdependence and sharing.

In organizational and broader society, however, knowledge is often hoarded, meaning trade secrets, practices and artifacts are held closely within the individual and the organization (Husted & Michailova, 2002). We ask: "why do individuals hoard knowledge, and how does individual knowledge hoarding impact organizations, nations, and society hoard knowledge?" At an even deeper level, "How might knowledge hoarding create economic disparity, injustice and place the global economy at risk, especially in our Industry

4.0 revolution?". If knowledge is an asset, and assets create organizational value, then it is likely that in competitive environments, one is not inclined to share knowledge widely. Often, individuals seek knowledge for their own personal and professional gain, they find the knowledge or solution that they understand most clearly, or they find a solution to a problem that might not be optimal for the organization or broader society (Husted & Michailova, 2002). But, when knowledge sharing is a systematic process, the resistance and errors associated to knowledge sharing are diminished. When individuals are rewarded, acknowledged, and reinforced to share knowledge, knowledge sharing is likely to increase and even sustain over time.

In terms of Industry 4.0, knowledge sharing occurs when organizations, communities, and nations build a knowledge sharing practice whereby global partners thrive in all sectors including health, education, business, and governments. To build this channel of knowledge sharing, our global society needs to understand the notion that creating skilled labor who captures, codifies, stores and shares knowledge at the global level is of benefit to all. Doing so can alleviate global injustices due to lack of knowledge, resources, tools, technology, and outlets. In Industry 4.0, it is essential and just that global citizens have access to knowledge. Knowledge and skills are key to acquiring new scientific and technological expertise and to building an economy's capacity to use this knowledge. Investment in R&D is a vital factor in human capital because it supports the generation of knowledge and the development of skills in highly qualified human resources, which are needed to increase competitiveness. Patterns in R&D investment between countries generally mirror the industrial structure of economies, differences in the knowledge intensity of sectors and their research capabilities.

3. ICT-human capital for navigating the COVID-19 pandemic

Industry 4.0 is based on cyber-physical systems, cloud manufacturing, cyber security, big data analytics, artificial intelligence and emerging technologies that are advancing at a very fast pace while also bringing new requirements for the manufacturing workforce. Intelligent data collection and interpretation as well as effective and timely decision-making play an important role as a result of the use of state-of-the-art technology. Big data capabilities and smart predictive decision support tools are used to increase productivity and efficiency, increasing the speed of the processes, and reducing the number of problems and the downtime (Kicová, 2019). The advantages of Industry 4.0 can be summarized in the increase of economic efficiency, labor productivity, flexibility, and intelligence, while at the same time achieving a reduction in production costs

and increasing returns on investment. The World Economic Forum's study (The future of jobs, 2016, <https://www.weforum.org/reports/the-future-of-jobs>) forecasted that 5 million jobs will be lost before 2020, however, some 2.1 million new jobs in more specialized areas such as engineering, mathematics, computing, and architecture will be created. Therefore, it is necessary to introduce new, flexible concepts in skills training with future-ready curricula to adapt the education system to the new development requirements of the society. Human capital can offer significant impact in this work and will facilitate a redirection of jobs and learning.

The labor market is undergoing remarkable changes in the context of technological changes, but this requires the expansion of human capacities so that people are empowered and equipped to bring about change. Investment in access to high quality education and increased enrollment in science, technology, engineering, and mathematics (STEM) programs is therefore needed. The educational profile of human capital is changing, and new approaches to education systems are emerging (Cotet et al., 2020; Carbonaro, 2010, 2019; Andronico et al., 2004). Indeed, the ability of education and training systems to anticipate and adapt to changing skills demands will require high-quality basic education that provides the fundamental skills to enable people to embrace change, take advantage of emerging job opportunities and engage in further learning. Additionally, we must facilitate dynamic learning throughout one's working life cycle to ensure that we not only sustain, but also advance digital and technological skills as well as other drivers of change to ensure productively engagement in work. Emerging patterns of employment using new technologies are evolving, and they are changing traditional job tasks in support of global and digital production and leading us towards part-time, temporary, on-demand, etc. jobs. The way of working is changing with the integration of office work, smart working, coworking, crowd-design/crowdsourcing, physical and virtual spaces, digital marketing, and new hi-tech internet-based services. The Covid-19 pandemic has radically altered and accelerated the spread of flexible forms of work, and the change companies have been forced to implement will have medium and long-term impacts. All 'agile workers' have undergone a rapid maturation as they have had to learn to fend for themselves, download applications, discover new features, and solve the problem, which we had never faced before. We accomplish in three months work that would have previously taken years of effort. For example, today more than 8 million people in Italy perform tasks that could be done remotely (Bonacini et al., 2021).

Similarly, the revolution in the labor market is revolutionizing what is required of schools and universities, leading to an ever-increasing demand for scientific and technological skills. But this increase in

demand is often not matched by an adequate supply of vital training and education, which results in a lack of viable job candidates. The aim must be one -to find solutions to direct educational aspirations and investments toward a STEM education pathway. Consider that a large proportion of today's human capital is comprised of millennial or Gen Y (born between 1980 and 2000) and GenZ (born after 2000) employees who were born in the age of the internet, social media, and smartphones. They bring different expectations to their employers, such as anytime, anywhere collaboration, instant feedback, open culture, and data-driven decision-making.

But inequalities in opportunities must be globally eliminated to expand human capabilities. While more than 90 percent of children in the world today receive some schooling, fewer than half of those in school achieve minimum proficiency in reading and mathematics when they complete primary school. In addition, over 3.7 billion people do not have access to the Internet or STEM programs, women are lagging and make up only 35 percent of post-secondary student population. Increasing the number of women in science could provide greater job security and well-paid jobs as well as create equity in STEM-based jobs. Empowering women in tertiary education and enhancing their employment opportunities in the R&D sector should be also an essential part of the research and innovation policy and a key element of the Horizon 2020 program. By building awareness and creating promotional activities that help young women nurture their ambition to work in innovation and technology while also enabling them to succeed in the digital economy throughout the world would yield positive results. A positive perspective of oneself, starting from childhood, allows one overcome stereotypes and gender inequalities and can contribute to a real cultural change with respect to the educational choices of girls. This objective can be achieved through a viable network concept in which the various educational contexts collaborate constructively. For example, initiatives that involve partnerships between educational institutions (e.g., schools, teacher training, universities, training centers, research institutions, the private sector, and active community support) can help spread, accelerate, and sustain development of innovations in education through new ideas and unexpected inspirations, increased financial possibilities, credibility, and improved human capital. Family, school, and societal levels must act jointly to promote and facilitate multi-sectoral collaboration and partnerships.

4. Opportunities and Outcomes of a Global ICT Human Capital Development Initiative

Over the past few years, our planet has been pushed into a compulsory "digital metamorphosis", a true collective experiment launched without strategy or parachute. Despite some progress, the digital divide has not disappeared. The new digital divide has become even more dangerous because pockets of social, educational, and professional exclusion have been exacerbated between those who are online and those who are not. With vision, effective actions, and joint efforts between the public and private sectors, it is possible to increase the digital heritage in a process that benefits everyone. First, a paradigm shift is needed.

More or less advanced instrumental literacy in the use of technologies spanning a theoretical approach to digital literacy and with early studies underlining the functional and instrumental understanding of digital literacy focusing on one's technological skills to operate and use ICTs is not enough. Children and young people need to be offered analytical and even critical digital skills as a key element in acquiring and consolidating knowledge and skills in a fluid, overlapping, and interactive way. Adults need an awareness of digital technology as a resource for the individual and the community in terms of shared knowledge, collective intelligence, and conscious citizenship, overcoming the barriers between hyper-specialized experts and 'normal' users who are called upon to take on the sometimes-exhausting challenge of self-learning. There is also a need to develop a broad, transdisciplinary, cultural framework to overcome the tendency to uncritically adopt the latest digital innovation and to also build cultural awareness of this innovation. The tools in use today will certainly be obsolete in a few years' time, and perhaps so will the relevant skills. What will never grow old, however, is the understanding of knowledge that is much broader and more articulated than a single device.

A long-term, national, strategy should generate knowledge outside academic environments to the benefit of social, cultural, and economic development, the so called 'third mission' (Loi & Di Guardo, 2015). The university and the knowledge creation that it facilitates, either through its own research, in its learning environments or through its innovation activities, should be central actors in the circulation of ideas and know-how. This cannot happen unless Higher Education Institutions (HEIs) include engagement with business and communities in their core functions, and act as catalysts of these processes. HEIs who embrace digital technologies can have an important role in helping firms (OECD, 2019, <https://www.oecd.org/skills/launch-of-2019-skills-outlook-thriving-in-a-digital-world-paris-may-2019.htm>). Facilitating access of businesses to research with high innovation potential is an important

contribution of the university to regional and national innovation. Start-ups, spin-offs, competency centers, research areas centers and national and regional science parks can acquire the initial know-how, equipment, and funding to test new technologies and scale-up new products and services linked to new the re-search results in the digital field (OECD, 2019). For HEIs, collaborative research and research grant income generated through research cooperation constitute a substantial and fast-growing proportion of institutional research and of its funding base. Accordingly, they may support a wider ecosystem formed by firms, institutions, and stakeholders, by providing consulting and services of new technologies, best practices, and opportunities of digital transformation (Kowal and Paliwoda-Pękosz, 2017). A well-functioning R&D system is important also to promote excellence in education and skills development.

Open education and massive open online courses (MOOCs) offer important new sources for knowledge and skills development across life. These dedicated Internet platforms represent an opportunity for digital learning because access is usually free, and students have the option to fund their own learning if they decide to invest in the certificates that recognize their enrollment and acquisition of knowledge. The development of MOOCs is one of the most prominent trends connected to the digital transformation of HEIs and can be of great interest and value to digital native students. Open education is primarily used by those who combine work and formal education as well as those who are employed but who are not engaged formal education. Therefore, open education seems to be a promising way to facilitate workers' lifelong learning, yet little is known about their standards and learning outcomes in terms of skill development, patterns of participation, and how to reproduce and sustain learning quality long term. Limited information exists regarding who engages in MOOCs and the impact they have on skill and knowledge development.

For example, MIT and Harvard University offered 2000+ online courses and enrolled more than 20 million learners, giving credence to how MOOCs are used and by whom (Kaur & Kaur, 2020). This data suggests that highly educated and skilled adults are more likely to participate in informal learning opportunities in an attempt to "skill up" in technical areas.

Digital technologies offer another important opportunity to contribute to open science in that open access to scientific publications and data provide an opportunity for science to become more inclusive. With greater access to open science to all, scientific results are available to the broader society, ensuring high-quality scientific publications and opportunities for authors to publish reputable journals (OECD, 2019). Additionally, implementation of open science principles increases the rigor, reliability, and reproducibility of scientific results (Cockburn et al.,

2020). In response to the COVID-19 pandemic, many publishers have increased opportunities for open science practice, and many researchers have contributed knowledge to open science which helps to optimize research efficiency and improve health outcomes.

Once again, the pandemic has offered us the opportunity to understand how it stimulates global scientific collaboration and the value of open science in an unprecedented way. It also highlighted the shortcomings of science policy and has accelerated many research trends already underway. The COVID pandemic has further increased access to data and publications, the use of digital tools, enhanced international collaboration, stimulated a range of public-private partnerships, and encouraged the active engagement of new actors. These developments could facilitate the transition to more open science and innovation in the long term. Similarly, it is now vital that social entities including governments, businesses, universities, and training centers each develop field-based action plans that encourage us to effectively manage these dynamics as well as exploit new opportunities offered through them rather than becoming overwhelmed by them.

For example, Artificial Intelligence (AI) is an approach to creating human capital aimed at supporting human capability (Popkova & Sergi, 2020). We suggest the possibility of obtaining optimal results by implementing the use of Artificial Intelligence system-wide, which can be effectively and profitably utilized in multiple sectors including health, education, judiciary, security, and the public administration of a country. We understand that this effort creates many challenges including ethical to technological, but above all, the need to have the appropriate digital skills to implement AI to raise our collective knowledge is worth our attention and energy. We suggest that Artificial Intelligence can become a tool reduces inequality and promotes inclusion.

Existing legal policies not only need to be adapted and applied, but they also need to provide dynamic legal mechanisms to preserve as well as anticipate risks that could emerge through the application of new AI systems. Complicating the challenge is a growing mismatch between the exponential growth of the AI market and a delayed regulatory response (European framework on ethical, 2020). Yet, as data-driven and machine-learning approaches begin to play an increasing role in society, thoughtful and detailed strategies on how we can share the benefits as well as achieve the best possible impact all while effectively managing risks is essential. Without proper management of such data that ensures quality and compliance, AI systems might become too risky to be entrusted when making consequential decisions.

To attend to this concern many organizations are utilizing data governance to exercise control over the

quality of their data and their processes. The concept of trustworthiness refers to properties through which a trusted entity is serving the interests of the trustor (Levi & Stoker, 2000). This process reinforces the use of sound information and fosters trustworthy decision-making processes.

Recently, the field of trustworthy AI has been gaining attention from the government and different scientific communities. The International Organization for Standardization, The European Union, The National Institute of Standards and Technology and The U.S. Government Accountability Office have offered varied approaches, ethical guidelines, and frameworks that can establish trust in AI systems. By adopting the properties of fairness, transparency, accountability, and controllability, trustworthy AI is more likely to govern and facilitate the development of and effective use of AI systems (ISO 2020; European Commission 2018; NIST, 2021; US GAO, 2021). The EU also recently passed a law called General Data Protection Regulation (GDPR), which gives individuals the “right to explanations” for AI decisions (Watcher et al., 2017). The Defense Advanced Research Project Agency (Gunning, 2017) also launched a program known as Explainable Artificial Intelligence, whose motive was to make these AI systems explainable and trustworthy. Gartner estimates that 30 percent of all AI-based digital products will require the use of a trustworthy AI framework by 2025 (Burke et al., 2020), and that 86 percent of users will trust and remain loyal to companies that use ethical AI principles (Edelman Trust Barometer, 2019). These examples illustrate the necessity to develop AI systems using a trustworthy framework and how vital trustworthiness is for both the success of AI systems and the safety of users and society. In all, to make knowledge accessible and trustworthy, AI becomes a viable asset globally not only for our corporations and governments, but also for formal educational systems as well as individual learners across the globe. Through the safe use of AI, human capital can be universally developed for the advancement of individuals, communities, and the broader society.

5. Conclusion

A new digital divide can threaten the resilience of people and business resulting in important implications for economies and society. The challenges are many and include the loss of competitiveness, inclusion/exclusion, and poverty, and new sources of social pressure globally. The COVID-19 pandemic revealed even more clearly the importance of digital assets to our collective and individual economies. It has also highlighted the importance of basic and advanced digital skills that ensure sustained and sustainable growth and development of our economies and

societies. Today, in addition to digital assets, organizational assets include also human capital. This paper focused on current human challenges amid COVID-induced technological challenges as well as how we create a future where digital workers learn, grow, and thrive and advance technological capacity in the workplace. We also offered a systematic tool to guide and inform policy makers, researchers, civil society, and the private sector to collaborate on different aspects of policies to promote knowledge-based societies and close knowledge gaps is the Global Knowledge Index (GKI). We reinforced an urgent, global, need for increased investment in R&D and suggested innovation as a means to advance the frontiers of knowledge for sustainable development. The goal is to provide the scientific and technical solutions needed to meet global societal challenges such as climate change and clean energy, active and healthy ageing, and to drive rapid progress in agriculture, consuming goods, and transport. The EU, with its Horizon 2020 R&D program, is helping this process by providing almost EUR 75 billion of funding for research projects aimed at addressing societal challenges, generating excellence in science, and promoting industrial leadership. Investments such as this in R&D stimulate innovation, which contributes to industrial competitiveness and job creation. We hope for greater investments such as these in the future.

An area of particular need for greater development of ICT-HC is to prepare individuals who can develop others' human capital through both formal and informal education. To obtain global economic wellbeing and to provide equitable access to technology for all global citizens, both human capital and technology are essential. We suggest it is imperative to create greater access to learning, information, knowledge, and education. The emergence of MOOC platforms, open education and open science, new digital teaching methods, together with the development of new technological infrastructures, are each development that are already changing the practices and the processes in which HEIs accomplish their mission. The risks facing our least developed countries in relation to indicators on education and training levels are great, but not all workers are equally impacted. With only 16 percent of university graduates at risk losing their jobs when compared to 45 percent of workers who have not completed higher education, it is essential that learning becomes universally democratized. If we are to solve our global problems, we need learners and workers across the globe equipped to meet the requirements of the Industry 4.0 era.

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Social exclusion and the digital divide

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Abstract

The recent advances in information and communication technology have given rise to radical changes in how we interact and communicate in our social, educational, and working environments. However, the potential and opportunities offered by these technologies are not fully available across society due to huge differences in their use and uptake, that is, what has traditionally been called the digital divide. Current research indicates that this divide is intimately connected to economic inequalities and social exclusion. The digital divide manifests primarily for those groups where economic resources are scarcest, and among such groups we find the lowest rates of device ownership and personal internet connection. Secondary to this, and the focus of the majority of literature on the subject, the digital divide further aggravates existing socioeconomic differences and even generates new forms of social exclusion. Taking a positive point of view, this situation does also imply that eliminating the digital divide could help alleviate social exclusion. Nevertheless, for social and educational intervention programmes to have any real effect on social exclusion, we need to have a more in-depth understanding of processes and variables that cause it at an individual level. In this way we could design interventions tailored to the personal interests, needs, limitations, and potential of every individual and that would prioritise particularly disadvantaged groups, which, according to this study include older people, the less well educated, those with health problems, and the unemployed.

KEYWORDS: Digital Divide, Social Exclusion, Digital Citizenship, Intervention, Social Justice.

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1. Introduction

Information and communication technologies (ICTs) permeate all aspects of modern life (in education, work, leisure, and social interactions), such that they have become an indispensable resource to function effectively in our society. ICT enables all manner of social, cultural, and economic activities; it is intrinsic to exercising certain rights (Martin, 2020) and even in enabling social and political participation (Delfino et al., 2019).

Or, to put it another way, the appropriation of technology has become the tool to achieve what has been defined as *digital citizenship*, in the sense expressed by Emejulu and McGregor “as a process by which individuals and groups committed to social justice deliberate and take action to build alternative and emancipatory technologies and technological practices” (2019, p. 140).

However, not all citizens have the same capacity to achieve this technological appropriation that allows them to enjoy full citizenship (which includes digital citizenship), the varying rates at which these technologies have penetrated the lives of people in different continents, countries, and social groups have given rise to a new form of inequality: the digital divide. The term was coined during the 1990’s, and, initially, it referred to an absence of technology access due to economic deprivation. Latterly, it has become increasingly apparent that the problem involves numerous structural, contextual, and personal factors

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(Colom, 2020). Furthermore, these factors go far beyond mere issues of access depending significantly on an individual's technological skills and the uses they make of technology (Toudert, 2019), since the opportunities offered by new technologies depend in great measure on the uses to which they are put (Castaño, 2009).

In this way, Martin (2020) observes that the multiple ways in which technology is used nowadays mean that the digital divide makes itself apparent in many different aspects of life, for instance, in access to the digital society, electronic commerce, training (e-learning), and the numerous digital government services that are often essential to citizens' ability to exercise of certain rights or undertake particular administrative tasks.

The digital divide is even present in the most technology saturated societies because the digital revolution is not reaching poorer urban and rural communities (Carrascosa et al., 2021). Access to ICT is not in itself a panacea for low income, however, lack of knowledge in how to use these tools can exacerbate existing inequalities in education and opportunities and increases rates of poverty and isolation (Servon & Nelson, 2001). Such effects were seen recently as a result of the COVID lockdowns (López-Aguado, 2020).

The relationship between digital inequalities and social inequalities is a two-way street. As multiple studies and reports have pointed out (Hernández-Gracia et al., 2019; ONTSI, 2020; Torres-Díaz & Duarte, 2015), digital exclusion is, on one hand, an effect of social inequality, thus, to a large extent it reflects previously existing social ills.

However, even more importantly, the digital divide is becoming a cause of social exclusion since on one hand it affects those groups already facing disadvantage by aggravating and perpetuating existing inequalities and on the other, it places at a disadvantage a whole new set of groups and individuals cutting them off from avenues of personal, social, and economic development (Carrascosa et al., 2021). A lack of access to ICT means individuals are barred from sources of information and have fewer personal opportunities which in turn leaves them unable to respond to social demands thus destroying their links with society (Olarde, 2017). In this way, technological discrimination becomes a route to poverty and social exclusion (Arias et al., 2018).

Those who are unable to navigate the digital environment are at greatest risk of social and cultural marginalisation due to various factors, among which one of the most important is the increasing role of ICT in the work environment (Peña-Lapeira, 2015), both in terms of access to the labour market and also due to its use in professional development (Acosta-Velázquez & Pedraza-Amador, 2020). This is borne out by a report from the European Centre for the Development of Vocational Training (Cedefop, 2020) indicating that before 2025 between 85% and 90% of employment posts will require ICT skills. Increasingly, knowledge of ICT will be necessary not only for highly skilled jobs but also manual posts such as cleaners, auxiliary staff,

security guards, waiters, domestic staff, warehouse workers, and shelf-stackers.

In 2015, alongside 193 other countries, Spain signed a United Nations General Assembly Resolution in which promises were made to put an end to poverty, channelling citizens' prosperity and opportunities into creating a healthier, peaceful planet. This was the 2030 Agenda for Sustainable Development and, it contains 17 Sustainable Development Goals (SDGs) that ultimately aim to guarantee the human rights of all citizens through the transformation of our financial, economic, and political systems. These goals are associated with 169 integrated and indivisible targets which will be achieved through the mobilisation of administrations at the national, devolved, and local government level.

Taking its cue from Agenda 2030, the Spanish government has initiated administrative activity at all levels of government: national, devolved, and local; it has also invited the contributions of various social actors, businesses, research centres, and universities in a person-centred enterprise with the shared vision of seeking to achieve the UN's SDGs. Besides publishing Action Plans and Implementation Guides, it has laid out 232 statistical indicators which are assessed yearly and reported in order to monitor progress with regards to the Agenda 2030 goals and targets.

Wide access to and use of ICT by citizens are among the conditions key to achieving several of the Agenda 2030 SDGs, for example, eradicating extreme poverty (1.1); reducing relative poverty in all its forms (1.2); ensuring good quality education (4.0); enhancing the use of enabling technologies including ICT (5.b), increasing productivity through diversification, technological upgrading and innovation (8.2); significantly increasing access to ICTs and the internet (9.c); and of course, fundamental to all the proposed targets: reducing all inequalities (10).

Overcoming the digital divide – achieving digital inclusion – is thus a tool in the promotion of social inclusion (Reyes & Prado, 2020); it is something that goes digital literacy (which itself is not simply the acquisition of digital skills) and would have a real social impact by immeasurably improving living standards (Olarde, 2017). The rapid digital revolution occurring in society represents a huge challenge as we strive for a more fully integrated society because it is precisely the cause of inequality, highlighting existing gaps in accessibility and ICT skills and leading to further, deeper social inequality. In this way, it is essential to look closely at infrastructure needs, and at the same time, develop people's skills so that they can make use of available ICTs thereby promoting self-teaching to gain relevant knowledge (Peña-Lapeira, 2015), and the use technology for personal, social, and economic development. As well as training initiatives, there is a need to increase the level of coordination between different administrative levels and among various organisations; to promote interventions that directly involve the citizenry in participatory processes and in

the adoption of technology; or simplifying administration processes (Carrascosa et al., 2020).

Thus, the challenge facing society is to strengthen integration strategies and so share the power of technology as a tool for inclusion, placing access to technological devices and an adequate internet within the reach of all citizens. But specially, what is required are public policies founded on evidence and based on a clear understanding of the issues involved (Olarte, 2017) which address ways to diminish the digital divide, particularly among groups at high risk of social exclusion (Carrascosa et al., 2021).

High-risk groups that for various reasons are especially vulnerable to the digital divide must be a priority for policy makers and social programmes. Furthermore, it is necessary to address other inequalities alongside the digital divide, for instance the urban-rural divide, the gender gap, and the generational gap, as well as considering the needs of other marginalised groups such as immigrants, those in poverty, the long-term unemployed, and ethnic minorities among others (Olarte, 2017).

However, in order to reinforce digital skills, we must identify first not only those segments of society that should be prioritised but also individuals' particular wants and needs such that personalised training programmes can be designed to fit their specific objectives and interests. It is increasingly clear that traditional one size fits all approaches are ineffective, personalised strategies on the other hand would ensure that ICT becomes a useful tool in combatting social exclusion.

Thus, the object of this work is precisely to focus on vulnerable sectors of the population (i.e., those who are marginalised or at risk of social exclusion) and identify those factors that have an effect, or are associated with, the manifestation of a digital divide in various spheres: personal, home, and family; health; training; and employment. Our purpose is then to make some proposals regarding training and skills development that are adapted to these citizens' needs and so design strategies that might result in better e-inclusion.

2. Materials and Methods

2.1 Instruments

Data was collected using the "Valora1001", a verbally administered questionnaire specifically designed for this study (Gutiérrez-Provecho et al., 2021). This instrument was used to explore the profiles of persons currently marginalised or at risk of social exclusion in the city of León (Spain); it investigates the following dimensions: socioeconomic circumstances, access to technology, health and disability, education, employment, and collects other data such as nationality, legal status, experience of gender-based violence, and previous criminal convictions. The validity of this instrument is

described in other work (Gutiérrez-Provecho et al., 2021) and assessments by multiple judges show a high level of agreement as to the validity of its component items.

2.2 Participants and access procedure

Our target population was persons aged between 18 and 64 years at the time of data collection in receipt of the social guaranteed income, *Renta Garantizada de Ciudadanía* (RGC). This group represents a section of the population who are marginalised or at significant risk of social exclusion and need financial assistance in order to subsist. This population (approximately 1,600 people) were invited to take part in the study and given the difficulty of access to this population, our contact procedures needed to be particularly well-managed. Contact was initiated by letter. Where there was no response or in the case of a letter being returned, individuals were contacted by telephone. Lastly, where telephone contact failed, we attempted to locate these individuals through social services. Our final sample comprised 1125 people with a median age of 41.44 years, of which 56.5% were women and 46.5% were men. In order to complete the interviews for our study, the corpus was segmented according to proximity to the city's social services hubs, CEAS (Social Action Centres). In this way we hoped to maximize accessibility and so encourage a greater level of participation.

2.3 Variables analysed

Personal, home and family: variables of interest were gender, age, number of persons in the home, number of minors in the home, the quality of living conditions.

Health: variables of interest were the presence of health problems, disability status, whether or not participants' perceptions concerning health problems stopped them from working, whether or not participants' perceptions concerning health problems stopped them from accessing education.

Education: variables of interest were the level of education, additional training undertaken, and where participants had not completed any additional training, their level of enthusiasm towards gaining additional training.

Employment: variables of interest were whether they had worked in employment with social security benefits (i.e., legally recognised, and protected work), whether they made weekly visits to jobseekers' centres, whether they believed they had a chance of finding employment, whether they felt they knew how to seek employment, and what importance did they give to technology.

Digital divide markers: variables of interest will be analysed with respect to several markers including 1) *devices*, the number of devices available in their home (smartphone, computer, tablet, smart TV, etc.); 2) *access points*, the number of points available to access the internet (connection via smartphone, fixed connection in the home, etc.); 3) *technology use*, the number of

different procedures an individual has completed over the internet (with public administrations, in search of work etc.).

2.3 Data analysis

In order to achieve the objectives of our study we used descriptive statistics derived from the variables outlined above. These variables were analysed with respect to our markers, devices, access points, and technology use. To establish the statistical significance of differences between groups we used simple variance analysis (ANOVA) and used the F-value to contrast hypotheses.

3. Results

Information concerning the access to, and use of, technology can be summarised in the three variables, number of devices, number of access points, and technology use. The first of these, calculated as the sum of all the various devices in a given participant’s home had a median value of 1.27; the second, calculated as the sum of all the various access points available to participants had a median value of 1.16; and the third, calculated as the sum of all online procedures participants undertook had a median value of 0.87 (Table 1).

n	Devices	Access points	Technology use
0	16.8%	18%	43.9%
1	45.9%	47.7%	25.6%
2	30.5%	34.1%	30.1%
3	6.8%	0.10%	0.40%
\bar{x}	1.27	1.16	0.87

Table 1 - Summary of digital divide markers.

3.1 Personal, home, and family related variables

Gender does not appear to effect participant’s risk of e-exclusion; however, age does emerge as a significant factor (Table 2). As can be seen, increasing age corresponds to progressive and significant decreases in the number of devices, the number of access points, and the technology use recorded by participants.

The number of people living in the home appears to bear no relationship to either access or technology use, however, in the case where co-habitants were minors, the situation was somewhat different. Where there are minors in the home, the number of devices in the home increased, as did points of access, however technology use did not increase.

As might be expected, the quality of living conditions was related to our digital divide markers. Where participants reported having good quality living conditions, a significantly higher number of devices was recorded and, although this relationship was less pronounced, participants also recorded more technology use.

		Devices	Access points	Technology use
Gender	Male	1.22	1.15	0.84
	Female	1.31	1.17	0.86
Age	25-34	1.44	1.38	1.07
	35-44	1.28	1.18	0.92
	45-54	1.25	1.06	0.72
	>54	0.97	0.87	0.64
		$F(3,1121)=13.61, p < .001$	$F(3,1121)=25.11, p < .001$	$F(3,1121)=13.82, p < .001$
Number of persons in the home	1	1.19	1.06	0.91
	2	1.32	1.18	0.91
	3	1.36	1.23	0.83
	4	1.32	1.17	0.86
	5	1.20	1.23	0.85
	>5	1.33	1.27	0.86
Minors in the home	No	1.17	1.07	0.85
	Yes	1.36	1.24	0.86
		$F(1,1123)=15.70, p < .001$	$F(1,1123)=16.16, p < .001$	
Quality of living conditions	Poor	1.04	.098	0.76
	Good	1.32	1.20	0.90
		$F(1,1106)=19.30, p < .001$	$F(1,1106)=15.40, p < .001$	$F(1,1106)=4.21, p = .04$

Table 2 - Differences in markers of the digital divide as a function of personal, home and family variables.

3.2 Health related variables

The results of our analysis (Table 3) allow us to establish a significant relationship between health problems and a greater digital divide. Participants with health problems reported lower numbers of devices, fewer points of access and lower technology use. This trend was exacerbated when participants also reported having a registered disability.

Other variables in the area of health are also related to the digital divide: participants who perceived their problems as a barrier to finding work or to pursuing education reported lower values in all digital divide markers than those who believed that they did have opportunities to seek employment or further their education. In all cases these relationships were statistically significant.

These result show that health problems constitute a risk factor in the processes that lead to e-exclusion.

3.3 Education related variables

Results show (Table 4) the number of devices, points of access, and technology use all show a clear tendency to increase with the level of academic study achieved, and also with the completion of additional training. Furthermore, the same tendency was seen where participants expressed more desire to complete additional training. In all cases the relationships observed were statistically significant.

In this way, lower levels of education, both official and additional, seem to be important risk factors for e-exclusion.

		Devices	Access points	Technology use
Presence of health problems	No	1.32	1.23	0.92
	Yes	1.20	1.07	0.80
		$F(1,1121)=5.75, p =.017$	$F(1,1121)=7.31, p <.001$	$F(1,1121)=5.58, p =.018$
Disability status	No	1.30	1.19	0.90
	Yes	1.04	0.96	0.57
		$F(1,1117)=10.18, p <.001$	$F(1,1117)=11.08, p <.001$	$F(1,1117)=15.45, p <.001$
Participants' perceptions concerning health problems stopped them from working	No	1.38	1.20	1.07
	Yes	1.10	1.00	0.64
		$F(1,361)=7.79, p =.006$	$F(1,361)=4.95, p =.027$	$F(1,361)=18.01, p <.001$
Participants' perceptions concerning health problems stopped them from accessing education	No	1.42	1.22	1.01
	Yes	1.02	0.94	0.61
		$F(1,368)=20.86, p <.001$	$F(1,368)=14.54, p <.001$	$F(1,368)=20.66, p <.001$

Table 3 - Differences in markers of the digital divide as a function of health variables.

		Devices	Access points	Technology use
Level of education	1*	0.77	0.53	0.10
	2	1.07	1.00	0.46
	3	1.15	1.08	0.74
	4	1.26	1.24	0.94
	5	1.56	1.34	0.77
	6	1.60	1.37	1.19
	7	1.63	1.37	1.39
	8	1.68	1.43	1.59
		$F(8,1116)=11.28, p <.001$	$F(8,1116)=9.42, p <.001$	$F(8,1116)=25.75, p <.001$
Additional training undertaken	No	1.00	0.96	0.58
	Yes	1.38	1.24	0.98
		$F(1,1116)=50.66, p <.001$	$F(1,1116)=35.12, p <.001$	$F(1,1116)=51.71, p <.001$
Attitude towards gaining additional training	No	0.89	0.81	0.43
	Yes	1.15	1.10	0.68
		$F(1,368)=20.86, p <.001$	$F(1,368)=14.54, p <.001$	$F(1,368)=20.66, p <.001$

* 1. Illiterate; 2. Without qualifications; 3. Primary education (no graduation certificate); 4. School Certificate; 5. Professional Training; 6. Completion of Compulsory Education (ESO); 7. Baccalaureate; 8. University Level

Table 4 - Differences in markers of the digital divide as a function of employment variables.

3.3 Employment related variables

Whether or not participants had worked in employment with social security benefits had a statistically significant relationship to both the number of devices and technology use. However, no relationship was seen between this variable and the number of access points reported.

Further, participants’ weekly attendance at jobseekers’ centres, their perception of their chances of finding employment, their perceived knowledge of how to use technology to seek employment all showed a relationship to the number of devices, points of access, and technology use. Results demonstrate that not having had legal work in the past, as well as having a passive or negative attitude to searching for work are risk factors for e-exclusion (Table 5).

4. Discussion and conclusions

According to the latest report from Spain’s Social Observatory, the country has experienced a digital revolution over the last 5 years with 85% of the population now using the internet (Carrascosa et al., 2021), however, at the same time, differences between socioeconomic groups have become accentuated (Sevilla & Márquez, 2021). Differences in access, use, and technology adoption tend to be associated with other socioeconomic inequalities and people belonging to vulnerable or marginalised groups also have high markers of e-exclusion. The Fostering Social Studies and Applied Sociology foundation estimates that 35.2% of homes are disadvantaged by the digital divide, and this percentage rises to 45.8% among groups experiencing social exclusion and further, to 51.2%, in instances of severe exclusion (FOESSA, 2021).

Our previous work (AI) has demonstrated the existence of a significant digital divide between our sample

population (of those currently marginalised or at risk of social exclusion) and the general population. This divide is of such magnitude that it constitutes the most pronounced difference, i.e., Type IV or very significant (difference>16%) and suggests the presence of a social fracture between the two populations (Mendoza-Ruano & Caldera-Serrano, 2014) dividing them by a chasm of technological knowledge and capability.

However, technological deprivation is not homogeneous across all vulnerable groups, indeed, the character and depth of deprivation varies substantially between individuals. Hence there is a need for greater understanding of this variation, and this is the motivation behind this work.

In general terms, the results of this study confirm those of other researchers and the risk factors detected for the vulnerable population considered here are the same as those identified by Varela (2015) and Colom (2020) for the general population—with the exception of gender. In the following, we will discuss our results for each of the dimensions analysed.

Personal, home, and family

It seems that, in Spain, in the population at large, e-inclusion is becoming equalised with respect to gender (INE, 2020). Our results confirm this, and indeed may be swinging towards a situation where the most excluded population is increasingly male.

Our results also demonstrate the continued existence of an age gap in the sense that among those over the age of 55 years, deprivation manifests more deeply and creates a greater degree of vulnerability. This is in line with the findings of other work in this area (Carrascosa et al., 2021; Martín, 2020; ONTSI, 2020; Papi et al., 2020; Repetto, & Trentin, 2008).

With respect to the composition of the family, our results show this exerting some degree of influence on e-exclusion. Although the number of people in the

		Devices	Access points	Technology use
<i>Had worked in employment with social security benefits</i>	No	1.14	1.12	0.70
	Yes	1.33	1.18	0.94
		$F(1,1118)=13.06, p<.001$		$F(1,1118)=17.84, p<.001$
<i>Make weekly visits to jobseekers’ centres</i>	No	1.24	1.10	0.80
	Yes	1.48	1.39	1.18
		$F(1,706)=11.26, p<.001$	$F(1,706)=24.21, p<.001$	$F(1,706)=28.35, p<.001$
<i>Belief in having a chance of finding employment</i>	No	1.14	1.06	0.72
	Yes	1.43	1.27	0.84
		$F(1,1034)=31.18, p<.001$	$F(1,1034)=22.89, p=.027$	$F(1,1034)=35.64, p<.001$
<i>Knowing how to seek employment</i>	No	0.93	0.83	0.17
	Yes	1.56	1.43	1.45
		$F(1,1114)=186.18, p<.001$	$F(1,1114)=242.98, p<.001$	$F(1,1114)=1320.16, p<.001$

Table 5 - Differences in markers of the digital divide as a function of employment variables.

household appears not to be a factor, the presence of minors among that number is significant in that it influences both the number of devices and the access points available in the home. The National Observatory of Technology and Society (ONTSI) has also found that the presence of children in a household has a positive impact on internet usage. In households comprising a couple with children, on average, 97.7% are occasional internet users while 96.2% report using the internet on a weekly basis. In contrast, in households composed of childless couples these figures are 87.3% and 82.8% respectively (ONTSI, 2020). These findings may be due to the fact that younger people need to use technology for educational purposes and, particularly, as a primary tool for socialising.

Health

Our findings demonstrate that having health problems is a risk factor for e-exclusion but also that such problems feedback to worsen social exclusion. Participants with health problems had fewer devices, fewer access points and their technology use was low, and these effects were more pronounced for participants who also reported having a disability.

This pattern is reproduced in the population at large where significant differences are found between those reporting having some form of disability and those who do not in terms of the number of devices, number of access points, and technology use (Peña-Lapeira, 2015; Torán & Sendra, 2021). These facts clearly show how the disadvantage of having a disability amplifies the risk of cultural and social marginalisation (Ferreira & Velázquez, 2009).

The participants in our sample population already belong either to marginalised groups or groups at risk of social exclusion and, as our results show, this feeds back into their digital disadvantage. People in these vulnerable groups tend to believe themselves unable to find employment or continue their studies. This is perhaps because literacy programmes are often targeted at the general population without taking account of the needs of persons with disabilities (Torán & Sendra, 2021), or it may be due to persisting problems of content accessibility (Peña-Lapeira, 2015).

As a result, from our participants' point of view, their health problems negatively affect their chances of accessing education which in turn has repercussions on their subjective perceptions concerning their employment opportunities. Undoubtedly, these individuals' extremely negative beliefs about their opportunities are likely to lead to these people feeling less able to undergo personal development causing a progression towards ever greater exclusion, further demotivation, and a lack of proactivity. This process could perpetuate and deepen the divide experienced by those who perceive their lack of resources to be too great to overcome. In order to change this, it is essential to depart from the "one size fits all" model of social intervention and instead design personalised

programmes of action aimed at strengthening social participation, targeted to take specific account of individual limitations (Peña-Lapeira, 2015).

Education

Our results show that the digital divide is exacerbated by lower levels of academic attainment, lower rates of additional training, and even by the lack of motivation to consider additional training. These results reproduce patterns seen in the general population where educational level has also been related to e-exclusion (Papi-Galvez et al., 2020). Studies show that, among people with primary level education, 70% connect to the internet on a weekly basis and this percentage rises to almost 100% among those with university level qualifications (ONTSI, 2020). Work by Carrascosa et al. (2021) showed practically identical findings with 100% of those holding a university degree using the internet on a regular basis, while only 27.4% of those who had only finished primary education reporting the same.

In very general terms then, our study demonstrates that a high digital divide index is associated with a lack of proactivity and a low level of motivation. This reinforces the idea of feedback described in the literature in the sense that lower educational attainment results in a wider digital divide. Educational e-exclusion generates fewer opportunities, more inequalities, and ultimately a greater degree of social exclusion such that the resulting inequality of opportunity with regards to information access, knowledge, and ITC enabled education severely limits possibilities of personal development (Vivancos, 2013).

Employment

Our study shows that not having been employed in the past, as well as having a passive, negative attitude towards seeking a job appear to be risk factors for e-exclusion. These findings partially coincide with those of the ONTSI (2020) report indicating that the employed, the jobless, and students had the highest percentages of internet access, while pensioners, and those who worked in the home had the lowest rates of connectivity.

Nevertheless, this relationship is bi-directional in the sense that differences in access to technology understood as training in its use, establishes an employment divide (access to employment, choice of better/worse employment, and job stability) that causes new forms of poverty and exclusion (Olarte, 2017).

The labour market is undergoing profound restructuring due to technological innovation, not only because this process generates new jobs demanding new technological qualifications (Olarte, 2017), but also because of the way in which traditional jobs are becoming increasingly digitised. According to the COTEC foundation (2021), this growing digitisation involves the automation of many activities and also changes in roles, services, and tasks requiring a new

level of technological competence such that it is estimated that by the end of the period 2017-2025 between 85% and 90% of jobs will require technological skills (Cedefop, 2020).

The digital divide represents a barrier to employment (Morales & Macias, 2020), and means that the excluded (at a disadvantage in the labour market) are exposed to poverty and marginalisation as a result (Olarte, 2017), or as is the case with our corpus, experience greater levels of social exclusion.

In this way, it is evident that in order to lessen the digital divide we much enhance connectivity and access to technology particularly among vulnerable groups. This, of course implies the need to increase economic growth and development and investment in technology should be seen as a tool to reduce inequality bringing access to education and better employment opportunities. However, as has been indicated in other studies, an abundance of technology in itself does not reduce the digital divide, instead, the essential ingredient is enhanced technological skills during the process of adoption (López-Aguado, 2020; Gómez et al., 2018) with educational institutions - schools and universities - taking a leading role (Cabero & Ruiz-Palmero, 2018; Gallo, 2008).

Understanding the digital divide as a factor that causes or deepens social exclusion leads to an understanding of how its reduction could at the very least act as a tool to facilitate social inclusion. However, to achieve this requires focussed attention on particular priority groups identified in this study as especially vulnerable, that is, those groups for which several risk factors coincide. According to our findings, these priority groups include older people, especially those who do not live with children or youngsters of school age; people with lower levels of academic achievement; people with health problems (those with a greater degree of disability being in most urgent need of help); and people who have not been able to find work.

As a result, it is essential to design educational interventions that reach all segments of the population (Carrascosa et al., 2021) and for these to have the objective not only of developing digital skills but also, perhaps especially, of fostering social participation taking account of individual starting points, as well as the different needs, skills, limitations, and potential of every individual. In this way, it might be possible to mitigate the effects of the digital divide on the social exclusion experienced by the most vulnerable groups in society and so move towards the goal of a fully digitally empowered citizenry, so that people in vulnerable situations are able to use technologies as a way to achieve greater inclusion, but also to appropriate them as an emancipatory and empowering tool that drives social change.

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Digital marginalization, data marginalization, and algorithmic exclusions: a critical southern decolonial approach to datafication, algorithms, and digital citizenship from the Souths

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Abstract

This paper explores digital marginalization, data marginalization, and algorithmic exclusions in the Souths. To this effect, it argues that underrepresented users and communities continue to be marginalized and excluded by digital technologies, by big data, and by algorithms employed by organizations, corporations, institutions, and governments in various data jurisdictions. Situating data colonialism within the Souths, the paper contends that data ableism, data disablism, and data colonialism are at play when data collected, collated, captured, configured, and processed from underrepresented users and communities is utilized by mega entities for their own multiple purposes. It also maintains that data coloniality, as opposed to data colonialism, is impervious to legal and legislative interventions within data jurisdictions. Additionally, it discusses digital citizenship (DC) and its related emerging regimes. Moreover, the paper argues that digital exclusion transcends the simplistic haves versus the have nots dualism as it manifests itself in multiple layers and in multiple dimensions. Furthermore, it characterizes how algorithmic exclusions tend to perpetuate historical human biases despite the pervasive view that algorithms are autonomous, neutral, rational, objective, fair, unbiased, and non-human. Finally, the paper advances a critical southern decolonial (CSD) approach to datafication, algorithms, and digital citizenship by means of which data coloniality, algorithmic coloniality, and the coloniality embodied in DC have to be critiqued, challenged, and dismantled.

KEYWORDS: Digital Citizenship, Digital Marginalization, Data Marginalization, Algorithmic Exclusions, Data Colonialism, Critical Southern Decoloniality.

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1. Introduction

This paper explores how communities (also regarded as users or citizens) from the Souths, especially indigenous, subaltern, and underprivileged communities, tend to be marginalized by big data in all its multiple digital configurations [The other co-references of these indigenous, subaltern, and underprivileged communities in the paper are Black, Indigenous and People of Color (BIPOC) communities, Southern societies, and societies in the Souths. A further co-reference of these communities is *the others* even though this co-reference

has not been used in this paper]. It also examines how such communities in the Souths often get excluded by algorithms through their multifarious uses. Those who collect, collate, capture, configure, process, and preserve data do so for various purposes: advertising, tracking, monitoring, surveillance, credit control, population census, and decision making. To this end, there are different types of data. All of these data processes get passed off as big data and datafication (Andrejevic, 2014; Charitsis & Lehtiniemi, 2022; Milan & Treré, 2019, 2021; Van Dijck, 2014). Central to collecting, collating, capturing, configuring, processing, and preserving data, to the purposes that data serve, and to big data and datafication, are algorithms. That is, data has to be *big* for it to undergo these data processes and for it to be subjected to algorithms. If it is not big, it cannot be data, and it cannot have data infrastructure (cf. Milan & Treré, 2021). If it is not big, it is worthless and unusable.

Data, particularly big data, benefit societies that are data- and digitally-savvy, and that have unlimited access

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to such data and to associated technologies. Such societies are, however, confined to the Norths – in their diverse and multiple configurations (see Milan & Treré, 2019) – and not to the Souths – also in their diverse and multiple configurations (again, see Milan & Treré, 2019). In this data sphere, Northern societies tend to be more privileged in terms of big data and datafication than Southern societies as characterized above. This means that for societies in the Norths, big data and datafication imply empowerment and affirmation, what Charitsis and Lehtiniemi (2022) refer to as data *ableism*. Conversely, for societies in the Souths, especially Black, Indigenous and People of Color (BIPOC) (Terp, 2020) communities, big data and datafication entail marginalization and exclusion from digital citizenship if data is deemed to be a passport to being a citizen in the digitally datafied world. Charitsis and Lehtiniemi (2022) regard this state of affairs as data *disablism*, while Lerman (2013) refers to it as a *perspective of exclusion*.

In a similar vein, the deployment of algorithms in harvesting and mediating big data has spawned a parallel process in which Northern societies are privileged and affirmed by algorithmic inclusions as they serve as a model society for machine learning, while Southern societies tend to be disadvantaged and disaffirmed by algorithmic exclusions as they are a non-model society for machine learning. A corollary of this is that, right from the onset, in an increasingly automated world and in a world where what Janssen and Kuk (2016) call Big and Open Linked Data (BOLD) is readily available, Southern societies are denied digital citizenship by algorithmic exclusions even if they were all to be data- and digitally-savvy. This is a consequential issue as who gets excluded by both big data and algorithms has their life chances negatively impacted by exclusions perpetuated by automated algorithms. This is also a problematic issue as those whose data is harvested and utilized by algorithms have no control and decision-making capacity over how their data is used. The point here is, as Janssen and Kuk (2016) pertinently argue, even though algorithms are thought to belong to the domain of computer programming, they nonetheless percolate into social and economic spheres. In fact, there is no gainsaying that big data and algorithms have almost colonized the life worlds of modern-day, automated societies, wherever their locations are.

Against the background sketched above, this paper has the following sections: the Souths and data colonialism; digital citizenship and emerging regimes of digital citizenship; digital marginalization, data marginalization, and algorithmic exclusions; and critical southern decolonial approach to datafication, algorithms, and digital citizenship.

2. The Souths and data colonialism

The phrase, *the Souths*, builds on and departs from the Global South, whose counterpoise is the Global North.

It builds on the Global South in line with how the latter (the Global South) has been conceptualized and utilized by different scholars from various disciplines (see, for example, Benabdallah et al., 2017; Chaka, 2020; Clarke, 2018; Dados & Connell, 2012; Kloß, 2017; Lazar, 2020; Mahler, 2018; Milan & Treré, 2019; Wolvers et al., 2015). Sometimes, tying down a concept to a definition yields the opposite: prescriptiveness, essentialism, and definitional opaqueness. This is particularly the case with concepts such as the Global South and the Souths. In trying to define them, one may end up being prescriptive, essentializing them, or making them appear more opaque. So, there is no one straightforward or no one-size-fits-all definition that can be attached to these two concepts. Rather, definitional perspectives from which these terms are conceptualized are more helpful in this context. Concerning the Global South, and without delving deeper into a historical evolution of the term, three definitional perspectives are relevant [for the historical evolution of the term, the Global South, see Clarke (2018), Dados and Connell (2012), Kowalski (2020), and Mahler (2017)]. First, it is a metaphor for countries characterized by persistent inequalities and asymmetrical power relations owing to imperialism and neocolonialism, irrespective of their spatial locations. Second, it refers to global subaltern communities (subjugated peoples and Indigenous Peoples), irrespective of their geographical locations, whose knowledges are often marginalized by the Global North. This is an equivalent of what Kloß (2017) calls *the global peripheries*. Third, it refers to countries whose economies are less developed when compared with those of the countries situated in the Global North (see Dados & Connell, 2012; Kloß, 2017; Lazar, 2020; Milan & Treré, 2019).

As noted from the three foregoing definitional perspectives, there is a sense of reductionism and essentialism about them: reducing the countries and the peoples deemed to belong to the Global South to a homogeneous whole and to subalternity, and essentializing them territorially, racially, demographically, and economically along that reductionist axis. Additionally, there is a sense of romanticizing about the countries and their peoples in the Global South, and about the latter itself: that these countries and their peoples are ideal polities situated in the ideal spatial locality (the Global South). Owing to this, the paper prefers to use the phrase, *the Souths*, to refer to the Global South. It does so in keeping with Mahler's (2017) and Milan and Treré's (2019) view of the Souths (also see Armillas-Tiseyra & Mahler, 2021). In its plural form, the Souths, conceptually and metaphorically, signals the multiplicities of the Souths across the geographic globe. It also signifies the heterogeneity, the diversity, the severalness, and the situatedness of the countries and the peoples of the Souths: they are Indigenous Peoples; they are the erstwhile colonized; they are the subaltern and the *othered* peoples; they are the peoples whose knowledge systems are marginalized; they are the peoples with

varying underdeveloped and developing economies and with limited and varying access to the fourth industrial revolution (4IR) technologies; and they are the peoples defined by, as pointed out by Francis (2021), their positionalities relative to global capitalism. Moreover, they are countries that have differing pockets of the Norths in them. Mahler (2017) aptly captures this geography-defying, and sometimes nation-state-incompatible Souths and Norths by asserting that: “there are economic Souths in the geographic North and Norths in the geographic South” (p. 32). Likewise, Francis (2021, p. 689) avers that “there are Global Souths in the geographic North and Global Norths in the geographic South”. This is a deterritorialized conception of the term, *the Souths* together with its alter ego, *the Norths*.

Alongside the Souths are the notions of the big data from the Souths and data colonialism. Data colonialism is the practice of unilaterally extracting computational data from mainly the Souths that parallels predatory extractive and exploitative tendencies of geopolitical colonialism (see Couldry and Mejia, (2019a) to which the majority of the Souths were subjected. It is, on the one hand, one of the salient features of global colonialism that is aided and mediated by digital technologies. On the other hand, it is a central part of datafication in which big data algorithms are indispensable technologies. Datafication itself has to do with the pervasive digital harvesting and use of big data and its impact (Heeks & Shekhar, 2019) on the social life worlds of individuals in a borderless digital world. Elsewhere, Ricaurte (2019) and Zembylas (2021) talk about digital colonialism and digital neocolonialism, respectively. Data colonialism is part of this overarching neocolonialism.

In this context, big data from the Souths refers to different forms of big datasets digitally harvested or extracted from the Souths and how these datasets are appropriated and exploited by the Norths in a manner similar to historical and geopolitical colonialism (cf. Couldry & Mejia, 2019a; Milan & Treré, 2019; Mumford, 2021). Driven mainly by big corporations and big money from the Norths – a proxy for global capitalism – data colonialism has as one of its key purposes extracting and aggregating big data for profit-making and for other purposes that serve the various digital dividends for such big corporations and big money. One of these digital dividends is marketing, commodifying, and monetizing personal data and behavioral data. Another digital dividend is surveilling individuals by governments or by private entities, a data practice that Greenwood (2020), Hintz et al. (2019), and Zuboff (2019) refer to as *surveillance capitalism*, and which Van Dijck (2014) calls *dataveillance*.

3. Digital citizenship and emerging regimes of digital citizenship

Conventionally, digital citizenship (DC) refers to a situation in which users of digital technologies are

presumed to possess a wide range of skills that enable them to competently, progressively, and critically engage with and use such technologies. This includes the ability to meaningfully participate, learn, socialize, work, play, and communicate in diverse digital environments (Richardson & Milovidov, 2019). DC comprises the following nine features: digital access; digital literacy; digital communication; digital commerce; digital health; digital law; digital ethics; digital rights and duties; and digital security (Mukhametzyanov, 2022). It also consists of two features: state organization and citizens’ self-organization; and human activity. State organization refers to the manner in which the state organizes and regulates digital technologies in its jurisdiction, and the type of access to digital environments it allows its citizens to have. Self-organization has to do with how citizens leverage digital technologies as individuals and as groups of people. For its part, human activity is related to citizens’ digital presence and the digital traces citizens leave online. Additionally, this has to do with whether the digital presence and the attendant online traces of citizens are anonymized or not. This latter point is crucial as citizens’ digital presence is a virtual copy of citizens’ persona. Their presence and traces online serve as a gateway to and as a source of their personal data that is tracked, used, and surveilled by the state and corporations for various purposes. In this way, citizens’ online presence and traces are also part of their digital footprint. Most importantly, DC is tied to citizens’ digital literacy, digital rights, and digital freedom (Mukhametzyanov, 2022; also see Richardson & Milovidov, 2019).

Viewed from another perspective articulated by Richardson and Milovidov (2019), DC is, as represented in a temple-like model, underscored by four sets of competences, five framing pillars, and ten DC domains. The four sets of competences are as follows:

- *Values* – democracy, fairness, equality, human rights, and cultural diversity
- *Attitudes* – openness, self-efficacy, civil mindedness, respect, tolerance, and responsibility
- *Skills* – communication, plurilingual skills, listening, observing, cooperation, empathy, flexibility, adaptability, autonomous learning, analytical and critical thinking skills, and conflict resolution
- *Knowledge and critical understanding* – knowledge and critical understanding of: self, language and communication, cultures, politics, human rights, religions, law, media, environment, and sustainability.

These core competences, which are the foundational or bottom layer, are followed by five constructs: policies, stakeholders, strategies, infrastructures and resources, and evaluation. These constructs are regarded as framing

pillars, and constitute the middle layer. At the top layer are ten DC domains. These are as follows:

- *Students* – empowering, educating, and protecting themselves
- *Parents* – participating in citizenship and Internet debate, and helping children find a balance between interpersonal and social lives when using digital technologies
- *Teachers* – upskilling in terms of digital competences and reviewing teachers' role in the digital era
- *School management* – ensuring that all the relevant stakeholders are part of a decision-making process concerning safe, ethical, and legal use of both digital technologies and digital information
- *Academia* – developing local resources to ensure maximum engagement by all stakeholders, highlighting the positive and negative implications of digital technologies and digital information; and conducting research related to DC
- *Private sector* – creating conditions conducive to effective DC; initiating a multi-stakeholder and cross-media approach to dealing with digital technologies and digital information with a view to empowering users and protecting minors; and putting in place appropriate terms and conditions that are user-centric
- *Civil sector* – providing new directions and future orientation for DC education
- *Local educating communities* – developing a framework for formal, informal, and non-formal education that speaks to DC, and initiating civic tech to respond to and address different aspects of DC
- *Regulatory authorities* – encouraging education authorities to embrace DC education, and ensuring that users' and children's rights are respected
- *National/international authorities* – promoting democratic values and human rights for multi-stakeholder consultative and governance structures (Richardson & Milovidov, 2019).

While the points attributed to DC above are crucial, the notion *DC* is very complex, especially given the nuances and challenges associated with it. This is more so given the rapidity with which digital technologies evolve and the new ones come into play; and also given the fact that digital environments are ever-changing minefields in terms of user data, which feeds into datafication. In this case, acquiring digital competences, which include digital literacy, and knowing about one's digital rights and privacy protection are not sufficient safeguards against an unauthorized use of personal data, or against a nefarious use of such data. For this reason, it is equally

crucial for users to acquire critical digital literacies, critical technology education (Pötzsch, 2019), and critical data literacies, and to develop an understanding of critical data infrastructure literacies (cf. Chaka, 2019; Gray et al., 2018; Pötzsch, 2019) and datafication. Nonetheless, all of this becomes tricky and challenging when users are children.

Reflecting on the complexity of DC in the ever-evolving digital age and taking into consideration the era of the COVID-19 pandemic and its ramifications both on digital environments and on DC, Calzada (2022) proposes and discusses five emerging DC regimes. These DC regimes can also be taken to be the modes of DC or the personas of DC users assume in various digital environments. The main drivers of these emerging DC regimes are different digital technologies and the practice of datafication. These five emerging DC regimes are: pandemic citizenship, algorithmic citizenship, liquid citizenship, metropolitan citizenship, and stateless citizenship. Pandemic citizenship is a global, generalizable, emerging DC regime that reflects how datafication practices during and post-COVID-19 have engendered interwoven, techno-politically and city-regionally driven, unique DC regimes in certain urban parts of European nation-states.

In this context, algorithmic citizenship is mainly powered by big data algorithms. Similarly, liquid citizenship is driven by the big data ideology or dataism. For its part, metropolitan citizenship is powered by data cooperatives in response to Brexit. Finally, stateless citizenship is driven by data sovereignty. Even though the last two regimes of DC are specific to conditions related to European nation-states, and by extension to the Norths, the first three regimes have applicability to other nation-states, including those in the Souths. This is especially so when taking into account the datafication and algorithmization that are key in mediating these DC regimes. Another factor to note is that these regimes of DC are not necessarily mutually exclusive: they can overlap and co-exist within one user. Their interlocking reflects how intricate living digitally can be in the face of what Calzada (2022) calls *algocracy*, *algorithmic surveillance*, *dataveillance*, and *digital panopticon* (also see Floridi, 2020; Geeker and Hind, 2019). Moreover, it highlights how DC is inextricably linked to data citizenship, with the latter underscoring the need for users to display active and critical agency when online, particularly when datafication and algorithmization have become so naturalized and normalized (see Pawluczuk et al., 2020).

4. Digital marginalization, data marginalization, and algorithmic exclusions

Digital users can and do get marginalized when online, when accessing digital environments, or due to lack of access to digital technologies and to the Internet connectivity. This constitutes, the paper contends,

digital marginalization. Digital marginalization entails digital exclusion and discrimination. For example, Gangadharan (2021) maintains that digital exclusion is linked to issues about Internet infrastructure access, Internet technologies adoption, marginalization caused by socio-economic conditions and forms of historical oppression (also see Martin et al., 2016; Tomczyńska, 2017). All of these factors have a significant bearing on whether or not citizens have a meaningful and active participation in digital technologies, or whether or not they have a meaningful and active digital participation. According to Tomczyńska (2017), digital exclusion, whose origin he traces to the United States, has much to do with information-poor societies versus information-rich societies, or with information *have-nots* versus information *haves*. It is an equivalent of an erstwhile digital divide. Nonetheless, as Tomczyńska (2017) points out, this dualism tends to oversimplify a very complex phenomenon. This oversimplified dualism is rooted in technological determinism that views digitality and digitalization [digitality refers to a condition in which everything a user does (communicating, writing, purchasing, creating content, etc.) happens exclusively online through digital technologies (see Fund, 2022). Segura and Waisbord (2019) calls it digitalism. For its part, digitalization is a process in which a user's social life domains, and the information related to such domains, are structured around and mediated by digital communication and media infrastructure. In it, social interactions such as work and leisure occur solely on digital platforms as opposed to analog platforms. It also relates to an environment in which business operations happen on digital platforms, thereby blurring the physical and digital worlds (see Bloomberg, 2018)] in terms of *haves* and *have nots*, while ignoring the factors engendering this binarism such as political, social, racial, cultural, educational, economic, institutional, infrastructural, geographical, and ideological factors. These factors are not binary, but multilayered, multidimensional factors; they are also inextricably intertwined, and have embedded or underlying subsets.

At a more intricate and nuanced level, digital exclusion transcends the binarism and both the multilayerism and multidimensionality portrayed above. For example, it can occur at the level of what Sin et al. (2021) call digital design marginalization. The latter refers to a situation in which certain digital interface designs are configured in such a way as to exclude particular users, especially underrepresented users such as those in the Souths, thereby contributing to their being marginalized in certain aspects of their digital lives. As a result of such non-inclusive designs, these users encounter digital barriers when trying to access essential services such as shopping, healthcare, and personal finance. A similar process is the one in which underrepresented users, owing to their socioeconomic, cultural, and historical marginalization, manage to possess only low-level digital devices that are not fitted with user interface designs that can allow them to access essential services online. Another instance is the one in which certain

underrepresented users may possess relevant digital devices, but may still not be able to access online essential services due to some of the marginalizing and exclusionary factors mentioned in the preceding paragraph.

Digital users can further be marginalized when their data or the data they generate online is used by various data exploiters, whenever they (users) access digital technologies and digital environments through any form of Internet connectivity. This practice engenders data marginalization. The practice is so called because users become marginalized from the very data they generate, particularly in automated and datafied societies. It is a practice that typifies data colonialism, whose central logics are algorithmizing, commodifying, and monetizing data (big and small data) within the broader datafication process as defined and discussed earlier. It is a scenario, in which, to repurpose Charitsis and Lehtiniemi's (2022) thoughts, market-driven norms and standards trump the privacy and the sanctity of personal data for marketization purposes.

It also a situation in which certain individuals and communities, especially the underrepresented communities from the Souths, get excluded and marginalized, while others, particularly the data- and digitally-rich users from the Norths, are privileged and rewarded. Herein lies the notions of *data ableism*, *data disablism* (see Charitsis & Lehtiniemi, 2022), data capitalism (Charitsis and Lehtiniemi, 2022 also refer to it as *data-based capitalism*; see Coudry and Mejias, 2019a; Segura and Waisbord, 2019), and data coloniality (Mumford, 2021). The first two concepts are, as argued by Charitsis and Lehtiniemi (2022), more than just ability (efficiency) versus disability (deficiency) and more than just tropes especially when they are viewed from both critical disability scholarship and critical technology scholarship. In line with this dual view, data ableism refers to practices, processes, and politics of data whose primary purpose is to privilege and affirm particular data-related abilities and digitalization practices that are expected in certain data subjects. These data abilities and digitalization practices include, the paper argues, the skillsets of competences and their attendant sub-skillsets possessed by mainstream digital citizens in the Norths as outlined earlier. They also include these digital citizens' digital habituses. Moreover, they relate to the five emerging DC regimes mentioned earlier into which digital citizens in the Norths are categorized.

In this case, data disablism has to do with practices, processes, and politics of data that tend to exclude and marginalize individuals and communities who are perceived to lack the requisite digital skillsets of competences and their attendant sub-skillsets as mentioned earlier, and who are deemed not to display the digital habituses often exhibited by the data-savvy digital users. Such individuals and communities are, additionally, construed as having data-based deficiencies (see Charitsis & Lehtiniemi, 2022). The

corollary of the two processes, data ableism and data disablism, is the parallel processes that Charitsis and Lehtiniemi (2022) call data (in)visibility and data (un)desirability. The former refers to the ability users have to generate data that makes them visible or invisible within a data ecosystem, while the latter is related to the ability users have to generate data that is construed to be (in)valuable or (un)desirable within a data ecosystem. These two processes underscore the value and the normalizing/de-normalizing logic of data in automated, datafied societies and of the attendant data economies of such societies in the Norths. In such societies, visibility and desirability through data becomes the norm, while data invisibility and data undesirability become an aberrance. Therefore, data invisibility and data undesirability lead to data marginalization and exclusion, or to what Lerman (2013) calls a perspective of exclusion. In a data visibility/desirability - data invisibility/undesirability continuum, the first end of the continuum gets more privileged and validated than the last end of the continuum in terms of the data produced by users (cf. Charitsis & Lehtiniemi, 2022). In addition, the first end of the continuum is often associated with the automated, datafied users and communities in the Norths, whereas the last end is seen to be linked to the less automated and the less datafied users and communities in the Souths.

What is intriguing in the data colonialism, data ableism, and data disablism equation in which underrepresented individuals and communities are marginalized and excluded, is data coloniality or the coloniality of data. While data colonialism, like its alter ego, historical colonialism, can be dealt with within legal and legislative frameworks (e.g., personal data privacy rights, data protection laws, data sovereignty, and digital citizenship rights) in given data jurisdictions, data coloniality is impervious to any legal and legislative interventions. That is, as pointed out by many scholars such as Escobar (2007), Grosfoguel (2007), Hsu (2017), Maldonado-Torres (2007; 2018), Mignolo (2007), Núñez-Pardo (2020), Quijano and Ennis (2000), coloniality, unlike colonialism, persists in postcolonial jurisdictions well after colonialism has ended. It does so in multiple variants like the coloniality of power, of knowledge, of being, and of thought. To this, can be added the coloniality of data, of algorithms, and of digitality. Underscoring these three forms of coloniality is Eurocentrism, which projects Euro-American worldviews as centers of universal, objective, zero-point epistemes (Mumford, 2021) against which all subaltern knowledges can be judged and benchmarked. With reference to data and algorithmic coloniality, “the heteronormative ... White ... modern subject” (Mumford, 2021, p. 4) together with its gendered, racialized, and classed (Mumford, 2021) Euro-American representation is the basis of both data representation and algorithmic configuration. Human features and characteristics of non-European subjects become excluded and *peripheralized* in this data and algorithmic setup.

Over and above digital and data marginalization, there are algorithmic exclusions. At a basic level, algorithms⁵ are abstract, formalized, automated, rules-based descriptions of computer procedures for processing data [algorithms are more complex than they have been presented in this paper. They do not operate only in digital gadgets, but also in large machines and in super computers, where in tandem with AI, they perform complex functions and tasks that human brains cannot ordinarily perform. For some of the examples of algorithms and their related methods and tools, especially within the educational data mining field, see Chaka (2021); Jago and Laurin (2022); also see Cofone (2019)]. They are sets of procedural steps intended to solve certain problems based on inputs and outputs that regulate and ensure the functioning of automated tasks. Simply put, they are computer programs (Borgesius, 2018; also see Orwat, n.d.). Mostly, algorithms operate through very complex and coded procedures that are invisible to users. They are often required to remotely execute coded and automated decision-making based on the types of datasets that they are assigned to collect or work on. Many of big data-driven algorithms tend to operate predictively in real-time by learning from previous and existing observations with a view to perfecting their predictions (Tenney & Sieber, 2016). Overall, algorithms have wide-ranging applications in different contexts such as generating and distributing online data, surveilling and policing citizens, carrying out employee assessments, marketing and advertising, financial and purchasing transactions, stock trading, and fraud detection (see Ulbricht & Yeung, 2022). To these algorithmic applications can be added online personal profiling, hiring, and university student admissions as well (cf. Orwat, n.d.; Ulbricht & Yeung, 2022; Williams et al., 2018). One key issue worth mentioning is that algorithms are intended to computationally optimize things: solve problems; carry out or complete tasks; and save lives. At a very innocuous level, and with the aid of artificial intelligence (AI), algorithms help different digital devices sort photos, recognize human faces; respond to voice commands; drive cars (Rainie & Anderson, 2017); personalize learning and adverts; harvest and match publications against authors; or diagnose illnesses. This includes their nefarious use in activities such as cyberattacking, hacking, and code-breaking (Rainie & Anderson, 2017).

To this end, big data-driven algorithms are constantly employed by organizations, corporations, institutions, and governments in different jurisdictions, or in different data jurisdictions (Ulbricht and Yeung, 2022), both in the Norths and in the Souths, to access citizens' datasets, either innocuously or nefariously, for various decision-making purposes such as the ones mentioned above. Inherently, algorithms operate on a discriminatory and differentiating computational logic. That is, they have to recognize and discriminate patterns on the basis of what they have by ignoring that which they do not have. Jago and Laurin (2022) point out that even though applying algorithms has led to a new hope

in various human domains, nonetheless, algorithms are capable of both systematizing discrimination and obscuring its presence. This, the paper contends, is tantamount to normalizing discrimination, while simultaneously *invisibilizing* it. This is also equivalent to naturalizing exclusion, while pretending that it does not exist because algorithms are autonomous, neutral, rational, objective, fair, unbiased, and non-human. No, they are not necessarily so, especially social algorithms and algorithms meant to regulate and monitor human behavior! They are, as Mattiuzzo (2019) maintains, designed and created by humans. This is a point that she aptly frames as follows: “results provided by algorithms have a façade of objectivity, which runs from their use of mathematics ... [c]urrent algorithmic systems are mostly concerned with finding correlation in data, not causation” (p. 3; also see Borgesius, 2018, pp. 7 and 9; Madden et al., 2017; cf. Cahan et al., 2019; Cofone, 2019, pp. 1409-1410). To add to this, they are concerned with identifying and recognizing familiar and relatable patterns from a sea of datasets.

The picture painted above underlines algorithmic exclusions, especially the exclusions of marginalized and underrepresented users such as BIPOC communities both in the Souths and in the Norths by algorithms. This is particularly the case when algorithms are programmed in such a way as to replicate given historical human biases embodied in their input datasets. For instance, algorithms trained using unrepresentative, incomplete, insufficient, or biased datasets in which men are inferred and evaluated more positively than women in performance variables are likely to perpetuate negative evaluations of women as they employ gender as their predictive input variable (Jago & Laurin, 2022; also see Borgesius, 2018; Gilman & Green, 2018; Lee et al., 2019; Noble, 2018; Williams et al., 2018). In a different but related scenario, Noble (2018) points out that when querying the phrase, *black girls*, on a Google search, the information returned was *Big Booty* and other terms that sexually depicted black girls. Conversely, she contends that when the string, *white girls*, was queried, completely different results were returned. In the current paper, when a search string, *race and crime*, was queried by the author into the Google search engine (to 26 April 2022), the piece of information that was returned was: “According to the FBI, African-Americans accounted for 55.9% of all homicide offenders in 2019, with whites 41.1%, and “Other” 3.0% in cases where the race was known. Among homicide victims in 2019 where the race was known, 54.7% were black or African-American, 42.3% were white, and 3.1% were of other races”. This was out of 3,710,000,000 returned results. The primary source of this returned information was Wikipedia (2022), which had last been updated on 18 March 2022 (also see Lee et al., 2019).

By contrast, when the same search string was queried into the Microsoft Bing search engine (to 26 April 2022), the first result was: “Race is one of the correlates of crime receiving attention in academic studies, government surveys, media coverage, and public

concern”. The primary source of the returned result, which was out of 134,000,000 results, was the same Wikipedia (2022) referenced by the Google search engine above. While the comparison of the two sets of results on the same search string from the two Internet search engines is not intended to imply that one search engine is more racist or discriminatory than the other, or the algorithms of one search engine are more racist or discriminatory than those of the other, the results emphasize what can happen when search engine algorithms are fed source datasets that potentially replicate human-induced biases. This significantly compromises the objectivity and fairness of such algorithms. This algorithmic replication of racist or discriminatory human biases have dire ramifications for BIPOC people as digital citizens in both the Souths and the Norths.

The point is, when algorithms have, as their predictive input, training data sources that exclude variables or that discriminate against variables related to underrepresented users and communities, they are likely to exclude those users and communities in their predictive pattern recognition and correlation. Terp (2020) contends that technologies, together with their associated AI and algorithms, can reinforce prevailing racist human biases by entrenching them in machine learning systems through biased input data encoded in algorithms. Or, by perpetuating racial and gender biases embedded in interactions that are mediated in the way designed technology interfaces and datasets are presented. Moreover, she talks about technology that is accidentally racist because it is designed to recognize only monoculture, and about technology and data science that reinforce racist biases, but which are regarded as neutral technology. To this, needs to be added technologies and datasets that are deliberately racist and exclusionary, but which are passed off as neutral, objective, and fair. Cave and Dihal (2020) berates the racial slant of AI as the racialization and the Whiteness of AI. Lee et al. (2019) aptly contextualize how bias can emerge from algorithms:

Bias in algorithms can emanate from unrepresentative or incomplete training data or the reliance on flawed information that reflects historical inequalities. If left unchecked, biased algorithms can lead to decisions which can have a collective, disparate impact on certain groups of people even without the programmer’s intention to discriminate (n.p.).

They go on to assert that algorithmic bias finds its way into online recruitment tools, online advertisements, word associations, facial recognition technologies, and criminal justice algorithms. All of this relates mainly to BIPOC people as online algorithmic subjects.

In this regard, we have a situation in which data and algorithms are weaponized to discriminate against and to exclude BIPOC people. In this context, Raghuvvera and Koch (2020) discuss how data has been weaponized against underrepresented communities, or what they call communities of color in South Africa and in the United

States. They argue that “[d]ata is weaponized whenever it is used to inflict harm, well-intentioned or not” (n.p.). Indeed, Treré and Milan (2021) point out that even in Latin America, there is a tendency to replicate social asymmetries, which are a colonial legacy, in automated, data-driven systems that are often amenable to data manipulation and corruption. For this paper, the point is that both data and algorithms can be weaponized to discriminate against and to exclude BIPOC people as digital citizens in both the Souths and the Norths. This is what Calzada (2022) refers to as *algocracy*, which for this paper, is the rule and government by algorithms. Its alter ego is *datacracy*: the rule and government by big data, whose other variants are data colonialism and data capitalism as discussed earlier. In fact, with respect to the algorithmic colonization of Africa as part of the Souths, Birhane (2020) argues that algorithmic domination and colonialism as driven by corporate monopolies has come to replace traditional or historical colonialism, and is passed off and marketed as “state-of-the-art algorithms”, cutting-edge “AI solutions”, and “technological innovation[s]” (p. 391).

5. Critical southern decolonial approach to datafication, algorithms, and digital citizenship

This section of the paper proposes a critical southern decolonial (CSD) approach to datafication, algorithms, and digital citizenship. This particular approach seeks to build on the work of researchers such as Adams (2021), Ali (2017), Couldry and Mejias (2021), Mohamed et al. (2020), Ricaurte (2019), and Zembylas (2021). However, these researchers’ work focuses on the decolonization of or the decolonial approach to one of these three aspects. For example, Couldry and Mejias (2021) deal with a decolonial turn to data and technology; Ali (2017) advocates decolonizing information narratives in algorithmic racism; Adams (2021) argues for decolonizing AI; and Mohamed et al. (2020) and Zembylas (2021) propose a decolonial AI. For her part, Ricaurte (2019) explores data epistemologies, the coloniality of power, and resistance. This section of the paper, therefore, argues for a CSD approach to datafication, to algorithms, and to digital citizenship, simultaneously. CSD integrates critical scholarship and southern decoloniality. Briefly, the former entails a critical approach to existing forms of scholarship, while the latter is a decolonial approach as framed and theorized from the Souths (Chaka, 2022; Ndlangamandla & Chaka, 2022). In this context, CSD advocates, on the one hand, a critical view of: data, datafication, data literacy and infrastructure, algorithms, digital citizenship, digitality, and technology. On the other hand, it calls for challenging, interrogating, problematizing, critiquing, and decolonizing of all of these aspects and the Euro-American colonialist orientations on which they are founded.

The picture painted above, applies to both the Souths and the Norths, even though more so to the former than

to the latter. In relation to data coloniality, BIPOC communities, as marginalized and underrepresented users both in the Souths and in the Norths, should cease serving as passive purveyors of data to organizations, to corporations, to institutions, and to governments that utilize and exploit their data for their own purposes. Also, the manner in which these users’ datasets are harvested, extracted, appropriated, and represented by big and small tech companies and by governments must be challenged and criticized. Persistent calls need to be made to involve BIPOC users (see Karumbaiah and Brooks, 2021) in deciding the fate and the endgame of their extracted data. This fate should not be left to the whims and dictates of data privacy and security regimes or of data legal and regulatory frameworks. In fact, CSD questions and challenges the very existence of these regimes and frameworks as, in most cases, they are formulated without involving end users, from whom datasets are extracted. Needless to say that this tendency has to be flagged as a classic example of a data colonialist practice. Couldry and Mejias’ (2019b) view that colonization by data at the point of getting connected to digital technologies is an entry point to a costly appropriation of human life, becomes more instructive in this case.

A CSD approach in this context, then, advocates an epistemic disobedience to data and datafication, and to data surveillance. It challenges the epistemic enterprise that underpins and informs data configuration and datafication, and argues that this epistemic enterprise is disproportionately ethnocentric as it is biased toward Euro-American, White, middle-class, racial demographics (see Arora, 2018; also see Ali, 2017; Mumford, 2021; Raghuvveera and Koch, 2020; Ricaurte, 2019; Terp, 2020). To this effect, Ricaurte (2019) opines how dominant data epistemologies, based on Western rationality, tend to perpetuate serial marginalization of and to reproduce multiple injustices to underrepresented users in multicultural countries that have huge social inequality levels. In doing so, these data epistemologies promote a misrepresentation and a mischaracterization of underrepresented users in the Souths, while subjecting their beings, their languages, and their cultures to data violence, oppression, and alterity. It is this data-based epistemic violence and oppression, which relegates BIPOC users in the Souths to data subalterns and to data purveyors and, which is anchored on Euro-American data infrastructures that CSD rejects and challenges.

Moreover, CSD resists and questions algorithmic coloniality. Sustained by its symbiotic relationship with data coloniality, algorithmic coloniality adds another layer to the coloniality of modern-day, automated, data-driven, machine-learning decision-making process. As mentioned earlier, algorithmic coloniality comes into play when algorithms have as their source and utilize as their sole predictive basis, datasets and AI configurations modeled on heteronormative, White, modern subjects (see Mumford, 2021), and this to the exclusion of the human attributes of underrepresented,

non-European subjects in the Souths. The endgame of all of this, is the algorithmic bias against and the algorithmic marginalization and exclusion of the underrepresented users and communities in the Souths. Additionally, this algorithmic coloniality leads to harm and violence being algorithmically inflicted on such users and communities. Gangadharan and Niklas' (2019) assertion that "systems powered by bad data, bad algorithmic models, or both lead to 'high-tech' discrimination – misclassifications, over target, disqualifications, and flawed predictions that affect some groups, such as historically marginalized ones, more than others" (p. 883) becomes relevant in this regard. A stand for CSD, in this case, is that the Euro-Americanism, the *Westernness*, and the Whiteness built into algorithms employed by organizations, corporations, institutions, and governments in different data jurisdictions in both the Souths and the Norths, must be dismantled and replaced by algorithms that are capable of recognizing the human attributes and the peculiarities of diverse BIPOC communities in the Souths and in the Norths. Importantly, CSD calls for the dismantling of algorithmic coloniality, or what Karumbaiah and Brooks (2021) refer to as the rootedness of algorithms in coloniality, and of what Birhane (2020) calls "the West's algorithmic invasion" (p. 389) of Africa, and by extension, of the Souths.

Furthermore, CSD impugns and rejects the coloniality embedded in digital citizenship (DC) or in data citizenship, and as embedded in its five emerging regimes (pandemic citizenship, algorithmic citizenship, liquid citizenship, metropolitan citizenship, and stateless citizenship) discussed earlier. It argues that in its current form, DC is conceptualized from a colonialist framework that uses as its prototypes, White, modern, middle-class, Euro-American subjects with the Western, digital, data, and algorithmic infrastructures to which they have access. This colonialist framing also applies to the five emerging regimes of DC. But, however, it excludes and is oblivious to BIPOC users in its canvas. If anything, such users feature as subalterns in it. What is missing and excluded from this framing in terms of the five emerging DC regimes are rural citizenship, Indigenous citizenship, nomadic citizenship, immigrant citizenship, refugee citizenship, diasporic citizenship, crossborder citizenship, and transnational citizenship that are characteristic of most BIPOC users in both the Souths and the Norths. These missing regimes of DC, are what CSD insists should be considered and included when DC is conceptualized and theorized across digital and data spheres both in the Souths and in the Norths.

6. Conclusion

This paper has focused on digital marginalization, data marginalization, and algorithmic exclusions in the Souths. To this end, it has explored how underrepresented users and communities, especially BIPOC communities, tend to be marginalized and

excluded by digital technologies, by big data, and by algorithms employed by organizations, corporations, institutions, and governments in different data jurisdictions. Framing data colonialism within the Souths, the paper has pointed out that data ableism, data disablism, and data colonialism are at work when data collected, collated, captured, configured, and processed from these users and communities is utilized by these mega entities for their own multiple purposes. Some of these purposes are advertising, profit-making, monetization, tracking, surveillance, and decision-making. The paper has also highlighted how data coloniality is immune to legal and legislative interventions within data jurisdictions. In addition, it has discussed digital citizenship (DC), specifically foregrounding pandemic citizenship, algorithmic citizenship, liquid citizenship, metropolitan citizenship, and stateless citizenship as emerging regimes of DC.

Moreover, the paper has argued that even though there is a nexus between digital marginalization and exclusion and digital infrastructural underdevelopment, digital exclusion transcends the *haves* versus the *have nots* binarism as it manifests itself in multiple layers. Furthermore, it has characterized how algorithmic exclusions tend to replicate historical human biases despite the contention that algorithms are autonomous, neutral, rational, objective, fair, unbiased, and non-human. Finally, the paper has proposed a critical southern decolonial (CSD) approach to datafication, algorithms, and digital citizenship in terms of which data coloniality, algorithmic coloniality, and the coloniality embedded in DC have to be critiqued, challenged, and dismantled.

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Using Rasch model analysis for assessing psychometric properties of digital citizenship in Indonesian students

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Abstract

In the networked society era, more research on students' digital citizenship levels has been conducted and reported. However, rarely is this topic covered from third-world countries, which have seen significant increases in the numbers of Internet users. Seeking to examine digital citizenship levels in Indonesian students, this study employed the non-experimental quantitative research design with an online questionnaire distributed to a total of 581 students. The data collected were analyzed using Rasch Model measurement and Winsteps 5.1.2 software. Descriptive statistical analysis was utilized to evaluate students' digital literacy readiness in terms of knowledge and understanding in accessing technology and the Internet, while Differential Item Functioning (DIF) was utilized to identify digital citizenship levels based on demographic profile. The findings showed that students had high levels of readiness in relation to Internet skills, Internet attitudes, computer self-efficacy, and three digital citizenship sub-scales. More in-depth analysis indicated the presence of differences in students' digital citizenship levels by gender, parents' education level, and Internet use frequency. It is hoped that this research will expand literature concerning digital citizenship as a reference for future research works and for policymakers, particularly in developing countries.

KEYWORDS: Digital Citizenship, Internet Skills, Internet Attitude, Computer Self-Efficacy, Rasch Model.

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1. Introduction

Over a few decades, technological developments have been significantly driving changes in human life. For instance, the Internet has made it easy for users to access

information, deliver criticisms, and make decisions (Anderson et al., 2008; Qazi et al., 2014; Waheed et al., 2016). In the educational field, the Internet has revolutionized learning environments through integration of technology and information, which has transformed interactions and approaches between teacher and student, be it offline, online, or blended. The Internet and computer skills proficiency are needed as a basic competency, which constitutes a standard parameter impactful to students' academic achievements (Losh, 2003; Nketiah-Amponsah et al., 2017; Qazi et al., 2021).

Nonetheless, scholars have paid attention to gaps in access and technology use between males and females (Ardies et al., 2014; Mumporeze & Prieler, 2017; Potvin & Hasni, 2014). Literature shows that this divergence is

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attributable to the goal of improving students' learning outcomes (Lee et al., 2019; Siddiq & Scherer, 2019; Tam et al., 2020). Other than demographic factors, the technology use gap is also created by computer use frequency, computer anxiety, computer self-efficacy, and Internet skills (Cai et al., 2017; Harrison & Rainer, 1992; Rahiem, 2020). Even though Internet use within educational settings or in personal life has been on the rise (Ribble & Miller, 2013), notably for building social networks (Lenhart et al. 2011), it still demands knowledge and skills related to how to participate and engage according to digital citizenship criteria (Alvermann et al., 2012). Some attributes of well-informed digital citizens are then conceptualized, including social media use for sharing knowledge with others, communicating with relatives and old friends, making new friends, and participating in political agendas online (Choi, 2016; Isman & Gungoren, 2014; Payne, 2016).

Meanwhile, technology and Internet use calls for action from users, especially the adolescent among them, to anticipate and minimize the negative effects of social network use, including privacy, cyberbullying, and information accuracy/reliability issues (Choi, 2016). (Livingstone et al., 2011) pointed out the risk of using the Internet and technology which can lead to a variety of problems and at the same time raise concerns among society, such as online harassment and intimidation, privacy issues, and the ability to evaluate online content and to use information according to copyright rules. In the same vein, (Lenhart et al., 2011) mentioned the need for knowledge and understanding about digital citizenship in an attempt to deal with technology abuse and misuse. Besides, overuse of the Internet such as in the cases of plagiarism, illegal content access, and screen addiction effect on physical and mental health remain a persisting concern for many (Al-Abdullatif & Gameil, 2020; Aldosari et al., 2020; Cahyono, 2016).

Digital citizenship is a multidisciplinary and complex concept that is debated. The term has been discussed in a variety of contexts related to the impact of new technology on the human being (Choi, 2015). In 2010, Common Sense Education and Harvard Graduate School of Education established the Digital Literacy and Citizenship Curriculum, which defines digital citizenship as "the responsible use of technology to learn, create, and participate" (James et al., 2019). Mossberger et al. (2007) defines digital citizenship as economic and political engagement. Digital citizenship protects adolescents from cybercrime and cyberbullying, according to (Lenhart et al., 2011). A set of skills that incorporates digital citizenship would help people think critically and make ethical decisions about what they see, say, and share online (Collier, 2009).

This study investigated the relationship between psychometric properties like Internet attitudes, Internet skills, and computer self-efficacy and digital citizenship level in a group of students based on some demographic aspects, namely gender, Internet use frequency, and

parents' education level. Some studies have shown the role or the effect of three variables on digital citizenship level (Beam et al., 2018; Ke & Xu, 2018; Prasetyo et al., 2021), but there is a lack of influential studies from developing countries that capture digital citizenship development. Indonesia is home to an immense number of Internet users and rapidly developing e-market, which can serve as a benchmark for the discourse of digital citizenship development within the larger scope (APJII, 2020; Arifin, 2017). The research questions guiding this study are therefore as follows:

RQ1. How ready are students in using Internet technology in schools?

RQ2. Do significant differences exist in students' digital citizenship levels based on gender, Internet use frequency, and parents' education level?

2. Materials and Method

2.1 Instrumentation

This research developed digital citizenship parameters in reference to the framework developed by Ribble (2015), called the nine elements of digital citizenship, which consists of the sub-scales respect, educate, and protect (REP). The measurement scales employed in this research were adopted from multiple measurement instruments developed by Jones and Mitchell (2016) and Al-Zahrani (2015). The digital citizenship scale (DCS) by Al-Zahrani (2015) was based on the assumption of Ribble (2015). The digital citizenship measurement scale (DCS) was a 15-item 5-point Likert scale (5 = strongly agree, 1 = strongly disagree) consisting of sub-scale respect (6 items), educate (5 items), and protect (4 items). The question items for the variables Internet attitudes (5 questions) and computer self-efficacy (5 questions) were based on the measurement scale of Al-Zahrani (2015), and 9 question items for the variable Internet skills referred to the opinion of van Deursen et al. (2016). Additionally, Jones & Mitchell (2016) also developed a DCS based on respectful online behavior and online civic engagement practice, with a total of 11 question items on a 5-point Likert scale from 'not everyone likes me' to 'everyone likes me very much'. In this research, the measurement scale preferred was the same as the DCS developed by Al-Zahrani (2015).

2.2 Respondents

This study recruited 581 students from 12 senior high schools across Central Java, Indonesia, by convenience sampling technique. A tick box on an online consent form was used for under-age participants to discuss with their parents the item content in order for them to understand the process, risk, and benefits of the research and to gain consent from their parents to participate in the research. The survey was also conducted with the consent and voluntary support of school principals and teachers. The online survey was taken anonymously to ensure the confidentiality of the participants' personal data.

2.3 Data Collection and Analysis

The raw data collected were inputted in a Microsoft Excel file and later evaluated with Rasch Model analysis using Winsteps 5.1.2 software. Afterward, we analyzed the instrument validity and reliability and tested the person and item fit on a simultaneous basis. The validity of the instrument in this research was judged from the validity of the responses to the items, in which case $0.5 < \text{acceptable Outfit Mean-Square (MNSQ)} < 1.5$, $-2.0 < \text{acceptable Outfit Z-Standard (ZSTD)} < +2.0$, and $0.4 < \text{acceptable Point Measure Correlation (Pt Mean Corr)} < 0.85$ (Sumintono & Widhiarso, 2014).

We found a respondent who gave outlier responses (at maximum rank). Therefore, data cleaning was conducted to figure out respondents' consistency in answering and to figure out whether there was no aberrance in answers (Widhiarso & Sumintono, 2016). The results showed that no respondents were found to give answers aberrating or differing from other respondents' response pattern; hence, all students' responses could be analyzed and no data were excluded. The demographic profiles of the students are provided in Table 1.

Characteristics	Students % (n = 581)
Demographic	
Sex	
Male	25% (144)
Female	75% (437)
Age	
16-17	93% (542)
18-19	7% (39)
Parent Education Level	
Elementary School	13% (74)
Junior High School	17% (100)
Senior High School	42% (245)
Bachelor	23% (135)
Master	4% (24)
Doctoral	1% (3)
Length of Internet Usage in a Day (in Hours)	
1-3 (Low)	3% (17)
4-6 (Medium Low)	26% (150)
7-9 (Medium High)	37% (214)
> 9 (High)	34% (200)
Digital Devices Frequently Use	
Handphone	99% (576)
Laptop	0.7% (4)
PC Dekstop	5% (31)
Tablet	0,3% (1)
Internet Budgeted per Month	
IDR10.000-25.000	8% (48)
IDR26.000-50.000	25% (144)
IDR51.000-75.000	37% (214)
> IDR75.000	30% (175)
*IDR = Indonesian Rupiah	

Table 1 - Demographic and socioeconomic characteristics.

2.4 Instrument Validity and Reliability

This study used Winsteps 5.1.2 to perform calibration of item difficulty level and person ability. This selection of Winsteps software was grounded on its ability to convert the scores of the items measured on a Likert's scale and ordinal data based on the frequencies at which responses occurred as a probability into an interval scale called logit (log unit) via an algorithmic function. This enabled us to predict individuals' responses accurately on all items according to the measurement model, that is, by using person parameter and item parameter on the same scale (as a measure of difficulty level). This serves as a key indicator in Rasch model analysis (Boone et al.,

2014; Sumintono & Widhiarso, 2014, 2015; Wirth et al., 2016).

Two-side (person and item) measurement scale/Wright map model was implemented to gain an idea about 34 students' digital citizenship level measurement items and 581 respondents. The items were centered on zero, allowing students to 'float' and enabling calibration of students' digital citizenship levels. Table 2 presents the instrument's internal reliability score. This score refers to the statistical fit or reliability index reported in logit measure, which determines the quality of all dimensions of the digital citizenship and psychometric properties measurement instrument.

The person reliability index (0.85) (see Table 2) indicates that the consistency of students' responses was 'good' (Sumintono & Widhiarso, 2014). The same interpretation logic also applied to the item reliability index (1.00), which was categorized as 'extraordinary' (Sumintono & Widhiarso, 2014). This shows that the item reliability and person reliability were 'exceptionally good'. The Cronbach's Alpha coefficient (0.89) (see Table 2), according to Rasch model calculation, depicts that the interaction between 581 students and 34 items was 'extremely good'. This score shows that there was a high level of interaction between person and item. An instrument that has internal psychometric properties with 'extremely good' consistency is considered as a highly reliable instrument (Bond & Fox, 2007). Therefore, the Internet attitudes, Internet skills, computer self-efficacy, and digital citizenship instrument with REP sub-scales are considered as an instrument that is reliable to use across various respondent groups. Besides, the unidimensionality measure was good, as shown in the Raw Variance Explained by Measure score of 42.3%, or, in other words, the raw variance index was beyond the standard 40% (Fisher, 2007). This means that the instrument was effective at measuring students' digital citizenship levels. The effectiveness of the instrument can also be seen from the person and item instrument score, which approached 1.0. This is supported by the chi-square score significance level that indicates that the data fit the model (Boone et al., 2014; Engelhard, 2013). We subsequently analyzed the person separation index to estimate how well the digital citizenship instrument was able to discriminate 'person ability' against the latent variable. The higher the separation index, the more reliable the probability would be for the respondents to respond to the item correctly. On the other hand, the item separation index shows how broadly the item is defined as 'easy' and 'difficult'. The wider the distribution, the better the fit, which is supposed to

be equal or exceed three (Boone et al., 2014; Fisher, 2007). Based on Table 2, the person separation index (2.42) and the item separation index (14.29) show that the reliability of the digital citizenship instrument was distributed among various respondents and items. This criterion supports the digital citizenship level measurement instrument, including the model fit and reliability of the instrument in identifying students' digital citizenship levels.

Based on the explanation above, the selection of data analysis by Rasch model was considered appropriate as it aimed to measure latent properties in assessing human perceptions and attitudes. Rasch model analysis was able to elaborate on item difficulty levels using the right measurement (item calibration) as well as by detecting item fit and measuring respondents' knowledge levels (Bond & Fox, 2007; Engelhard, 2013; Linarce, 2012). Furthermore, respondent analysis with this measurement model yielded better, more accurate results, which supported respondents' consistency against the questionnaire (person fit statistics). An algorithmic function was used to result in measurement with the same interval scale. In addition, calibration of the measurement model and conjoint measurement process was aimed at figuring out the relationship between item difficulty and person ability with the same unit scale (logit).

Winsteps 5.1.2 was used to test students' digital citizenship levels and specifically assess the levels based on gender using descriptive statistics (mean and standard deviation), item score (logit), and person score (logit). Therefore, if the person logit was positive, then the student's perceived digital citizenship level was higher than the item mean. By contrast, if the person logit was negative, then the student's perceived digital citizenship level was lower than the mean score required for the item tested. In conclusion, logit scores reflect students' digital citizenship levels.

Psychometric Properties	Person	Item
<i>N</i>	581	34
<i>Outfit mean square</i>	1.03	1.04
Mean	1.13	0.00
SD	0.69	0.81
Separation	2.42	14.39
Reliability	0.85	1.00
Alpha Cronbach	0.89	
Chi-square (χ^2)	43383.9544**	
Raw Variance Explain by Measure	42.3%	
<i>Note: ** P < 0.01</i>		

Table 2 - Summary statistics of person and items.

3. Results

3.1 Students' readiness (knowledge and understanding) in using and taking advantage of Internet technology

Based on Table 3, the person mean measure (logit) was found to be +1.13 logit, with SD = +0.69 or greater than 0 logit. This shows that students had good knowledge and understanding in using and taking advantage of technology and the Internet as digital citizens. Table 4 provides that of the six dimensions measuring students' readiness in using technology and the Internet, students scored highest in the Internet attitudes dimension, with a mean score of 3.06, SD = 2.04, and lowest in the protect sub-scale, with a mean score of 0.93, SD = 1.4. According to Table 3, the person mean measure (logit) of +1.13 was useful in measuring students' readiness in using technology and the Internet, with a standard deviation of 0.69. This score shows that the distribution of students' readiness in terms of knowledge and understanding was rather wide. An item mean measure (logit) of 0.00, with standard deviation of 0.81 (see Table 3), demonstrates a wide item difficulty level

distribution of the whole item score (logit) based on logit scale on item difficulty level.

Table 5 shows the classification of items by item difficulty level or instrument item score (logit) of the students' digital citizenship questionnaire. The items classification into four difficulty levels was performed by distributing item logit scores by mean and standard deviation. There were 6 items (17.65%) in the 'very difficult' category (LVI > 0.81 logit), 11 items (32.35%) in the 'difficult' category (+0.81 LVI 0.00 logit), 6 items (17.6%) in the 'easy' category (0.00 LVI -0.81 logit), and 11 items (32.35%) in the 'very easy' category (LVI < -0.81 logit) based on students' judgment. Overall, students judged the Internet attitudes dimension to be within the 'easy' category and 2 of 5 items in the computer self-efficacy dimension to be within the 'very difficult' and 'difficult' categories. As for the Internet skills dimension and REP sub-scales, the items were more evenly distributed from the 'very difficult' category to the 'very easy' category.

Based on Figure 1, item difficulty levels could also be seen from the item-person Wright-map from the 'very easy to agree with' for the respondents category on the bottom right side of the map (CSE item -0.81 logit score)

Descriptive Statistics	Person	Item
<i>N</i>	581	34
<i>Measure</i>		
Mean	1.13	0.00
SD	0.69	0.81
Standard Error	0.03	0.14

Table 3 - Results of student's digital citizenship.

Construct	Mean	Std. Deviation
<i>Internet Skills</i>	1.04	0.75
<i>Internet Attitudes</i>	3.06	2.04
<i>Computer Self Efficacy</i>	1.01	2.32
<i>Digital Citizenship (Sub-Scale):</i>		
<i>Respect</i>	2.29	1.56
<i>Educates</i>	1.54	1.43
<i>Protects</i>	0.93	1.43

Table 4 - Results of student readiness in the using of internet.

Construct	Difficulty Level Distribution			
	Very difficult	Difficult	Easy	Very easy
<i>Internet Skills</i>	IS6, IS5	IS2	IS4, IS9, IS1	IS3, IS8
<i>Internet Attitudes</i>			IA2, IA4, IA1, IA3, IA5	
<i>Computer Self Efficacy</i>	CSE5, CSE3	CSE4, CSE2, CSE1		
<i>Digital Citizenship (Sub-Scale)</i>				
<i>Respects</i>		R1	R2, R5	R4, R6, R3
<i>Educates</i>	E3	E5, E2	E4	E1
<i>Protects</i>	P1	P3, P2, P4		

Table 5 - Calibrate the linkage of digital citizenship items.

to the ‘very difficult to agree with’ for the respondents category on the upper right side of the map (R1 item +0.81 logit score). Besides, the items in the instrument functioned well and were able to separate respondents’ digital citizenship levels, with unidimensionality raw variance index of 42.3% as can be seen in Table 2.

In item difficulty level distribution, the ‘very difficult to agree with’ and ‘difficult to agree with’ categories were found in items spread across almost all dimensions. Based on Figure 1, the ‘very difficult to agree with’ category included items IS5, CSE5, CSE3, E3, and P1, whereas the ‘difficult to agree with’ category included items IS2, CSE4, CSE2, CSE2, P3, P2, and P4. This shows that items within the ‘very difficult to agree with’ category, such as E2, E5, R1, and IS2, described that students had had knowledge and understanding in using

and taking advantage of the Internet well. However, their knowledge and abilities to use and maintain their personal computers were still low. In addition, the item difficulty level distribution in the ‘difficult to agree with’ category also indicates that students’ awareness of security protection within the digital world was still very low. The ‘easy to agree with’ item difficulty level was distributed in items IS4, IS9, IS1, IA1, IA3, IA2, IA4, IA5, R2, R5, and E4, whereas the ‘very easy to agree with’ category was spread in items IS3, IS8, R4, R6, R3, and E1 (see Figure 1). The two item distribution categories above show that students had had knowledge and understanding in using and taking advantage of technology and the Internet very well and had had rather good awareness in behaving and carrying out activities using the Internet well.

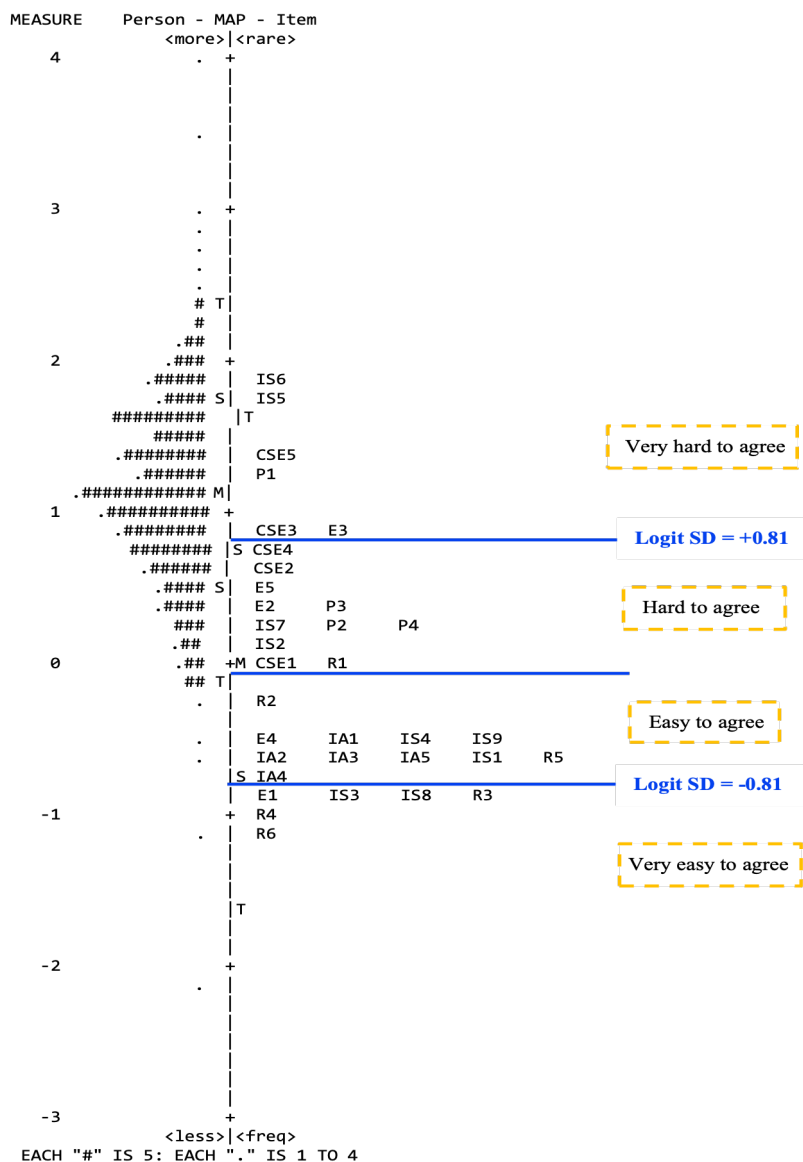


Figure 1 - Rasch Wright Item-Person Map of Digital Citizenship.

3.2 Digital Citizenship Level Difference between Demographic Factors and Students' Readiness in Digital Citizenship Improvement

In the next stage, the differences raised by gender, parents' education level, and Internet use frequency and students' readiness in terms of knowledge and understanding as well as technology and Internet access which influenced digital citizenship levels were analyzed with Differential Item Functioning (DIF). The analysis for each of the three demographic factors abovementioned is explained below.

Figure 2 provides DIF analysis based on respondents' gender. There were 20 items identified as showing significant differences, namely IS1, IS2, IS3, IS5, IS6, IS9, IA4, CSE2, CSE4, CSE3, CSE5, R1, R2, R3, R4, R6, E1, E2, P3, and P4. From items IS1, IS3, and IS9 it was known that female students were better able to use computer, the Internet, and smartphone than their male counterparts. In addition, items IS5 and IS6 show that many of the male students experienced difficulties in accessing the Internet. Nonetheless, as shown in item IA4, they perceived benefits from the use of the Internet to a greater degree than their female equivalents. On the other hand, from items CSE2, CSE3, CSE4, and CSE5, it was indicated that female students had a higher level of confidence in accessing computer. Items R2, R3, R4, and R6 show that more male students demonstrated awareness of and appreciation for the code of ethics for using and accessing computer and the Internet than female students. Item R1, however, shows that female students had a higher level of awareness, particularly concerning the knowledge that spreading computer viruses is a form of digital crime.

From items E1 and E2 it was discovered that male students' awareness in learning and pursuing understanding of the use and utilization of technology and the Internet was higher. It was as supported by male students' opinions on item P4, showing that their awareness in protecting their personal privacy when

accessing technology and the Internet surpassed their female counterparts. Meanwhile, item P3 portrays that female student had a higher degree of awareness in preventing digital crime via antivirus installation.

Other than the results of DIF analysis, the difference in students' digital citizenship levels could also be identified from the gender-based person-item Wright map (see Figure 3). It is shown that female and male students had nearly identical digital citizenship levels within the 'high' and 'low' categories, but more than half were within the former. Figure 3 provides person score distribution from students' digital citizenship levels categorization as seen from the person-item Wright map that illustrates students' digital citizenship levels distribution based on gender from the 'strong' category to the 'moderate' and 'weak' categories. Figure 3 also presents person (female and male) distribution within the 'weak' category on the bottom right side on the map with logit score < +0.69 to the 'strong' category on the upper right side of the map with logit score > +1.13.

Figure 4, meanwhile, shows students' digital citizenship levels based on parents' educational background. A total of 24 items demonstrated significant differences, namely IS2, IS3, IS4, IS5, IS6, IS7, IA3, IA4, IA5, CSE1, CSE2, CSE3, CSE4, CSE5, R3, R6, E1, E3, E4, E5, P1, P2, P3, and P4. It is worth noting that the variety of students' parents' education levels presented highly significant differences in digital citizenship levels. For one, items R6, IS3, and IA3 indicate that students whose parents were with a Master's degree scored lower than students whose parents had latest education at the elementary school, junior high school, senior high school, Bachelor's, and Doctoral levels. Similarly, items E1, E5, E4, P3, and P4 show that students with parents whose latest education was at the Doctoral level had a higher degree of awareness that informed them on the protect sub-scale than students with parents of lower educational levels.

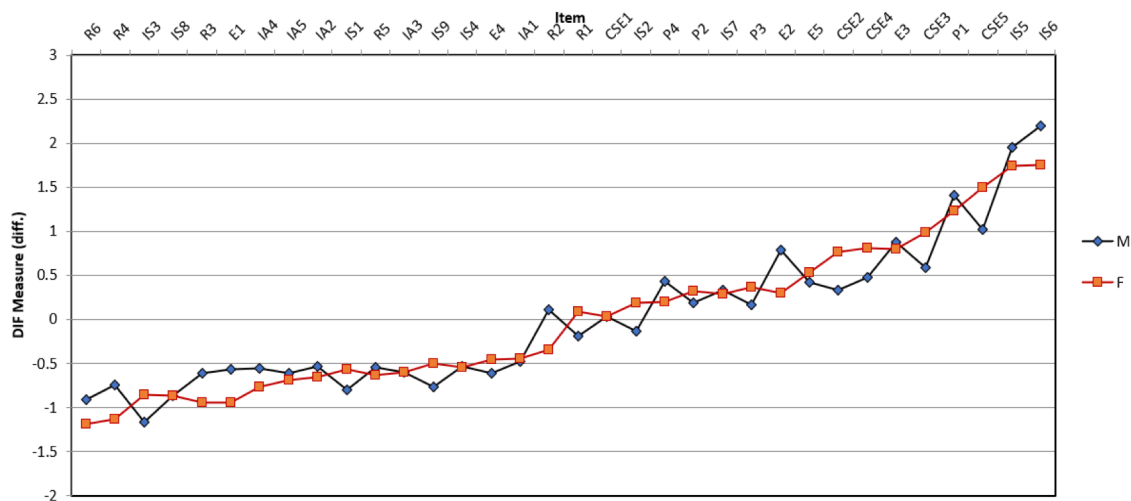


Figure 2 - Person DIF plot based on Gender (M : Male: F : Female).



Figure 3 - Rasch Wright Person Logit Map of Digital Citizenship based on Gender.

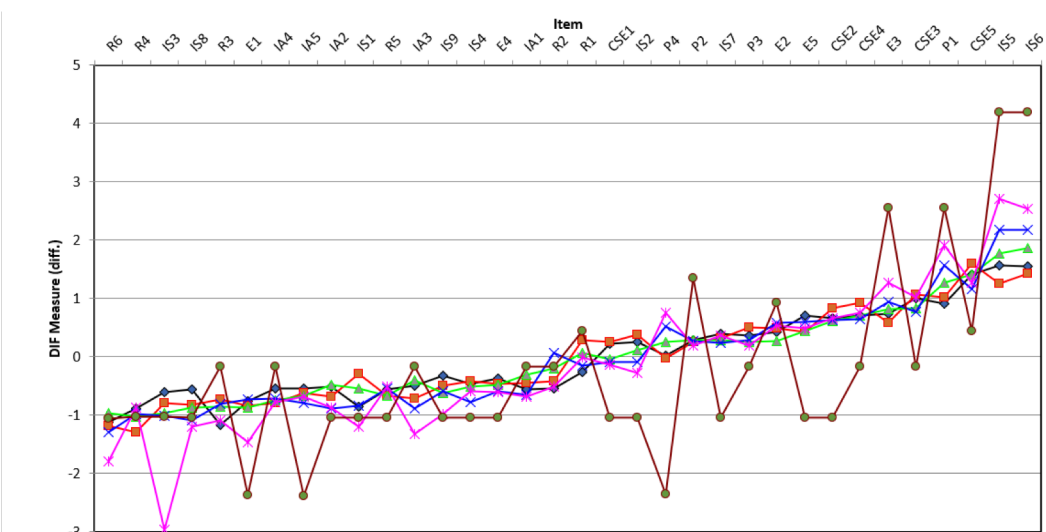


Figure 4 - DIF Parents' educational background (A : Elementary School, B : Junior High School, C : Senior High School, D : Bachelor, E : Master, F : Doctor).

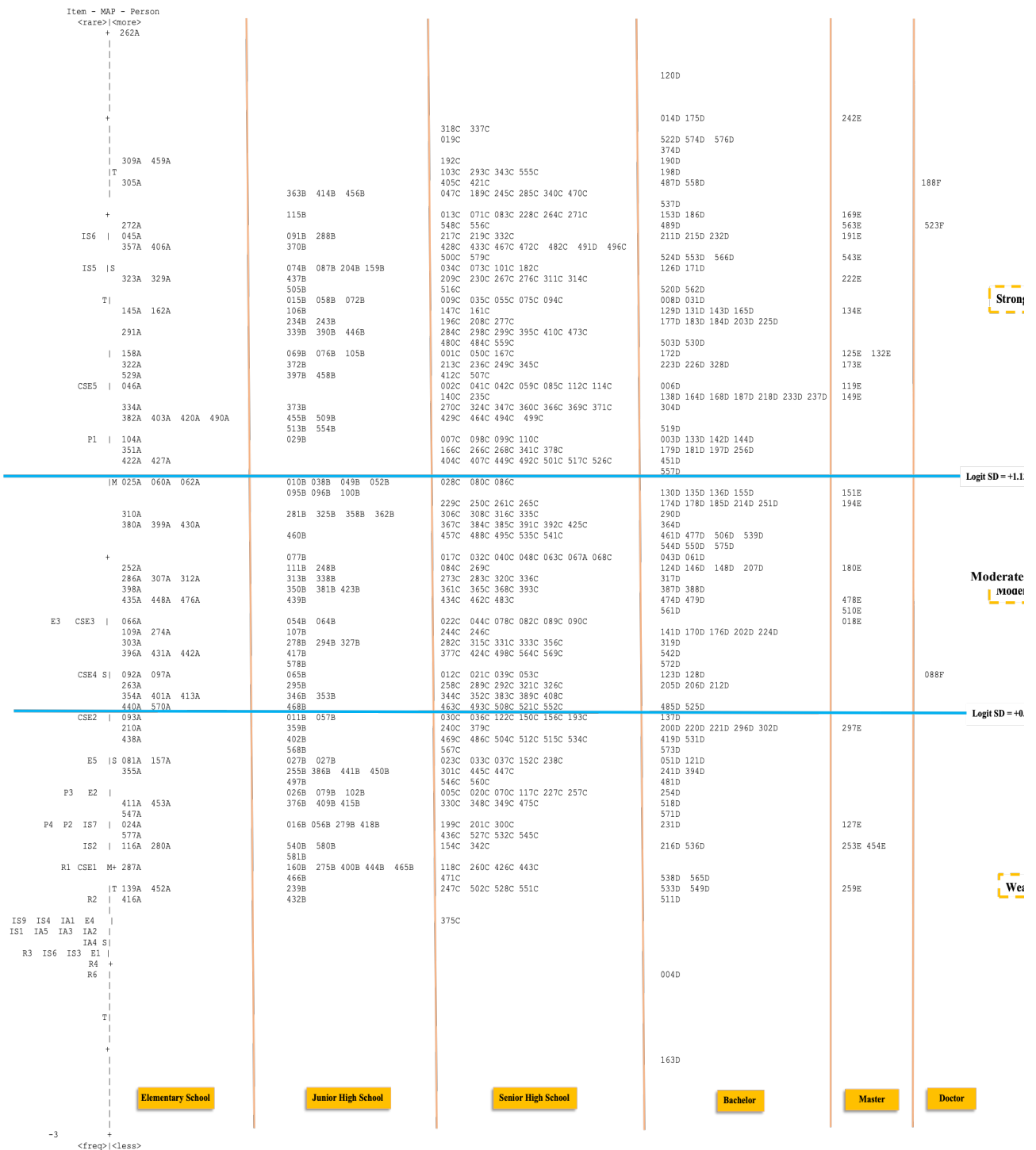


Figure 5 - Rasch Wright Person Logit Map of Digital Citizenship based on parents' education level.

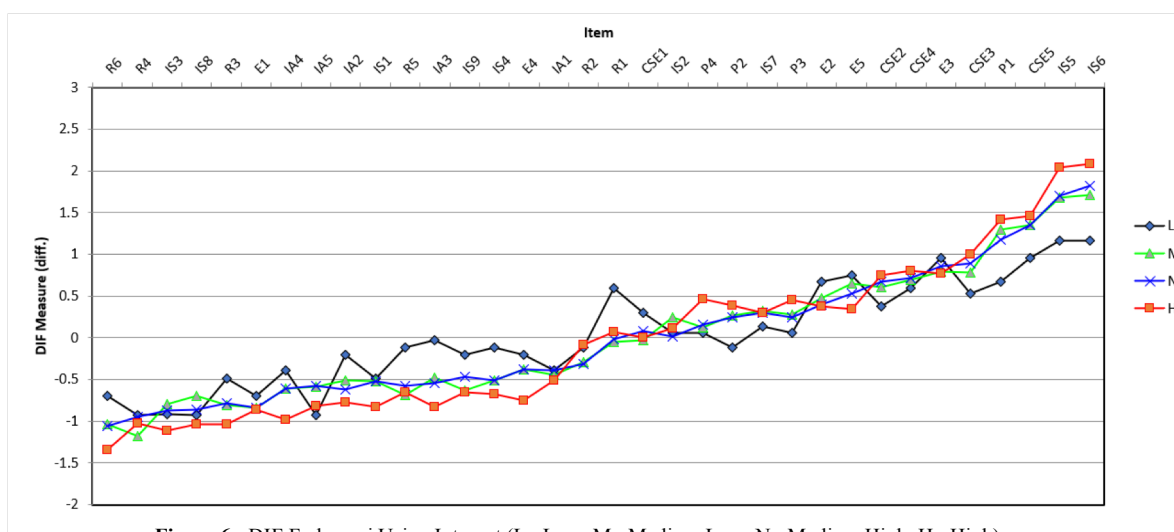


Figure 6 - DIF Frekuensi Using Internet (L : Low, M : Medium Low, N : Medium High, H : High).

Items IS4, CSE1, IS2, IS7, CSE2, CSE3, CSE4, and CSE5 also suggest that students with parents of Doctoral education level had low levels of self-confidence and knowledge. However, items R3, IA4, P2, E3, and P1 show that these students had higher levels of awareness of protection, security, and code of ethics. It was also discovered based on items IS5 and IS6 that these students were lacking in the knowledge aspect in using the Internet as an information medium in comparison to other groups of students.

The DIF analysis results described above are relevant with the distribution of students' responses to each item, as can be seen in Figure 5. Various levels of students' digital citizenship can be seen in the person-item Wright map based on parents' education level, according to which the 'strong' digital citizenship level was demonstrated mostly by students whose parents were of senior high school and Bachelor's education levels.

According to Figure 6, there were 18 items showing significant differences based on Internet use frequency per day. Students with 'low' Internet use intensity, as shown in items R6, IA4, IA2, IA3, E2, E5, IS9, E4, and CSE1, perceived more benefits from use of technology, computer, and the Internet. Besides, items R3, R5, IS4, and R1 show that students of the 'low' category were more aware of self-protection online than students of other categories. However, in terms of knowledge and understanding of self-protection such as on the Internet use code of ethics, students with 'medium-high' intensity scored high in awareness, as shown by items P4, P2, and P1. Interestingly, students with 'high intensity' felt it to be more difficult to access the Internet, as shown by items IS5 and IS6, than those with 'low', 'medium-low', and 'medium-high' Internet use intensities. Data also suggest that students of the 'high' intensity group scored lowest in the access and use of smartphone and felt less benefits from Internet use in their daily lives.

Additionally, the person score distribution from students' digital citizenship levels categorization can be seen from the person-item Wright map. Based on Figure 7, the distribution of students' digital citizenship levels according to Internet use frequency per twenty-four hours presents three categories, 'strong', 'moderate', and 'weak', in which case the person distribution in the 'weak' category is presented on the bottom right side of the map, with logit score $< +0.69$, and the person distribution in the 'strong' category is presented on the upper right side of the map, with logit score $> +1.13$. The distribution of the majority responses in the 'strong' and 'moderate' categories from students with 'medium-high' and 'high' Internet use frequencies can also be seen.

4. Discussion

This research sought to figure out to what extent students' digital citizenship levels differed in terms of gender, parents' education level, and Internet use frequency. Findings show that there were differences in readiness in terms of knowledge and understanding between male and female students to use information technologies, such as computer, smartphone, and the Internet, in daily activities, including educational, online commercial, and social media activities. This is in line with the results of several previous studies, which explained that female students had a more limited access to technology than male students, but most of them had more positive perceptions on ICT tools utilization (Mumporeze & Prieler, 2017; Tam et al., 2020).

DIF analysis (see Figure 2 and Figure 3) shows that various demographic variables had an effect on students' digital citizenship levels. Gender-wise, male and female students both had high/strong digital citizenship levels, but mostly the former was higher/stronger than the latter.

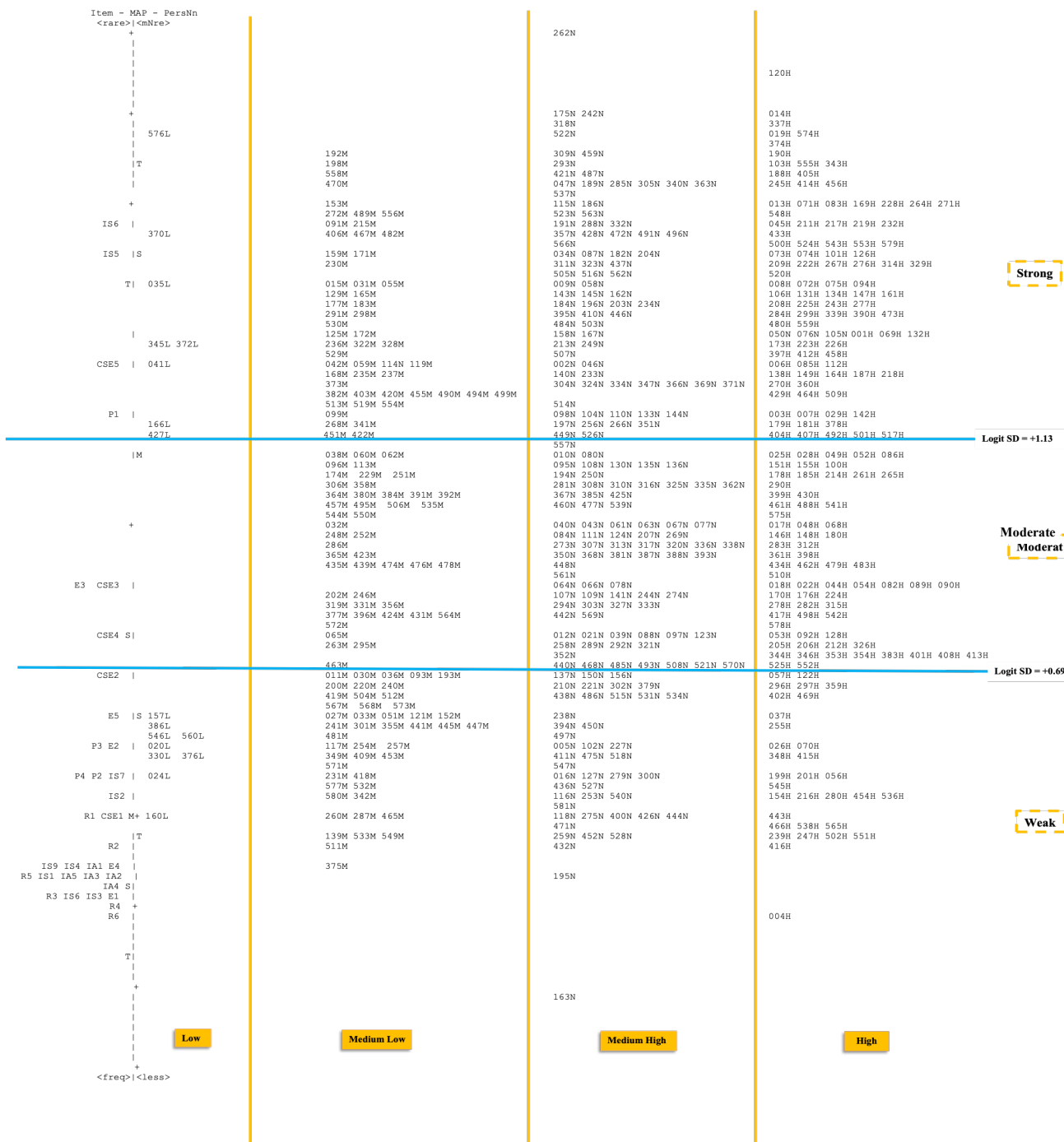


Figure 7 - Rasch Wright Person Logit Map of Digital Citizenship based on parents' education level.

A study by Babu et al. (2016) explained that male students were more comfortable in using and accessing technology and the Internet than their female equivalents.

Furthermore, we found that, in terms of Internet use, students had some difficulties, including in understanding computer components terminology for the purpose of periodically maintaining personal computer or installing necessary applications like an antivirus, among others. In addition, students' awareness of online protective steps, such as periodically changing password and preventing personal data theft, was

considered as very low. Nevertheless, they exhibited awareness in Internet use as a means of purchasing certain things keeping in mind the code of ethics according to the online commerce mechanism (Anandhita & Ariansyah, 2018; Jokisch et al., 2020; Oldeweme et al., 2021; Rahiem, 2020).

The results of DIF analysis in this research as well as Wright map show that male students outperformed female students in digital citizenship level. The digital citizenship construct describes students' readiness as digital citizens in terms of knowledge and understanding in using computer and the Internet according to ethics,

values, norms, and rules for communicating and interacting in online environments. Some studies have put an emphasis on reinforcement of concepts and meanings of digital citizens on attitudes and behaviors in online environments, such as taking responsibility for all behaviors conducted in online environments, including interacting and communicating with others via online media (Ribble, 2015; Simsek et al., 2013).

With regard to parents' education level, the data analysis findings demonstrate that students' parents' educational background did not affect their knowledge and understanding in using and accessing Internet technology, but it did on their awareness of self-protection and conducting activities over the Internet according to the ethics prevailing in online environment. According to (Shao et al., 2022), parents' education level had a negative moderating effect in relation to support for online learning implementation. As for the Internet use frequency aspect, we discovered that students with 'low' intensity enjoyed benefits, ease, and awareness of online privacy protection more than students with 'medium-low', 'medium-high', and 'high' intensities.

The results of our study provided insights on the necessity of integrating students' digital proficiency into their own instructional practices. As an example, the ubiquitous learning space allows children to develop to paradigm shift from the traditional method to a more personalized and interactive strategy for creating meaningful activities. According to (Keppel, 2014), digital citizenship promotes the development of self-regulated and constructivist learning processes, empowering students to expand their knowledge, skills, and behaviors. There is no doubt that adequate and appropriate training may assist students in enhancing their digital abilities and attitudes concerning technology use (Schmid & Petko, 2019).

5. Conclusion

The findings of this study reveal that the digital citizenship level of most Indonesian students is high. This means that they are ready to become digital citizens who are able to use and access technology and the internet appropriately. The results of the DIF analysis show that there are differences in the level of digital citizenship based on several aspects of student demographics, namely gender, parental education level, and the frequency of daily internet use. Another finding revealed that students' readiness in using and accessing technology and the Internet and students' level of digital citizenship were included in the 'strong' category. We pointed out that embedding instructional strategies into the curriculum and closing the digital ownership gap among Indonesian students are priorities to be addressed.

However, this research is not without limitations. First, this study was only concentrated on senior high school

students within a limited areal scope. Therefore, future research is hoped to target respondents of other education levels in greater respondent concentrations. Second, this research was convened to the cross-sectional quantitative research design. Hopefully, future research may involve samples in greater sizes to ensure that the data collected are more varied and generalizable. Referring to the findings of this research, effective and specific strategies are required to improve students' digital citizenship levels by developing dimensions that influence and are able to improve students' digital citizenship with a higher degree of complexity, both in terms of knowledge and skills, in order to support their digital citizenship levels. From this research we concluded that developing a digital class culture is critical to improving students' digital citizenship levels (Pertiwi & Sutarna, 2020). Applying technology-rich design in learning can serve as a catalyst for technological adaptation, including in accelerating the shift from face-to-face learning to online learning, from traditional methods to blended approach and game-based education (Jayanti et al., 2021; Mustofa & Riyanti, 2019; Wahyu et al., 2019).

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A model for a conscious digital citizenship

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Abstract

This article, in the form of an essay, proposes a new model of digital citizenship starting from ethical-social assumptions and bases, an alternative point of view through which the development of digital skills and new technologies is supported by anthropological and cultural paradigms. This becomes the only possible context where to develop a sustainable, shared and egalitarian digital citizenship, epitome of the transformation of today's society, which is increasingly connected to the world of technological innovations. The synergy of different activities, in fields and contexts not always linked to each other, develop a fertile network on which to enhance the attitude to a positive and critical use of digital tools. The proposed model aims to establish six key points, six focuses: governance, prevention, network and social ethics, education and research, all operating within a conscious sharing of real ethical-social rules, recognized as a primary source by society. The represented sectors of intervention move simultaneously, in a circular, dynamic, centripetal convergence; only the joint effort of all areas of intervention will be able to achieve a real digital citizenship permeated by a conscious and active ethical awareness. The discussion also focuses on training and on the disparities relating to accessibility and use in the technological field, detecting the inequalities still deeply rooted in the territory and identifying Universal Design for Learning as a possible inclusive model.

KEYWORDS: Digital Education, Conscious Digital Citizenship, Equal Accessibility, UDL, Ethical and Social Context.

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nineteenth century in Europe, arrived in Italy almost at the turn of the century,

*“The mouth of Time has eaten me alive,
A stiffened body underneath the snow;
When every refuge on the turning globe
Is lost to me, and every passion flies,
Come, Avalanche, and rip me from the heights!”*
(Baudelaire, 1893, LXXX, vv. 11-15)

1. An ethical-social starting point

The alienation already described in the decadent period clearly indicated how human relationships were crumbling within the loss of identity, intended as the impossibility of self-representation as a function of the existence of otherness. In the last century, the anthropic need to create a community, to be part of a whole, man's own need to communicate, to relate and, only thanks to interaction, to be fulfilled in an ontological sense, became manifest difficulties of a society that imploded in a rare form of self-isolation. Self-alienation, inner suffering, inadequacy for existence, that had indissolubly been expressed in the second half of the

The discomfort of decadent society and the impossibility of governing the unconscious triggered the birth of psychoanalysis, therefore the attempt to manage the nature of the soul, *both divine and human* (Plato 370 BC), to explain the human irrational, to investigate the unconscious, the unknown. The inner battle between the rational and the hidden ego became a path of investigation for contemporary analysis, a continuous passage between the emotionally elusive and the rational awareness. The governability of the conflict was resolved in Freud through the management by the ego of a functional unconscious, which represents the needs of

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the species, and a social unconscious, where the needs of society are found. The ability of the ego to govern and search for a point of balance between the two unconscious, to repress the drives in the name of a social function, therefore, allows us to find a point of stability (Galimberti, 2011). Within this scenario, modern sociology, e.g. Durkheim (2008), shows us how the individual is a product of society and depends on it through the implementation of his conscience and his collective rules. It is a clear view on the man-society relationship, where the whole produces a society, but the latter shapes and regulates its participants, to the point of aligning or even extinguishing them.

The psychological basis of the metropolitan type of individuality consists in the intensification of nervous stimulation which results from the swift and uninterrupted change of outer and inner stimuli. There is perhaps no psychic phenomenon which has been so unconditionally reserved to the metropolis as has the *blasé* attitude. The essence of the *blasé* attitude consists in the blunting of discrimination. This does not mean that the objects are not perceived, as is the case with the half-wit, but rather that the meaning and differing values of things, and thereby the things themselves, are experienced as insubstantial. They appear to the *blasé* person in an evenly flat and gray tone; no one object deserves preference over any other. (Simmel, 1903)

Therefore, the indifference of man in the society of the twentieth century, in which everything moves quickly, where the metropolises run and the individual pursues them without ever grasping the moment, without cultivating his own essence, the self that escapes; a primordial impossibility to know through the senses, to use them, an anthropic ontological paradox. Here is the society of the twentieth century, a community of individuals absent from each other, but all co-participating in the development of social complexity, intended as a reticular development of actions and reactions, of deep invisible bonds that regulate and self-determine themselves. At the end of the twentieth century, the study of society, and more generally of civilization, could only take place by studying the phenomenon through the simultaneous analysis of actions and reactions, of the context in space/time, of the transdisciplinary interconnection of knowledge, of habits and customs, and only within an idea of the complexity of existence, where each element involved produces something new, different, where the whole, generated by the individuals, becomes a completely new, different, unrepeatable reality as well as the dialogic dynamics of factors that generated it. The whole is more than the parts that compose it, because the components, interacting with each other, produce something new and unpredictable, which is indeed the result of those interactions (Morin, Cotroneo, & Gembillo, 2001).

The complexity of existence, in the awareness of being active citizens and at the same time of being fundamental for the production of a culture of belonging

where what is generated never corresponds to the sum of the generating parts. An idea of citizenship that today's society still struggles to understand, a global community in which everyone tends to protagonism, individualism, prevarication, the massification of oneself in the name of an existential vanity. Will we ever be able to share the idea that planetization now means community of destiny for all humanity. Nations consolidated the consciousness of their communities of destiny with the incessant threat of the external enemy. Now, the enemy of humanity is not external. He is hidden in it. The conscience of the community of destiny not only needs common dangers, but also a common identity which cannot be the only abstract human identity, already recognised by all, and not very effective in uniting us; it is the identity that comes from a paternal and maternal entity, concretised by the term "homeland", and which brings to fraternity millions of citizens who are not at all related. This is what is still missing for a human community to take place: the awareness that we are children and citizens of the Earth/homeland. We still fail to recognize it as the common home of humanity (Morin, 2002).

Will this vision of common identity be feasible in this technological age, in which virtual communities live outside space/time, where manifestations and communications are almost always lacking awareness and disconnected from any type of critical and conscious – forgive my oxymoron – partnership and sharing?

Where is it possible to find a civic sense of belonging in today's communities? How can Freudian impulses be redeemed if anthropic needs have undergone a profound metamorphosis? In what social media could the *blasé* man ever be placed? How can the Durkheimian idea not be transfused into the virtual reality of the world wide web? How can the complexity of Morin be rethought in the virtual society?

2. Perspectives for a shared model

2.1 Social context analysis

The epochal transition has already begun, the current society lives in a double context placed on two parallel tracks which will hardly become synergistic, despite being generated by their interconnection. On the one hand there is a real life built around its own social rules, based on civic virtues clearly delineated and shared through the millennial evolution of historical processes, cultural and scientific revolutions (Khun, 1962), consolidated by the birth of new paradigms; on the other, a new virtual, global society was born, detached from civic laws and ethical rules, in which space/time does not seem to be incisively present. However, it is essential to understand how the social media virtuality does not phenomenologically develop in an abstract, non-existent and virtual world, but it acts and manifests within the real life of individuals, deeply affecting emotions, self-efficacy, awareness, self-management, mood and social relations. My purpose is to depict how the transposition

of what happens on social media deeply affects people's real life, their way of acting, thinking, and even generating a sense of belonging to the chosen community of which we feel an integral part. Being digital citizens also means being citizens in a community that develops through the digital world but which is ultimately real, which lives, creates, establishes rules and uses. Digital citizenship, therefore, not only implies technological competence, that is using the digital world with conscience and awareness, but also a shared and universally recognized competence of digital civic rules. Nevertheless, if in real society the civic virtues are - so to speak - legitimized by the community that shares and elects them as an ethical form of representation, in a feeling of common belonging, in the digital community, which by its very nature is polymorphic, ubiquitous, individualistic, where could we find a common civic sense that can be shared and eligible as a recognised ethical source?

The main problem, therefore, lies in not having a circumscribed, defined community, as a society or a state can be; the web community, as already said, is not trapped in space/time, the stratification of interactions is infinite and difficult to control. Virtual relationships stratify with extreme speed and quickly overlap in a multitude of interconnected levels. How distant are Milgram's *small-world* and *six degrees of separation* theories (1967), according to which each individual manages to be connected to another within a maximum of 6 contacts. The creation of a network today, through the web and social networks, demonstrates how the average distance between two people is reduced to 4.74 (Fig.1) or, within the same country, even to only 3 contacts (Fig.2) (Boldi et al., 2011).

Thus in our technological and digital age, social networks reduce distances, easily increase the possibility of developing contacts and acquaintances, quickly establishing new social and communicative relationships. The first social network, born in 1997, sixdegrees.com (a clear reference to Milgram), reached more than a million users in just 4 years, clearly foretelling how the possible relationships among individuals on planet earth were irrevocably changing. The life of the first social network was very short, since it was not clear that the creation of a social network could be profitable. Nowadays, through YouTube, Instagram, Twitter, Facebook, record profits are generated, both for owners and users. Today the third sector has been completely invested by marketing strategies and job opportunities conceived and produced through the network: YouTube channels, social profiles and blogs become an easy source of income and a clear and easy redemption opportunity, but at the same time they are a source of risk and danger for inexperienced users who are not yet aware of the use of the web. Hidden traps often risk escalating in phenomena such as cyberbullying, vandalism, stalkerisation, manipulation and other manifestations related to the areas of use (Salamone, 2021). Freudian impulses return within the digital society; plus, the above said phenomenologies

produce emotional disturbs, social condemnations, prevarication, depression, fear, hatred towards others and towards oneself and other serious psychic pathologies that can sometimes degenerate up to extreme forms of self-harm such as suicide (Boccia Artieri, 2015).

Mass culture today feeds on the web and, through it, it continuously launches messages, ideas, rules, superstructures, warnings, information and yet continues to remain hooked to a logic of superficial appearance, of media exposure of its individualisms in an empty and sterile race to get more likes or followers. This is the new social model of the 21st century, if it is true that mass culture is a culture: it includes symbols, myths, images concerning practical life and imaginary life, a system of specific projections and identifications, which is added to national culture and humanistic culture, entering into competition with them (Morin, 2008).

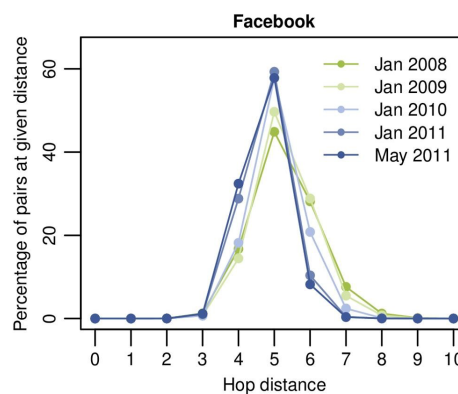


Figure 1 - Distance on Facebook.

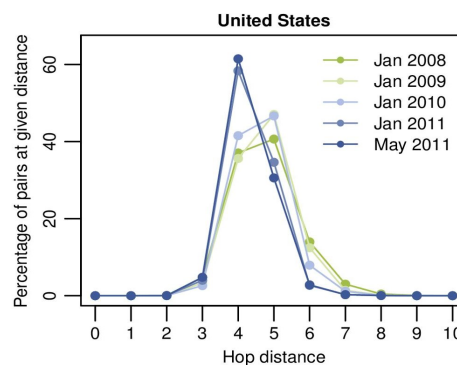


Figure 2 - Distance in the USA.

3.2 Theory and model

Therefore, a social phenomenon investing all knowledge and disciplines from an epistemological point of view, should also awaken consciences and encourage to find shared and convergent solutions to generate an ethical and deontological substrate for a peaceful and constructive use of the network.

Certainly the legislative apparatus, firstly EU, and the governance of Member States are making a great effort to regulate its use and consumption, drawing up its guidelines and adopting increasingly strict and attentive regulations for minors and education. However, significant differences remain in the various regulations, such as in the creation and management of accounts and in the ability to verify the truthfulness of information entered by the registering user. Even if the EU draws a common line about the key competences and the educational objectives for the achievement of community standards in digital skills and competences, there is no intermediate definition of them, and moreover each Member State is autonomous as regards the legislation and structuring of investments aimed at achieving a conscious digital citizenship (European Court of Auditors 2021). Even the Italian institutions have employed several tools, resources and commitment to accompany citizens in this digital transformation: from the PNRR (National plan of recovery and resilience), to the Agency for digital Italy (AgID), from the Privacy Guarantor to the Guarantor Authority for childhood and adolescence, and, locally, the Guarantor for the minors' rights and protection within regional governments. Furthermore, there is a high involvement of other national institutions, such as the Postal Police, the Ministry of Education and the Commission for internet rights and duties (Declaration of internet rights, 2015) which, in synergy, fight for the development of the country in the digital field and at the same time for the safeguard and protection of minors, who undoubtedly represent the weakest age group and are the most exposed to the dangers of the web.

Within the new DigiComp 2.2 report, integrated with new examples of knowledge, skills and attitudes that help citizens engage confidently, recently published by the European JRC, edited by AgID in the Italian version, 8 levels of mastery are detailed for each of the 5 areas of competence; it is therefore a document shared at European level, that represents the reference framework for Italian citizens' digital skills (JRC European Commission, 2022).

All the resources described seem to intercept, on the one hand, the push towards the acquisition of technological and digital skills in order to use them within real and virtual societies with ability and competence, and, on the other hand, the need to safeguard, protect, control and monitor the digital context, a vast and dangerous environment. The perplexities about the real and effective application of these directives and prospective frameworks lie above all in the evident differences among the Member States and, even more, within the various socio-economic-cultural contexts in the same country. Furthermore, it would also be necessary to move on an even more primordial level. It is certainly correct to intervene on deviances, but it would be more useful to intervene on the education of individuals, on the delivery of a civic awareness which, far beyond the digital field, is a fundamental pillar of real coexistence, of the permanent formation of a civic sense that actively

permeates all human manifestations, therefore also that which develops through the digital world and virtual sociality.

The moral rules moving the behaviours and choices of individuals should represent a status of belonging to the human species, that is valid tout court regardless of the field of application. Therefore, planning the conscious acquisition of an active digital citizenship, in the epistemological contents, rules and forms, means ensuring humanity a full and conscious digital citizenship, starting from the epistemological foundations of culture. Digital competence is not digital citizenship: the first develops within the functioning and the use, the second is instead based on ethical reasons, starting from the need to be aware citizens, within shared rules applied in social behaviours in a community which is real before being virtual. Legality, respect for man as well as for nature, sense of democracy, sustainability, enhancement of culture, equality of rights and resources become founding paradigms in the search for digital citizenship. Only in this way the civic sense of belonging to a community, to a culture, to human history can be able to develop digital citizenship. Managing the complexity of social differences through shared ethical rules realizes a favorable substrate for the development of active and conscious citizenship (Sennet, 2019). Differences, while present, must not become inequalities; real community, as well as digital community, lives and thrives on relationships. Shared ethical rules fight against the isolation of individuals and promote the equality of those who are different. The creation of thinking against individualist ideology results in a sharing of purpose that develops democratic, fair and equal individualism (Urbinati, 2011).

The model (Fig.3) for the realisation of a global digital citizenship proposed here develops a conscious, multiform, transdisciplinary, multicultural construction starting from a shared ethical-epistemological dimension, from which everything is born and takes shape.

3. Conclusion

The proposed model aims to establish six key points, six focuses: governance, prevention, network and social ethics, education and research, all operating within a conscious sharing of real ethical-social rules, recognised as a primary source by society.

The above described sectors of intervention move simultaneously, in a circular, dynamic, centripetal convergence; only the joint effort of all areas of intervention will be able to achieve a real digital citizenship permeated by a conscious and active ethical awareness. The governance of the States becomes fundamental: it senses the possibilities of using digital technology and imposes its constraints and freedoms, moving through shared and universally recognized laws.

The prevention dimension affects two sectors at the same time, mass information and continuous monitoring. The first aims to ensure everyone's full awareness of the network's risks and deviations; the second, entrusted to experts from the institutions (e.g. the Italian Postal Police), pursues the tracking of shares and incorrect or misleading uses, traces digital deviations reporting them to the law, preserves privacy and protects citizens. The ethical rules of the network, starting from those pertaining to universal moral conscience, epistemologically based on peoples' culture, mutual respect, equality in the use of digital resources (Rivoltella, 2020), non-violent communication, on the freedom to exist together with the other and not in place of the other, are integrated and inserted within a code of the network, which creates them through its own means of mass communication, through social media, the web and all the other phenomena related to the network (Buccieri, 2004). Furthermore, within the proposed model, the research sector acquires an important relevance: thanks to it, technological tools such as devices, connections, web browsing, can be improved, and through it unsafe and deceptive external attacks, fake news and fake social profiles can be easily identified. In short, it is a research which aims to make the virtual world more and more reliable and sustainable, and the web becomes a protected resource, a window on the world that is both free and safe. Research also becomes the driving force of digital development in all fields of use, from robotics to domotics, from the development in the pedagogical field to innovations in the medical-health field as a support to the citizen's well-being: a digital citizenship which permeates all fields of knowledge and tends to and promotes a universal and universally accessible smartliving.

Certainly, the massive increase of technology within various social practices leads to a rethinking of the ethical paradigm of the human race; artificial intelligence and machines slowly produce a radical change in social operations and practices and propose new forms of social interaction that must be well-structured and universally shared (Nida-Rümelin, & Weidenfeld, 2019). In addition, the world of education plays a role of fundamental importance as a source of knowledge and skills. It has the task of projecting young people into this digital transition and of educating them to a correct and conscious use. A renewed school encourages them to see the web as a resource for individual and collective growth, illustrating its infinite possibilities and capabilities, giving them solid and safe skills which can be spent in their life as lifelong learning. Consequently, the transmission of these skills will produce the development of critical and metacognitive skills, so as to allow a careful analysis in the use and management of social networks and of the web. Finally, attention should be paid to the world of lifelong learning for all educators, teachers and operators in the digital field, to increase the level of mastery of digital skills and facilitate their transmission to the new generations in an effective and professional way, to give life to a global digital citizenship, universally shared, aware, safe and sustainable (Calvani, 2010, 2013). In this perspective, I believe it is possible to detect a global methodology of priorities aimed at the acquisition of permanent knowledge. I am referring to the Universal Design for Learning (UDL) whose epistemological bases contain the characteristics analysed in this article; in fact, the seven principles of the UD (Mace, 1985), proposed as paradigms within the educational practices for UDL learning (McGuire et al., 2003), allow the creation of a

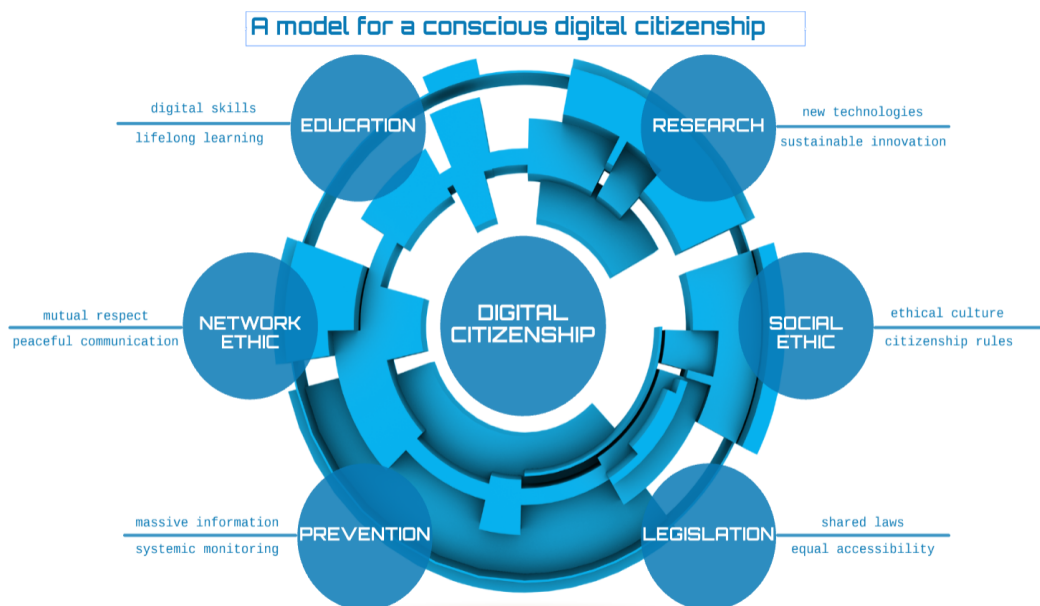


Figure 3 - A model for a conscious digital citizenship.

permanent and shared e-learning (Guglielman, 2011), in order to represent an inclusive strategy for the realisation of a universal digital citizenship (Calvani et al., 2011). If universally accessible, information technologies (Baroni & Lazzari, 2013), indispensable facilitators for breaking down barriers, can allow a free and effective implementation of a unitary and conscious model of digital citizenship.

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Understanding languages and building literacies for citizens education

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Abstract

In the school context, the theme of digital citizenship is equally crucial and cumbersome. Since citizen's education is the A-aim of the educational system, nowadays school must deal with the new and complex dimension that the concept of citizenship took on in the last decades. Nevertheless, school must face topics such as technology or globalization in observance of the national and international policies but also staying loyal to its cultural and educational role. In our contribution, we assume that analytic philosophy is the cultural ground for an “unblackboxing” approach to languages; we also analyse an exploratory research aimed at ensuring the growth of basic literacy for citizenship and digital citizenship developed in this framework.

KEYWORDS: Languages, Literacies, Analytic Philosophy, Citizenship, Unblackboxed Technology.

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1. Introduction

Newspapers have lately reported on Italian pupils' alarming situation of educational poverty, as underlined in recent reports. The aspect that hit the headlines is that 51% of pupils are able neither how to read nor how to understand a simple text upon completion of the first instruction cycle (Save the Children, 2022a). The same report draws the attention also on a peculiar aspect of educational poverty, viz. the digital education poverty (Save the Children, 2022b).

In a moral panic (Cohen, 1972) perspective we might be lead to think that in the *querelle des anciens et des modernes* (Prete, 1968), applied to the digital age, we are able neither to stand on the shoulders of giants nor to be agents of innovation. This leads us to reflect on the current scenario in which some paths oriented to citizens' education must be outlined.

In this contribution we set out these paths, by focusing on languages and by setting this theme in a broader perspective, that includes natural as well as formal language; they are both intended as the real ground for (our) action in the world. In the first part, we shape the basic structure of our world and society, in which we are knowers, learners and citizens; we also analyse the essential features of the European policies that define citizens in terms of learning and development of knowledge and skills. We also define a theoretical framework suitable to provide the language theme with a cultural horizon, to bridge culture and policies and to convert them into an interdisciplinary didactical proposal.

This way, we present our hypothesis applied to exploratory research. Finally, we analyse the research outcome useful to build up the *onlife* (Floridi, 2015) citizenship's competences and skills.

2. Context analysis

2.1. The current scenario

The Council of Europe webpage devoted to “Citizenship and Participation” reads:

“Traditions and approaches to citizenship vary throughout history and

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across the world according to different countries, histories, societies, cultures and ideologies, resulting in many different understandings of the concept of citizenship.”
<https://www.coe.int/en/web/compass/citizenship-and-participation>

One of the most impacting factors which characterise our society, as well as our reality, is the digital dimension. It is a matter of fact that our world results from a technological evolution that brings in changes and spreads them as quickly as ever before (Floridi, 1999). Between the two millennia, the possibility of simulating and observing phenomena, that would not otherwise be possible (Antinucci, 2001), of interacting with virtual reality (Floridi, 1999) and with augmented reality (Toschi, 2014) were almost creating a disruption to perceived reality. This world has some complexity due to an additional level of reality defined, from the different perspective of the philosophical recent analysis, *infosphere* (Floridi, 2019) on the one hand, and *docusphere* (Ferraris, 2021) on the other hand. This has led to the need for a new philosophical agenda that must differently face the already known dichotomies and relationships - real/virtual; man/machine/nature - and that goes beyond the usual epistemological frameworks to lead the development of new knowledge.

As noticed, “reality is one, digital and not digital; every distinction is the harbinger of storms” (Toschi, 2014) and the question is: what is nowadays the meaning of citizenship?

2.2. Citizenship and digital citizenship

The answer is digital citizenship. To define this concept by standing on the shoulders of giants, we must start from the idea of citizenship and its evolution; to ensure a full exercise of the same in the world we are describing, we must expand and problematize it *sub specie technologica*.

The Council of Europe followed this path: it laid down the framework of competences for the culture of democracy (CoE, 2018), it applied the ten domains for digital citizenship (Richardson & Milovidov, 2019) and came up with a conceptual model of digital citizenship (Gerhard, 2017).

The framework for the culture of democracy (CoE, 2018) includes twenty-one competences divided into four groups: values, attitudes, skills, knowledge and critical understandings.

The ten fundamental domains for digital citizenship education are collected in three main areas of participatory online life: Being online, declined as: Access and Inclusion, Learning and Creativity, Media and Information Literacy; Wellbeing online, specified in: Ethics and Empathy, Health and Wellbeing, ePresence and Communications; finally, Rights online, including: Active Participation, Rights and

Responsibilities, Privacy and Security, Consumer Awareness (Richardson & Milovidov, 2019).

2.3. Key competences, core competences and learning compass

The definition of the essential grounds for citizens’ full participation is supported by the European Reference Framework on the Key Competences for Lifelong Learning, published in 2006 and revised in 2018. In both editions (CoE, 2006, 2018), one of the first purposes is the need to identify and define the key competences necessary for active citizenship in the first version, and active and responsible citizenship in the second one.

Even in the summaries of the key competences we can find recurrences and a significant evolution.

As to “Digital competence”, the label remains unchanged, whereas the definition – according to the conceptual model of digital citizenship – is extended to include confident, critical and responsible use, engagement for participation in society, data and media literacy.

The aspects of languages also change significantly: “Communication in foreign languages” evolves in “Multilingual competence” and “Communication in the mother tongue” becomes “Literacy competence”.

The definition of Literacy turns out to be particularly significant in the previously described scenario, and it seems to match with the broad meaning of “languages” that we propose in the research subject-matter of this contribution.

Actually, “Literacy” is defined as “the ability to identify, understand, express, create, and interpret concepts, feelings, facts and opinions in both oral and written forms, using visual, sound/audio and digital materials across disciplines and contexts”.

The OECD Learning Compass as well highlights the multidimensionality of literacy with a specific focus on learning.

The Compass identifies the “core foundations” on which competencies can be built; they are of three kinds: cognitive foundations, health foundations, social and emotional foundations.

The introduction of data and digital literacy in the educational framework is relevant for our purpose. Nevertheless, the Compass results coherent with our approach, claiming the importance of traditional literacy and numeracy “upon which digital literacy and data literacy can be built” (p. 48).

2.4. Citizenship and disciplines in the Italian school

The issue of citizenship officially entered the Italian school in 1958, when *Civic education* was introduced from primary schools, pursuant to Presidential Decree no. 585/1958. At that time, it was up to the history teacher to initiate students into the principles of social, legal and political life.

Subsequently, the various reforms began to swing between the concept of civic education as a formative cultural horizon to which all disciplines contribute (programmes of 1979 and 1985, Law 30 of 2000 of the De Mauro Commission) and that of an autonomous subject (*Education for civil coexistence* in Law 53/2003 and *Citizenship and Constitution* in Law 169/2008).

In line with the European key competences and the UN 2030 Agenda, the ministerial document called *Indicazioni nazionali e nuovi scenari* of 2018 highlights the school's task "To promote students' ability to make sense of the variety of their experiences, in order to reduce the fragmentation and episodic character that risk characterizing the lives of children and adolescents. [...] the school is therefore invested by a question that includes, together, learning and knowing how to stay in the world" (*Ibidem*, p. 4).

The 2018 document, in fact, identifies in the various disciplines the cultural tools for citizenship, with a view to educating to the complexity hoped for by Morin (2000). These tools naturally include languages from a multilingual and intercultural point of view, history and geography, arts, scientific and mathematical thinking, but also computational thinking.

The last stage of this path is Law 92/2019, which perhaps is a step backwards, or a compromise between the two instances. *Civic Education* is included in schools' national curriculum as a transversal subject, with its own number of hours, training objectives and final grade, to which the various disciplines contribute. The initiative has raised doubts in the world of school and its stakeholders, maybe due to the somewhat rigid and simplistic solution given to the complexity of the problem (Ambel, 2020).

In any case, education to citizenship, from which stem both individuals and citizens, remains the strategic purpose and the common horizon of school, the inspiring principle of a standard curriculum, to which all disciplines contribute (Ambel, 2020). Yet, disciplines play this role when they are presented not only as a list of contents, but rather as cognitive, critical and potentially transformative cultural tools (Bruner, 2007) and when they are proposed through a teaching methodology that favours reasoning, analysis and exchange of views.

2.5. Literacy competence

As underlined by the Italian national guidelines and the *Council Recommendation on key competences* of 2018, the first access to cultural, social and political competence takes place through confident, critical and multilingual literacy competence, as defined in the *Indicazioni nazionali e nuovi scenari*:

"The mother tongue, the language of school and the European languages, which are the languages of education, help to promote the right of the subject to the full development of their identity while experiencing linguistic and

cultural diversity. Multilingual and intercultural education is a resource functional to the enhancement of diversity and school success of everybody and is a prerequisite for social inclusion and democratic participation" (2018, p. 9).

The text called *Dieci tesi per un'educazione linguistica democratica* drawn up by Giscel (1975) for the first time in Italy enhances the privileged relationship between linguistic competence and democracy, referring to Art. 3 of the Italian Constitution. This document calls both school and teachers to ensure equal activation of everyone's language skills in order to lift the barriers to an informed participation in society. The verbal language in one's mother tongue falls within the context of a knowledge of other languages and of the development of the individual's communicative ability (semiotic ability).

To be democratic, education must be able to "develop written and oral productive and receptive capacities and simultaneously stimulate metalinguistic reflection, that is the ability to observe, describe, analyse and evaluate the facts of language" (Ambel, 2020, p. 102).

Democratic language education is opposed to an "imitative, prescriptive and exclusive" language education (Giscel, 1975, VII Thesis), based on spelling, on learning rules and on the realisation of artificial tasks far from representing the communicative functionality of language (IX Thesis) and from being a profound reflection on its forms.

3. Theoretical framework

3.1. Philosophical ground

In the educational context, we identify a theoretical ground in the analytic philosophical tradition that allows to assume a coherent framework both for mother-study and codified languages, in order to face an approach to a conscious citizenship sustained by a literacy as previously described.

Not well known in the school context, the analytic philosophy has many peculiar aspects. According to D'Agostini (1997), we can define "analytic" an attitude characterized by rigorous procedures sharing-oriented and, aimed to codified languages, schemes, and formalisms.

The recent document called *Orientamenti per l'apprendimento della Filosofia nella società della conoscenza* (2017) looks at the possible applications of Philosophy in education and training. Already in 1998, with *Contenuti essenziali per la formazione di base*, the Italian school on the one hand considers the inclusion of philosophy among school disciplines as a positive feature, appropriately based on a historiographic approach and on the other hand underlines that philosophy cannot be limited to a historiographic perspective.

The analytic tradition has a quite recent history in Italy. Analytic philosophy has been excluded from the Academy in the first decades of the 1900s, with the exception of the neo-scholastic interest in logical issues. Between the 1950s and 1960s, translations of analytical philosophers began to circulate: Russell's texts were already widespread and translations of linguists such as de Saussure and Chomsky and philosophers of language such as Wittgenstein, Ryle, Black were also published. Between the '60s and '70s, De Mauro, Trincherò, Marconi and others began to write works of philosophy of language that take into account Frege and Wittgenstein's contributions (Penco, 2021).

It is necessary to realize, also in the curricula, that philosophy has profoundly changed its appearance with a turn that dates back to the end of the 19th century with Gottlob Frege and came to its full expansion in the first half of the 20th century.

Analytic philosophy provides the methodological and epistemological grounds for a better understanding of disciplines and of their interrelation in the cultural, personal and social path that characterizes citizenship, of which school should lay the foundation.

Actually, analytic philosophy recognizes the importance of understanding the history of thought; nevertheless, it stands as a method of analysis and reflection on the themes of the individual and society, rather than as a structured corpus of thesis.

Michael Dummett, one of the most significant voices of this movement, says that the analytic attitude entails that the theory of meaning is the basis of philosophy. Analytic philosophy recognises and analyses the role of language in thought and correspondingly sets the way philosophy works (D'Agostini, 1997). In this tradition, we can find a distinction (D'Agostini, 1997; Penco, 2004) useful to give a conceptual basis for the specific aspects of literacies:

1. formal and codified language, analysed by the philosophers of the ideal language, followers of Frege and Russell, who try to reconstruct the languages of sciences and to structure ordinary language;
2. ordinary language, dealt with by philosophers of the common language, followers of Moore and the second Wittgenstein, who highlight the wealth of language and the problems stemming from it.

The philosophy of language also includes the study of language as a systematic whole, with different perspectives based on de Saussure and Chomsky. The central node here is the search for the underlying language structure that orders lexicon and gives a structure to generative and not taxonomic grammars.

3.2. The Valency Grammar as reflection on language

Among the various grammatical models, the Valency Grammar is a theoretical model of description and explanation of the functioning of the sentence very

effective from the didactic point of view due to its simplicity, coherence and capability to explain the uses of language (Sabatini, 2004; Lo Duca, 2004), as demonstrated by empirical research also conducted by Indire (Pona et al., 2018; Camizzi, 2020).

This model was theorized by the French linguist Lucien Tesnière (1893-1954) who, observing the functioning of different languages, identified a common structure that governs the relationships within the elements of the sentence in terms of dependence, starting from the verb and its meaning (Sabatini, 2016).

The structural order of the sentence elements prevails over the linear order and can be represented by tree charts (Andreose, 2017). The Valency Grammar has a structuralist matrix from which it draws the idea of the systemic nature of language; thus, all linguistic phenomena can be explained on the basis of a model, through a methodological rigour and a formalism typical of logic and mathematics (*Ibidem*).

In its adaptation to the Italian language and to school teaching, in particular by Francesco Sabatini (2004; 2011; 2016; 2022), the above model has been integrated and clarified. Sabatini better illustrated the types of relationships occurring between verbs and the various elements of the sentence; he also proposed a new graphic representation through radial graphs with ovals, colours and continuous and dashed links between the elements of the sentence, in order for students to have a clearer and more immediate perception of the sentence structure (Camizzi, 2020).

There also seems to be a link with Chomsky's Generative grammar, that considers grammar the formal and explicit description of native speaker's language skills. In fact, the Valency model starts from a reflection on the implicit grammatical knowledge of the speaker to reconstruct the regularities of the language system.

Therefore, the reflection on language conducted in the classroom according to the Valency model and that starts from the children's observations and hypotheses, fosters:

- the development of cognitive abilities, accustoms students to the scientific method and gradually educates them to abstract thinking (Lo Duca, 2018);
- the ability to draw on one's own metalinguistic competence to better understand more complex texts, to correct one's mistakes in writing activities (Lo Duca, 2018) and to produce more effectively communicative texts (Sabatini, 2016).

3.3. Coding and codified languages, logic and computational thinking

Nowadays, talking about codified language, especially in the school context, implies talking about "coding". Coding is a slang term for computer programming, viz. writing code. In its most refined and academic form, this

activity is linked to computational thinking, coined by Papert (1980) and brought to the fore by Wing (2006).

We can easily understand that coding and computational thinking are connoted as languages of the current world when we read in *Piano Nazionale Scuola Digitale* (MIUR, 2015, p. 72) that: “digital is the alphabet of our time – whose core is computational thinking – a new syntax, between logical and creative thinking, which forms the language we speak increasingly often nowadays”.

Similarly, we find a first link between coding, logic and analytic philosophy in the *Indicazioni nazionali e nuovi scenari* (MIUR, 2018) in which computational thinking is defined as: “an education in logical and analytical thinking directed towards the solution of problems” (p. 13).

Coding has been recently characterized by visual elements, typical of block programming, or by perceptual-sensory elements, introduced by the use of robotic mediators with various levels of complexity.

Nevertheless, code writing consists in the use of a coded language, based on logic and formalization.

On the one hand, coding has its deep origins in Leibniz’s *lingua characteristica* and in Frege’s *Begriffsschrift*; on the other hand, computational thinking and related skills, are based on the concepts of procedure and algorithm elaborated by Turing.

We can therefore adopt an analytic attitude to approach coding as study, practice and understanding of the relationships between natural and formalized languages (Casalegno, 2011). From the same analytic viewpoint, coding can be also a poetic activity to address the relationship between code and languages, based on formalization processes (Penco, 2004). This way, we can outline a path which makes us aware of the deep mechanisms governing technology; therefore, like Dennett (2013), we can consider computers as powerful tools for thinking, because the concepts themselves, processed by computer scientists, are tools for thinking.

3.4. Constructionism to know and learn

We identified theoretical bases that allow a conscious approach to the identified literacies. The recent philosophical reflection on epistemology required for our world enables us to identify a framework which encompasses the knower and the learner, and then the conscious citizen. We are talking about Floridi’s constructionism.

We take constructionism as our model of theory of knowledge in this context for several reasons.

As Floridi (2011) declared, his constructionism looks to Papert theory that we can grant as base in developing an active learning structure to sustain knowledge and skills. Moreover, constructionism is based on the philosophical as well as on computational practices (Floridi, 2019).

Technological awareness is essential to digital citizenship. From a poetic perspective, we do not know

what we can only observe - which is therefore a “black box”; we only have a deep knowledge of what we make, that is a “white box” (Greco et al., 2005). Floridi’s constructionism lays in the maker’s knowledge tradition and seems close to the maker movement and FabLab tradition (Blikstein, 2018), against “black boxed” technology.

We assume a constructionist point of view according to which knowledge is a modelling process that shapes reality and make it intelligible (Floridi, 2019).

4. Hypothesis and research question

We therefore hypothesized a new and peculiar role for philosophy as a scenario for the development of literacies. The analytical perspective constitutes a methodological basis that allows controllability, justifiability and rigorous argumentation on a unique ground for discussion through shared languages. We built-up a proposal in which we deem that philosophical knowledge may be considered as the fourth pole of didactic transposition (Chevallard, 1985) and is added to the path leading from disciplinary knowledge (*savoir savant*) to subject-matter knowledge (*savoir enseigné*) up to learning (*savoir appris*).

We took the philosophy of language, linguistics and philosophical logic as tools to analyse natural languages and formalized languages, as well as keys to understand the underlying epistemology and developing core competencies.

This way, philosophy may represent a scaffolding both for teachers and students. It is an epistemological structure, a cultural and project support to the former and a learning scenario and a key for knowledge systematization to the latter.

Given the history of analytical philosophy and the directions of the European policies, we started from the theme of languages to identify a *fil rouge* that links two experiences, two relatively new areas, but on which Indire has already developed an expertise: the Valency Grammar and coding.

We identified three kinds of relationship: that of grammars with linguistics; mother tongue and study skills with the philosophy of ordinary language; coding with formalized languages. The philosophy of linguistic turn, which combines these elements, is the natural basis for the proposal we designed and suggested to teachers and schools.

The questions arising thus from our research is: can teachers’ training on philosophy of language and logic from an analytic perspective support a learning path aimed at developing those competences required to build literacies?

5. Project development and data collection

In September 2019, Indire started in field research named “*La filosofia come chiave di lettura nelle altre discipline - Linguaggi*”, involving eleven teachers of different disciplines and degrees of two *Istituti Onnicomprensivi* (from primary to upper secondary schools): the *Convitto Nazionale Colombo* in Genoa and the *San Marcello Pistoiese* near Pistoia. The teachers were involved in a training path and empirical activities about the wide theme of the languages concerning analytic philosophy, philosophy of language and logic, formal coding language, reflection on language through grammatical models. In particular: three teachers of a primary school worked on Coding; one teacher of a primary school, three teachers of a lower secondary school and two teachers of a two-year period upper secondary school worked on the Valency Grammar; two teachers of a two-year period upper secondary school worked on analytic philosophy.

The project structure was adjusted on the Design Based Research (Kelly, 2003), that relies on an interactive process of design, enactment, analysis and redesign (Design-Based Research Collective, 2003), and was characterized by a close collaboration between researchers and teachers.

The first three months (September – December 2019) were devoted to a preliminary phase of teachers’ training on philosophical framework, coding and the Valency Grammar, with the support of disciplinary experts (university professors and skilled schoolteachers) with seminars and individual study sessions of especially created study materials.

Then such experts and Indire proposed a format and a synoptic table to the teachers for them to design a learning path (with a variable duration, generally from four to ten lessons) on a “language” and within a philosophical framework, considering their context and objectives. During this design phase (December 2019 - February 2020), there was a great deal of interaction between teachers, experts and researchers to define the lesson plans (which were also the first data collected for research analysis).

The implementation phase (March 2020) unfortunately coincided with the start of Covid-19 emergency, and all schools switched to distance teaching in Italy. Therefore, there have been many delays and most of the teachers were able to put into practice their lesson plans with students only in the next school year, in autumn 2020, when schools resumed in-person classes. As it was not possible for researchers to make observations in classrooms, they supported teachers remotely for any closer examinations, advice and *in itinere* corrections. Teachers were strongly recommended to be observed by a colleague during their lesson performance, in order to introduce the practice of peer observation.

During the implementation phase, the teachers had to produce some documentation, which researchers collected for analysis:

- *Diario di bordo*: a written tool where teachers put down after each lesson any events, contingencies, strengths, weaknesses, developments;
- *Strumento dell’osservatore*: a written tool used by the peer observer during lessons;
- photos, videos, audios or other documentation about the lessons.

The researchers decided to expand the data collection with additional tools:

- seven remote focus groups with students, to inquire directly their opinions about the experimental educational path;
- two remote interviews with teachers who worked on coding to investigate the theme of coding as a language.

6. Data analysis and discussion in the light of the theoretical framework

6.1. Focal point to build-up and analyse learning experiences

Our project covered a series of main nodes concerning the themes and disciplines dealt with, throughout its phases, from teacher training to design and to classroom learning activities (Table 1). The nodes relating to philosophy have been used both for the teaching discipline and as a cultural framework for the approach to languages in grammar and coding.

The thematic nodes were developed on the basis of the theoretical framework and in particular of the analytical perspective adopted. The researchers and experts identified such nodes in each specific area, both in terms of philosophy and of the Valency Grammar and coding. They were then shared and evaluated to identify the core to be used by the whole involved workgroup.

The same nodes have been used as categories of the entire analysis path. In the *on desk* analysis, they were the tools to screen the materials elaborated by the teachers, with a particular attention to lesson plans; in the *in field*, analysis, they were used to set the instruments and to analyse the *Diari* and the results of observations, interviews and focus groups.

The approach chosen is aimed on the one hand to take into account and respect the peculiarities of the discipline, both for thematic purposes and for methods, and on the other hand to provide a common theoretical and methodological framework with an analytical approach.

This allowed each experience to maintain its own peculiarities and to develop the proposed nodes according to autonomous paths.

In the outcomes of each area, which can be found in the following description, the thematic nodes were used as tags to analyse the collected material.

THEMATIC NODES

Philosophy					
Ordinary language and its characteristics	Ideal language and its characteristics	Relationship between ordinary and formal language	Relationship between the truth of declarative statements and their form	Role of language in the work of thought	Logical connectives
Valency Grammar			Coding		
Relationship between form and function	The role of verb	The minimal sentence structure	Definition of coding	Use of symbolic languages	
Relationship between semantics and syntax	Language as rule and choice	From sentence to text	Algorithms: characteristics and applications	Use of programming languages	

Table 1 - Main nodes concerning the themes and disciplines.

6.2. The Valency Grammar experience

In the *in field* research, six teachers chose to work with the Valency Grammar: one primary school teacher, three lower secondary school teachers and two upper secondary school teachers.

The reasons that led such teachers to experiment with the Valency Grammar path are the following: to improve the understanding of texts, even the scientific and mathematical ones; to improve the pupils' logic and sentence analysis skills; to involve pupils more actively in language reflection; to integrate better the teaching of Italian and Latin by fostering comparative language reflection, to develop also transversal skills such as critical thinking and problem solving.

Figure 1 shows the themes chosen and implemented by teachers in their classes according to the different levels and on the basis of the issues proposed by the experts (Table 1).

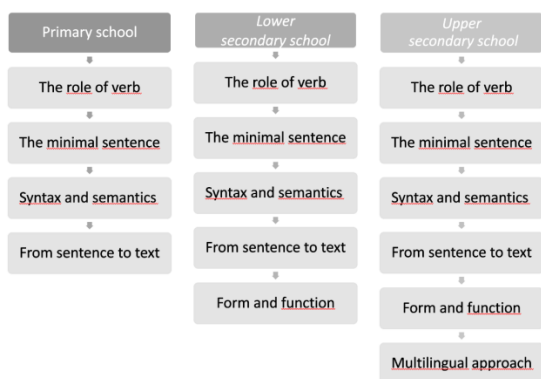


Figure 1 - Themes chosen by teachers.

It can be noted that the basic concepts of the Valency Grammar have been dealt with in all school levels, with

an increasing focus in secondary schools. The relationship between sentence (system) and text (communication) has been explored in all school levels (Sabatini 2011, 2016, 2022).

The observation and analysis of the documentation showed some interesting aspects that were partly confirmed by other research carried out on the Valency Grammar in classrooms (Camizzi ed, 2020) and which are ground for further investigation.

The pupils of all the involved levels understood the profound structure of sentences, by going beyond their linear order and the mere association of different morphological units. Starting from the reflection on the meaning of known verbs, close to their experience, they understood the relationships arising in a sentence among its different elements (syntax and semantics).

“The most important element is the verb, because it allows you to understand what happens, you have to say what it does”
[Primary school Student 1].

“It is better understood than when [words] are on the line” [Primary school Student 2].

Thanks to this discovery, secondary school students were also able to reflect on the relationship between the form of words (morphology) and its function in the sentence (syntax), unlike what happens in grammatical and logic analysis, that is often meaningless for them:

It helps to look at sentence structure, thus to select things and join each part by its role
[Lower secondary school Student 1]

It was an intuitive work. It is a more schematic and intuitive grammar if compared to work on complements
[Upper secondary school Student 1]

This turned even more evident when a teacher, together with the coding process, used Lego to represent the relationships in a sentence.

In all classes, the students identified a standard pattern applicable to more complex study texts, such as mathematical problems, through the analysis of simple sentences within their reach. They thus found their own key to understanding. About the understanding of mathematical problems, some lower secondary school students report:

“[We have] some troubles when we do not know the meaning of the verb to understand which actions must be performed or when we lack a datum” [Student 2].

“It is necessary to read well the text and to identify and understand the verb” [Student 3].

The students of the third level of a lower secondary school (introductory course in Latin) and of the upper secondary school (scientific upper secondary school) who worked with the Valency Grammar jointly with Italian and Latin, were able to grasp the same structure in the two languages and to understand better the construction and translation mechanism of Latin.

“The sentence structure of the two languages is the same. Languages are all similar, they all need a verb, subject and arguments, not only in Latin and Neo-Latin, but also in English and in every language” [Upper secondary school Student 2]

“Doing valence and regency together clarified some mechanisms of both languages” [Upper secondary school Teacher 2]

There were some difficulties in groups which approached the Valency Grammar directly with the study of Latin, without first experimenting it in Italian.

The teachers also took the opportunity to work in general on some logical categories linked to the Valency Grammar, such as the concept of “relationship”. In the students’ reflection, this notion was also extended to human relationships or to those of other disciplines, such as chemistry and mathematics. This way, the students got accustomed to using the schemes of specific disciplines to understand the complexity of reality.

Finally, the grammar lesson changed (Camizzi, 2020), as it involved pupils in an individual and collective search for regularities starting from the reflection on simple and familiar linguistic data. This is an inductive process similar to the logical and scientific one, which favoured greater learning motivation and awareness. Furthermore, it contributed to build up useful skills in study and in life, such as the problem solving, management of complexity and increased awareness of one’s own learning processes.

“The other [grammar] explains it, this one makes us think” [Primary school Student 3]

*“We changed our point of view and we understood better”
[Lower secondary school Student 3]*

*“We remember it better because we practice it by playing rather than learning with explanations”
[Upper secondary school Student 3]*

6.3. From linguistic to digital awareness: an analytic path

The two disciplinary experiences of philosophy were centred one on logic and the other on the philosophy of language. The former dealt with some of the proposed themes: the relationship between the truth of declarative statements and their form; the role of language in the work of thought; the logical connectives.

The latter tackled the theme of ordinary language and its characteristics by analysing the understanding of natural language, the role of the community of speakers, the uniqueness and the multiplicity of the reference.

We analysed the disciplinary experiences with a philosophic background to see which thematic nodes were useful to build up a framework. Grammar activities may be linked to the following nodes: ordinary language and its characteristics; the relationship between ordinary and ideal language; the role of language in the work of thought.

Coding activities focus on the relationship between ordinary and ideal language; the possibility of formalization; the logical connectives.

In the previous paragraph we discussed grammar activities, whereas in this paragraph we focus more on coding activities, whose analysis is aimed at the theme of technological and digital awareness.

Of the two implemented experiences, one focused on unplugged activities and the other one on the use of simple programming languages. Yet, they both pivoted around the following themes:

- relationship between natural and formal language (philosophical node)
- understanding of natural language (specific to the philosophical node “Ordinary language and its characteristics”)
- possibility of formalization (considering the philosophical node “Ideal language and its characteristics” and the coding node “Use of symbolic languages”)
- identification of connectives and logical elements (considering the philosophical node “Connective logical” and the coding node “Use of symbolic languages”)
- algorithm, its characteristics and applications.

Both experiences have taken into account the theme of algorithms, for which teachers have requested an in-depth training. The unplugged activity had a greater focus on the use of symbols and algorithms as a process.

The programming-oriented activity has given much room to the relationship between natural and formalized languages and to the man-machine relationship.

The activities drew up a path that starts from the analysis of ordinary language, goes on with the need for language structuring and comes to its formalization; this path was followed the other way round if compared to the school levels.

We analysed it with regard to the issues of citizenship and digital citizenship identified by the European documents.

We took as patterns the work of an upper secondary school class on ordinary language, that of lower secondary school classes on Latin from a multilingual perspective and that of primary school classes on coding.

The upper secondary school class worked on ordinary language and language games, starting from a discussion born spontaneously on cultural differences.

Within this framework, students deepened the dialogue on different positions with the support of the *Lezioni e conversazioni* (Wittgenstein, 1967) [the volume presents, in Italian translation, the *Conference on Ethic* and the incollection *Lectures and Conversations on Aesthetics, Psychology and Religious Beliefs* edited by Cyril Barret]. An analytical approach to language allowed them to engage in an open and respectful discussion.

Actually, the results attained by the focus group were as follows:

- language must be differentiated according to the linguistic game [Student 2];
- “it is possible to analytically tackle a subject from a linguistic viewpoint, what it is said, each word, as if it were mathematics” [Student 3];
- Starting from this perspective, “starting from Wittgenstein, we do not merely rely on our opinions, but we are also more open to the group’s thought” [Student 4].

In the lower secondary school, the study of the Valency Grammar as a tool to approach an ancient language accompanied a first reflection on the underlying structure of languages. In the observations of the online lessons, students noticed some basic hints about any possible similarities with the most known languages, such as Italian and English. Attention was paid to the possible use of a grammatical model for other languages. Some students focused on its use for various types of languages, such as Arabic or Neo-Latin. A more structured reflection was also made: “It can also be useful for other languages, because it helps to look at sentence structure”.

In coding activities, reflection on the relationship between natural and formalized languages was a way to bring about changes both in teachers and students. In

teachers, it influenced the way of looking at coding and computational thinking. Usually, these activities are seen as useful to keep up with times and motivate children. The involved teachers, after a training on the philosophy of language and logic, were able to prepare the activities by keeping in mind a specific target and to analyse the implemented path with peculiar criteria.

The learning outcome expected by the teacher who designed the activity aimed at using programming languages is similar to the already analysed notion of unblackboxed technology. In fact, he underlined the importance of making students aware of what machines are, that they are programmed by the man and that to do this, a programming language is required. In an interview, the teacher dealing with the unplugged activity claimed that, before following this path, she used floor robots such as Bee Bot and Dot, without knowing either the internal processes and educational purposes, or their connection with logic.

The results achieved by the focus groups show that the children of both classes acquired some awareness and began to look at technology, that has become part of their reality, from a different perspective. They learned that the clarity and certainty of language are essential:

“If you have to give instructions to a PC, they have to be even more precise than those given to a human being [...]. If you give a computer an information less than precise, that computer will not understand it.” [Primary school, Class 2, Student 6]

Students realised how natural language, which we are currently accustomed to thanks to the use of voice commands, is of help to manage technology, not to unblackbox the behaviour of a machine:

“Instructions are given by means of codes. We did not use natural language, we used an algorithm.” [Primary school, Class 2, Student 4]

7. Conclusions and lines of development

As we have seen in the excursus on the European policies, digital citizenship is not a merely state of fact, but rather a way of life in a constantly evolving society, that must be built-up by means of a responsible political and social action. To help its growth, it literacy, numeracy, data and digital literacy must be sustained by a cluster of knowledges, competences and skills. Clearly, school education can play a crucial role in laying the foundations to build up citizenship as well as digital citizenship. This can take place provided that school is able not only to approach a specific theme, but also to provide it with a cultural framework. It is actually necessary to acquire an unblackboxing attitude and then consciously achieve the basic literacies needed for citizen of our society.

Our hypothesis is that philosophy, especially the analytic one, can support this cultural path. It is important to keep in mind that new proposals in a school context must be introduced carefully, with an evidence-informed approach, taking account of school's readiness. The described exploratory research allowed us to take our first steps in testing the hypothesis in a small context from which we could draw insights for future experimentation.

First of all, the observation and analysis of the documentation showed the teachers' difficulty in dealing altogether with all the different aspects of the project (philosophical, linguistic and methodological); it also showed the need for a in-depth study of the theoretical aspects of the disciplinary fields, as well as their relationships. It would be advisable to provide teachers with higher theoretical (disciplinary) and practical (planning and mediation) skills. This issue can be tackled in future experimentation with a longer introductory training, opportunities for sharing, guided reflection and training on the job.

Nevertheless, the proposed path seems to draw the attention to peculiar aspects, such as language structure, relationship between natural and codified language, their characteristics and their relationship. In particular, great importance is attached to the approach of natural languages and their use, as well as of formalized ones and the resulting technology as subject-matter of study; this way, they can be analysed and understood with an active, unblackboxing attitude that can be the real basis for the growth of citizens.

Credit author statement

Margherita Di Stasio wrote sections 1, 2.1, 2.2, 2.3, 3.1, 3.3, 3.4, 4, 6.1,6.3 and 7; Loredana Camizzi developed sections 2.4, 2.5, 3.2 and 6.2; Laura Messini elaborated section 5.

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Critical digital literacy as a key for (post)digital citizenship: an international review of teacher competence frameworks

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Abstract

The use of information and communication technologies for education is increasingly recognised as essential in a post-pandemic world. In this regard, the ability to effectively engage with technologies for educational purposes is now part of the basic knowledge, skills and attitudes to be expected from anyone in the teaching profession. Accentuated by the proliferation of technology-mediated situations resulting from the Covid-19 pandemic, but linked to a longer-term trend, dealing with the digital is also now an almost unavoidable aspect of active participation in society and civic engagement. Indeed, the notion of ‘postdigital’ is rapidly gaining traction as a way to highlight that the digital and non-digital cannot be really separated anymore and, due to this fact, (post)digital citizenship is emerging as a core competence for citizens. Still, the way digitally competent educators are expected to support learners in their development as digital citizens is not explored enough. To contribute to closing this gap, this paper reviews 24 teacher competence frameworks from different regions of the world and makes the case for considering educators’ critical digital literacy as a key leverage to building digital (post)citizenship and fostering ethical uses of technology. The analysis reveals that critical digital literacy is mostly missing and, hence, the paper closes with a set of recommendations for policymakers and institutional leaders in the education sector on how to incorporate critical aspects of digital literacy in educators’ professional development activities, so that teachers and trainers can operate as a much needed vector to develop (post)digital citizenship across our societies.

KEYWORDS: Teacher Competence Frameworks, Digital Competence, Teachers, Critical Digital Literacies, Digital Citizenship.

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1. Introduction

The mandatory physical distancing, a “requirement for individuals to maintain a safe distance from one another” (QAA, 2020, p. 5), resulting from the Covid-

19 pandemic situation suddenly redefined the role and uptake of digital technology as the “the means by which information is conveyed and people are linked together” (Bower, 2019, p. 1036) in education.

In this context, governments and other authorities and key stakeholders all over the world are increasingly recognising the importance of ensuring that educators, working at all levels of education, have the ability to incorporate such technologies into the planning and delivery of educational experiences. An example of this can be seen in the *Digital Education Action Plan 2021-2027: Resetting Education and Training for the Digital Age*:

“Experiences from this period show that education and training systems and institutions

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that had previously invested in their digital capacity were better prepared to adapt teaching approaches, keep learners engaged, and continue the education and training process. In particular, the emergency confirmed the need for all educators to be skilled in using digital technologies effectively in their teaching and training process and to ensure that all children can participate in digital education” (European Commission, 2020, p. 3).

Beyond education, the pandemic has contributed to accelerating or consolidating already established trends around the increasingly central role of Information and Communication Technologies (ICTs) for participation in society, often described as “Digital Citizenship”. In this regard, the last edition of *The Digital Competence framework for citizens (DigComp)*, published by the European Commission, offers detailed examples of the knowledge, skills and attitudes that citizens need for engaging in citizenship through digital technologies, that is: “To participate in society through the use of public and private digital services. To seek opportunities for self-empowerment and for participatory citizenship through appropriate digital technologies” (Vuorikari et al., 2022, p. 19).

Teacher Competence Frameworks (TCFs) are policy documents that define the minimum standard of expertise and professional attributes that all the educators teaching within a given educational system are expected to possess, in order to be able to do their jobs properly. Therefore, analysing this type of documents can help us understand how the teaching profession is understood in different societies and the role that ICTs are expected to play in education.

In this paper we look at how TCFs from a variety of contexts address digital teaching competence. Likewise, considering schools play a key role in forming students to actively engage in society and become tomorrow’s citizens, we examine whether TCFs address citizenship education and so-called digital citizenship.

Last, but not least, our analysis focuses on elements of criticalness in relation to the digital socio-technical ecosystem. Therefore, we pay particular attention to TCFs that – beyond effectiveness and instrumental aspects – expect educators to engage critically, ethically, and responsibly with ICTs.

2. Background: from digital literacy to critical digital citizenship

2.1 Adding a critical dimension to the digital literacies debate

In the last couple of decades, the generalised understanding of digital literacy has transformed considerably: from the capacity of using ICTs as mere tools to a more complex and socio-culturally sensitive concept associated with the adoption of digital practices

and digitally mediated interactions with human and non-human actors. If we look at the European Union again as an example, this shift is rather clear: while in the 90s to be digitally literate meant to comply with the so-called European Computer Driving Licence (ECDL), which basically meant being able to use digital productivity tools such as word processors or spreadsheets, current interpretations of the concept as a key competence for lifelong learning see it as:

“the confident, critical and responsible use of, and engagement with, digital technologies for learning, at work, and for participation in society. It includes information and data literacy, communication and collaboration, media literacy, digital content creation (including programming), safety (including digital well-being and competences related to cybersecurity), intellectual property related questions, problem solving and critical thinking” (European Commission, 2019, p. 10).

Building on that definition, the latest version of DigComp (Vuorikari et al., 2022, p. 2) stresses the importance of digital competence in collaborating with others to make sense of existing content (e.g. information, data, narratives) and to produce new knowledge while being aware of the constraints and affordances of the specific social-cultural-political context where one acts (Lankshear & Knobel, 2003; Marín & Castañeda, 2022).

A while ago researchers also started to argue for the use of the term ‘literacies’, in plural, as a way of emphasizing the existence of multiple forms of literacy connected to multiple communities and domains, or multiliteracies (Barton et al., 1999). At the beginning of the century, the typical differentiation was between *instrumental* digital competences, which are the basic technical and operational know-how in relation to the use of technological devices, and *strategic* digital competences, which relate to a cognitive rather than technical dimension, referring to the ability to use the information proactively to affect one’s professional and/or personal environment (see, for example, Steyaert, 2002). More recent classifications tend to embrace other components: for example, Ferrari et al. (2012) consider digital competence as a combination of information skills, communication skills, content creation skills, safety skills, and problem-solving skills, while Deursen et al. (2014) distinguish five different types of internet skills relevant to a large segment of the population: operational, formal, information, communication, and content creation.

Undeniably, the debate is going beyond instrumental aspects concerning the use of ICTs and starts to pay some level of attention to the social, cultural, political, economic, and ethical implications of technology. In line with this understanding, several recent digital competences frameworks highlight the importance of developing a ‘critical’ perspective in relation to digital

technologies. For instance, the already mentioned DigComp framework defines digital competence as not only confident but also critical use of ICTs for participation in a number of areas of life in contemporary society, for example by critically evaluating the credibility and reliability of sources of data and information or by being critically aware of the risks posed by exclusively relying on digital technologies (Vuorikari et al., 2022). Likewise, the UNESCO's Broadband Commission for Sustainable Development highlights the importance of critical digital literacy and defines it as a "set of specific understandings and a disposition towards the politics of the digital society and digital economy" (2017, p. 32).

Adopting a critical perspective in relation to digital literacy can be understood in different ways, depending on the perspective we start from. For example, scholars and practitioners from the field of Information and Media Literacy, consider the critical dimension as the one that is needed to "assure the validity of processes such as triangulating information and checking sources are appropriate" (Leaning, 2019, p. 10). Likewise, Media Education, as a field of both research and practice, has long been concerned with the competences to assess the credibility of content and to differentiate misinformation from reliable messages (Leaning, 2019). Regardless of the starting point or the academic discipline, adding the word 'critical' before the term 'digital literacies' implies bringing ethical implications and power dynamics to the fore, while connecting with different traditions in the fields of literacy, media education and information literacy (Pangrazio, 2016). It not only entails adopting a critical position when consuming and sharing content, including dealing with data, but also having at least a certain level of awareness of who controls ICT infrastructures and the vested interests of different stakeholders. In this regard, approaching the current media landscape from a critical perspective implies at least a basic understanding – and making informed decisions accordingly – of the 'political economy' of informational capitalism, the pervasiveness of datafication in contemporary society and its social, political, legal, and ethical implications, (Cohen, 2019; Cukier & Mayer-Schoenberger, 2014; O'Neil, 2016), including how algorithms may promote biased views of the world, for instance reinforcing racism (Noble, 2018). At the same time, the ability to critically evaluate content and spot misinformation – a traditional concern of media and information literacy – remains as relevant as ever at a time when the reach of so-called fake news is amplified by both human and non-human (i.e. bots) actors. The networked and, at the same time, uneven configuration of the current media environment along with the increasing datafication of life makes it essential for everyone to develop at least a basic understanding of how most online platforms and digital services operate (Nguyen, 2021).

Critical digital literacy is essential to anyone living in contemporary societies, but even more to teachers

considering they are uniquely positioned to empower younger generations to engage not only effectively but also ethically and responsibly with the current socio-technical ecosystem (Gouseti et al., 2021; Marín et al., 2021). Moving beyond prescriptive and normative views, it is essential to favour dialogue and questioning instead (Buckingham, 2018). For this shift to become mainstream, however, education systems as a whole need to be invested in approaching digital competences from a critical perspective, starting from the training of teachers themselves, and with the frameworks regulating both pedagogies and curricula. Finally, investing on teachers as enablers of critical digital literacies development would contribute to avoiding the too often predominant instrumentalist association of ICTs with performance and efficiencies (Raffaghelli & Stewart, 2020), which connects digital literacy to labour market workforce demands rather than to the challenges of living in digital societies (Alexander et al., 2017).

2.2 Education and digital citizenship

Digital citizenship can be interpreted in two different ways, as the concept may refer to:

"being a citizen of the digital, as if government portals, social network platforms and online shopping were in themselves their own kind of states or empires in which its citizens had several roles, functions and so forth. At the same time, it can also refer to the ways that classic traditional models of citizenship (of a nation state) now can involve citizen actions through new and changing voting systems and civic forums" (Pangrazio & Sefton-Green, 2021, p. 17).

Whether we put emphasis on the former or the latter, education can be expected to play a central role in helping individuals to develop the attributes they need to navigate both dimensions. In this regard, educational systems across the globe are actively aiming at introducing into the curriculum the development of digital citizenship; see for instance Couros and Hidelbrandt (2015) or NetSafe (2018) as examples from Canada or New Zealand respectively.

A concept analysis on digital citizenship and related terms (i.e. online citizenship, cyber citizenship, e-citizenship, networked citizenship, technological citizenship, and Internet citizenship) conducted by Choi (2016) revealed four key categories that include different kinds of competence:

1. making a responsible and ethical use of the Internet
2. accessing and creating content, as well as successfully communicating with others, as covered by media and information literacy
3. participating in existing social structures in relation to political, economic, and cultural aspects of life

4. critically challenging existing power structures to pursue social justice

Digital literacies are necessary for individuals to perform digital acts, and that it is through digital acts that digital citizens come into being (Isin & Ruppert, 2015). Digital acts entail interpreting multiple streams of information, anticipating unknown consequences of digitally driven processes, creating new spaces for political engagement. The implications of all these acts for citizenship is complex, and the increasing reliance on closed algorithmic decision-making is questioning what it means to be an engaged and active citizen.

The inclusion of critical components within digital literacy frameworks is helping to move the discussion away from the operational nature of digital skills towards critical understanding of what it means to be a digital citizen today. For this to happen beyond the academic debate, education systems need to be equipped with educators able to instil, leading by example, these critical literacies into their students, which in turn requires Teacher Education policy to explicitly address digital citizenship. For instance, by making sure that Teacher Education degrees “clearly highlight democratic work and digital technologies as connected” (Örtegren, 2022, p. 19).

The present article, moving from the above discussion, explores the state of the art in terms of the inclusion of critical digital competences and digital citizenship in TCFs. It outlines the current profile (or lack thereof) of the digital teacher and discusses what further shifts need to happen in the form of recommendations for policymakers and institutional leaders in the field of education. For the purposes of this paper, we focus on teachers defined as those professionally employed to teach in a formal education context, particularly in compulsory education.

2.3 Embedding the digital into Teachers’ Competence Frameworks

With education being usually heavily regulated by the state, and teaching qualifications being necessary to enter the teaching profession (Musset, 2010), teaching practices are pervasively marked by a tension between the professional autonomy required to meaningfully engage with the diversity of contexts and students, and the top-down standardisation required to organise, operationalise and make inter-operable curricula and pedagogies at the national and international level (Torrance & Forde, 2017).

TCFs have played an instrumental role in the implementation of professional standards in teaching, a movement initiated in the United States in the 20th Century (Davies, 1962) that gradually permeated other educational systems and traditions. Indeed, in later years the push towards standardisation has become more and more prominent through the influence of both national governments seeking to enhance the educational outcomes and transnational organisations such as OECD (Landri, 2016; 2022): this has often led to national level

TCFs detailing what is expected from teachers. The proliferation of TCFs has taken place in the context of institutional discourses and policymaking that aim to reshape education in relation to the so-called knowledge society and life-long, lifewide learning (Caena, 2014). In the case of the European Union, many member states have created TCFs, which are broadly aligned with the *Key Competences for Lifelong Learning* European Reference Framework (European Union, 2019).

In addition to generic TCFs, there are also some frameworks specifically created with the aim of offering a detailed view of the digital competences expected from educators and the role they can play in supporting students’ digital literacy development. This kind of TCFs, that in a number of cases are promoted at the national level, often takes the form of non-binding documents proposed as guidance by transnational organisations, such as UNESCO or the European Commission.

The UNESCO *ICT Competency Framework for Teachers* (UNESCO, 2018), firstly created in 2011, has become a worldwide referent for teacher digital competences, influencing national and regional frameworks. It includes three levels (knowledge acquisition, knowledge deepening and knowledge creation) and six elements of teacher digital competence: understanding ICT in education, curriculum and assessment, pedagogy, application of digital skills, organisation and administration, and teacher professional learning, with several examples of implementation. In addition to this, UNESCO has also produced a *Media and Information Literacy Curriculum for Teachers* that identifies a set of core competencies consisting of six skills areas for media- and information-literate teachers (UNESCO, 2011).

Another influential example is *the European framework for the digital competence of educators* (Redecker & Punie, 2017), known as DigCompEdu, which was developed by the Joint Research Centre of the European Commission following an extensive consultation with experts and stakeholders (Pujol Priego & Kluzer, 2018). DigCompEdu calls for a rather holistic understanding of digital literacy and addresses the digital competences of 21st century educators, together with their professional engagement’s activities and the impact that teachers can have on their learner’s digital literacy (Nascimbeni 2018). This framework does indeed advocate for a change in the role of teachers, by introducing meta-cognitive and self-development teachers’ competences, getting them ready for open and networked learning settings (Loeckx, 2016), but still does not fully address the lack of contextualisation and criticality. DigCompEdu has been able to inspire national interventions in various countries (Caena & Redecker, 2019), such as the *Marco de referencia de la Competencia Digital Docente* in Spain (INTEF, 2017).

Having appropriate digital competence frameworks for teachers is a prerequisite for educational institutions to become engines to develop critical digital literacies of

students (Littlejohn et al., 2012), possibly extending digital literacies across different contexts, making sure that the critical, ethical, and technical level can interplay as an evolving set of competences (ibid.). If traditionally schools are assigned the mission to foster the development of responsible and active citizens, when it comes to digital societies they should become the place where individuals learn how to behave in our platform-based and datafied societies, in other words, the place where digital citizenship is fostered. However, for this to happen it is essential that digital citizenship is explicitly included into teacher education (Örtengren, 2022).

3. Method

This review is guided by three main research questions:

1. To what extent is (critical) digital competence present in TCFs?
2. To what extent is (digital) citizenship present in TCFs?
3. Where present, are (critical) digital literacy and (digital) citizenship explicitly connected to each other in the context of the TCFs?

Our aim was to examine the presence of critical digital literacy and digital citizenship as relevant dimensions in general TCFs – or similar documents outlining standards for the teaching profession, as the goal of these documents is to shape the qualifications that give access to the teaching profession as well as professional development opportunities available to in-service teachers.

Seeking to explore whether regulatory frameworks internationally provide the tools to deal with the critical issues outlined above, we have conducted a review of TCFs and teachers' professional standards by means of a purposive sample aimed at covering all continents and different scopes (i.e. supranational, country and regional). A fully comprehensive review is beyond the scope of this paper, and the collection of documents surveyed is both heterogeneous and has substantial geopolitical gaps (due to either lack of documentation, access to it or linguistic barriers). Still, the review constitutes a revealing exercise to identify high-level trends and (mis)alignments in global policy as pertaining to expectations towards teachers' ability to use ICTs for teaching and learning purposes and their role in supporting students to develop the competence required to become future digital citizens. Given our purpose, we focus on their criticality (and relevant gaps thereof) in relation to the uses of digital technology in education.

We categorised each of the TCFs included in the review by answering the following questions:

- Which organisations are behind the TCF?
- How is authorship credited?: individual authors named vs. only institutional author

- When was the first version released? What is the date of the most recent update?
- What are the educational levels it covers?: Early years (kindergarten), Primary Education, Secondary Education, All levels
- What is its geographical scope?: Supranational (i.e. covering more than one country), National (i.e. operating at country-level) or Regional (i.e. established by authorities in jurisdictions within countries)
- What are the countries covered by the TCF? What is the specific territory or jurisdiction (e.g. district, state), if any, within a larger country covered by this TCF?
- In which continent(s) are the countries covered by this TCF?
- In what language(s) is this TCF available?
- How many publications, if any, are included in the list of references of this TCF?: None, Less than 5, More than 5

Likewise, we used Computer-Assisted Qualitative Analysis Software to code the documents, looking at the following themes:

- Digital competence (including also equivalent terms such as ICTs and educational technologies).
- (Digital) Citizenship
- Criticalness

Therefore, apart from examining the presence of these three dimensions within each of the TFCs, the analysis also looks at the intersection of digital with both citizenship elements and criticality.

4. Results

The sample included 24 TCFs purposely selected with the aim of ensuring diversity of scopes, scale and coverage by spanning across five continents and all levels of compulsory education (see Figure 1). For a complete overview of the analysis of the TCFs, see Appendix 1.

TCFs tend to be created by authorities that shape the teaching profession across entire countries (e.g. Myanmar) or within specific regions of a given country (e.g. provinces in Canada), usually covering all levels of compulsory education. However, our sample also included international TCFs designed by organisations such as UNESCO or the Commonwealth, as well as some cases aimed at just specific levels (e.g. primary education or early childhood education). English is the most used language among those TCFs, although some have been published as multilingual documents with the content also available in the languages spoken in the target territory (e.g. French in Québec, Chinese in Hong Kong or Burmese in Myanmar).

Although only nine of the reviewed TCFs (37.5%) mention the word 'digital', overall almost all of them (n=22, 91.7%) include the use of technology in

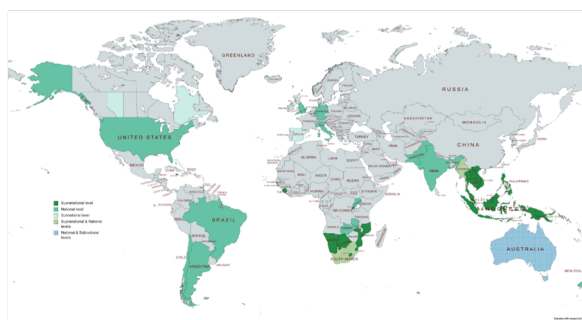


Figure 1 - Location and scope of the sample of TCFs analysed in this study. Map created by the authors with mapchart.net and available in high resolution from Zenodo <https://zenodo.org/record/6628521>

education by means of closely related terms, primarily ‘Information and Communication Technology’. Expertise in the use of ICTs, for both general and educational purposes, tends to be a common requirement for teachers within these frameworks. For instance, in the case of South Africa, legislation establishes that “Newly qualified teachers must have highly developed literacy, numeracy and Information Technology (IT) skills” (Government of South Africa, 2011, p. 56) and also that “the utilisation of ICTs for innovative teaching and enhanced learning” (ibid., p.12) must be addressed as part of the fundamental learning underpinning the acquisition, integration and application of knowledge for teaching purposes.

Some of these frameworks include elements that relate to different dimensions of teaching as a professional domain while detailing various levels of expertise. In this regard, the Pan-Commonwealth TCF addresses the use of educational technology as part of the

‘Professional Knowledge’ that all teachers need to acquire at pre-service stage, as well as part of the collaborative work they are expected to do in-service with the aim of fostering conducive learning environments (see Table 1).

Likewise, Myanmar’s TCF includes a competence standard devoted to educational technologies, according to which educators across all levels (early years, primary and secondary education) are required to be able to “Demonstrate understanding of appropriate use of Information and Communication Technology (ICT) in teaching and learning” (Government of Myanmar, n.d., p. 30). More specifically, it contains three indicators relating to the ability to a) describe the function and purpose of educational tools and materials to support the teaching and learning, b) evaluate and match available tools and materials to curriculum content and pedagogical strategies, and c) describe and demonstrate the understanding of basic concepts and principles of media and information literacy.

Overall, TCFs approach digital technologies as something that enhances learning and, therefore, require educators to know how to make use of them as part of their professional practice. The overall optimistic view on the potential of technology prevailing in TCFs is exemplified by the following statement from Hong Kong’s TCF: “They [teachers] subscribe to the use of cutting-edge technology to help students employ different learning modes that take advantage of digital transformation.” (Government of Hong Kong, 2015, p. 8). While over half of the frameworks (n=13, 54.2%) somehow include elements of criticalness, mainly expressed in terms of critical thinking, only a handful (n=6, 25%) do so – at least explicitly – in relation to ICTs, by introducing competencies that can be regarded as manifestations of critical digital literacy. For example, critical engagement with ICTs is referred in the

Category of professional standard	Standards	Initial	Proficient
Professional knowledge	Knowledge of ICT including a wide range of new technologies (PK11)	Demonstrates an understanding of technological concepts and effectively utilises technologies to support teaching	Demonstrates an understanding of technological concepts and effectively utilises a range of technologies to support teaching knowledge of selecting appropriate curriculum materials and integrate them into lesson planning and implementation
Professional leadership, community and relationships	Create conducive learning environment through the incorporation of new technologies (PLCR8)	Utilises new technologies in lessons; works with colleagues to implement new technologies	Identifies and utilises new technologies in lessons; works with colleagues, communities and stakeholders to implement new technologies

Table 1 - Elements related to ICTs in The Commonwealth’s *Standards Framework for Teachers and School Leaders* (Gallie & Keevy, 2014).

Countries, regions	Mention
United States	“As participants of a larger world, the students of accomplished teachers recognize the effect that their actions have outside the classroom. They therefore develop civic responsibility and digital citizenship, becoming aware of how their actions affect others.” (National Board for Professional Teaching Standards, 2016, p. 16)
Chile	“[educators] provide opportunities aimed at supporting students in the development of abilities that are needed in order to become digital citizens capable of solving relating to information, communication and knowledge, as well as legal, social and ethical dilemmas in a virtual environment” (Government of Chile, 2021, p. 41, authors’ translation)
Quebec, Canada	“the use of digital technologies, with all the benefits it has to offer, also creates challenges and has made inroads in the education world, thus confronting teachers with phenomena relating to citizenship in the digital age.” (Quebec Ministry of Education, 2021, p. 17)

Table 2 - Mentions of “digital citizenship” in the TCFs analysed.

United States’ framework, as it indicates that “accomplished teachers position themselves as critical users of technology, ensuring that it is employed to enhance student understanding” (National Board for Professional Teaching Standards, 2016, p. 23) or in the case of Argentina’s framework, which stresses the importance of critical and creative appropriation of digital resources (Government of Argentina, 2018, p. 6).

Interestingly enough, India’s framework is one of the very few cases raising concerns about the hype and naivety that too often surrounds policy making in relation to educational uses of technology (Facer & Selwyn, 2021), calling for a critical engagement with ICTs:

“With the onset and proliferation of Information and Communication Technology (ICT), there is a growing demand that it be included in school education. It has become more of a fashion statement to have computers or multimedia in schools, the result being that in spite of its potential to make learning liberating, its implementation is often not more than cosmetic. It is also often touted as a panacea for shortage of teachers. These are detrimental to the learning of the child. Teacher education needs to orient and sensitize the teacher to distinguish between critically useful, developmentally appropriate and the detrimental use of ICT. In a way, ICT can be imaginatively drawn upon for professional development and academic support of the pre-service and in-service teachers.” (Government of India, 2009, p. 14)

Despite the key role of teachers in shaping the future societies, as they are responsible for educating tomorrow’s citizens, the terms ‘citizenship’ or ‘citizens’ are only mentioned in 10 out of the 25 frameworks (40%). For example, in Kenya’s framework it is part of the professional values and behaviour standard for teachers, referring to the teachers’ mode of conduct,

ethics, high standards of commitment towards their professional role and promotion of good citizenship. Beyond citizenship in relation to particular countries or societies, the idea of learning to live in globalised and multicultural societies is also present in some frameworks. In this regard, Myanmar’s framework requires from teachers, as a minimum requirement, the ability to build students’ understanding of different cultures and global citizenship, while Hong Kong’s envisions teachers as global citizens who “enhance their knowledge of current issues in the local, national and global scene and relate their teaching and guidance to these issues” (Government of Hong Kong, 2015, p. 6).

Only three of those frameworks in the study that addressed civic education consider its intersection with technology, as expressed by the term ‘digital citizenship’. That means that just 12.5% of all the reviewed frameworks pay attention to such an important issue (see Table 2 above).

The regional TCF of Quebec, Canada, somehow adds a critical dimension to the notion of digital citizenship by referring to the key elements of the *Digital Competency Framework* of the Quebec Ministry of Education (2019), which stresses the importance of exercising ethical citizenship in the digital age.

TCFs are normative documents, in many cases with policy status, that set a vision for the professional attributes expected from all educators within the educational systems of a given territory. Looking at the way TCFs relate to the literature can help us gain insight into the grounding of those visions and the extent to which they are informed by research. In total, 13 of the analysed TCFs include a list of references (54.2%). While only some refer to relevant legislation, like South Africa’s TCF, others draw heavily from the academic literature. The Chilean TCF is by far the TFC in our sample with the longest list of references, with 165 documents including both policy documents and an extensive set of academic works. Besides this outlier, most of those TFCs cite less than 20 documents.

5. Discussion and Conclusions

Overall, the analysed TCFs lack a critical contextualisation of the role of technology in teaching and learning, not only in terms of the above-mentioned political economy, but also within local pedagogical cultures and needs, often simply linking back to the aforementioned transnational organisation mandates (e.g. frequent references to OECD guidelines). The articulation of digital competences included in these documents appears to be framed mainly in terms of instrumental use, coherently with the hegemony of human capital theory in educational policy (Marginson, 2019). Therefore, while it broadly argues for a critical and risk-aware use of technology, it does not further elaborate on what critical and risk-aware mean in this context, nor provides a more specific framing of criticality in digital contexts in terms of political-economic contextualisation, as discussed in the introductory section.

One aspect that seems to be particularly lacking across all these frameworks is therefore that of critical digital competences. None of the above-mentioned frameworks demonstrates an articulated critical perspective, or even a general awareness of the political economy of digital technology, be it with specific regards to teaching, or more generally with regards to contemporary societies. A recent initiative looks promising in this sense, the Critical Digital Literacies framework for educators derived from the Erasmus+ project “Developing Teachers’ Critical Digital Literacies” (Gouseti et al., 2021).

Though, as we have seen above, TCFs provide a meaningful degree of guidance in structuring the teachers’ role in formal learning contexts, part of the introductory argument of this paper is that the inclusion of digital technologies in teaching spaces and practices has blurred the boundaries of formal and informal to the point where competencies and pedagogies developed for the first domain are not necessarily sufficient for the newly emerging hybrid environment. Informal learning, defined by Livingstone (2006) as “any activity involving the pursuit of understanding, knowledge, or skill that occurs without the presence of externally imposed curricular criteria” (p. 206), can be triggered by work requirements or social interactions and involve support and motivation from others. Also, it can be useful to consider the intersections of informal learning and self-directed learning, where “self-directed informal learning per se is most simply understood as learning that is undertaken in the learner’s or learners’ own terms without either prescribed curricular requirements or a designated instructor” (Livingstone, 2006, p. 205).

Most of these competence areas are normally not integrated within existing TCFs such as those reviewed above, as they do not necessarily outline specific areas of knowledge nor skills in terms of measurable and outcome-oriented behaviour, but instead lean heavily towards critical values and attitudes towards the current

media ecology, inclusive of its political economy, which are contextualised and therefore harder to operationalise and standardise - going against the grain of current trends in educational policy making (Landri, 2022). The challenge is therefore that of moving away from pre-determined competence frameworks and towards broader and more inclusive concepts of digital literacy and digital fluency, while also preserving the focus, scaffolding and institutional interoperability that comes from structured approaches (Marín & Castañeda, 2022).

This is not to say that all teachers should become experts in those six dimensions of critical digital teaching competence: that should not be the responsibility of any individual educational professional, and indeed overreliance on individualised expertise is a problematic aspect shared by all the above discussed frameworks. What we argue for is rather a framing of teachers as professionals, and citizens, who are critically aware of the socio-technical ecosystems where they work and live, recognising the importance of these six aspects to live in contemporary societies. Likewise, we advocate for TCFs that go beyond individual qualities and professional attributes to promote the integration of teachers into broader informal, inclusive and responsive communities they can refer to when in need to address specific issues and contexts. This approach is explicitly political, and echoes Lankshear and Knobel (2003) and Burnett’s (2010) claims about the situatedness of literacy in its broader sociocultural and political contexts as an essential prerequisite to move beyond simple skills: to achieve a full connection beyond competencies and criticality teachers and students will have to actively engage in socio-culturally informed production of digital artefacts, and not merely replicate the status quo by consuming and integrating them.

Beyond education and professional practices, the digital is now an essential aspect of active participation in society and citizenship in the broadest possible sense of the term. However, while this has been accentuated by the proliferation of technology-mediated situations resulting from the pandemic, it is important to acknowledge that these dynamics are linked to longer-term trends. The idea of the ‘postdigital’ has gained traction over the last few years as a way of highlighting that digital technology is enmeshed in the fabric of society and everyday life to such an extent that it does not make sense to treat it as a meaningful category to label specific things or practices that are separate from the rest (Taffel, 2016).

Therefore, we argue that it would be more accurate to talk about postdigital citizenship, as the digital increasingly mediates key practices and behaviours that underpin civic participation in contemporary societies, even though neither access nor competence are evenly distributed. However, the way digitally competent educators are expected to support learners in their development as (post)digital citizens is not explored with enough attention in the literature (Örtengren, 2022) and it is virtually absent from TCFs.

Ortegren (ibid.) and Jandric et al. (2018) argue that the embeddedness and pervasiveness of digital technologies has an impact on the increasingly blurred boundaries between the different types of networks (technological, relational, social, political) citizens participate in. In particular, they problematise previously assumed boundaries – between the ‘real’ or the ‘natural’ and the ‘digital’ or ‘technological’ – as increasingly less useful analytical criteria when attending to current conceptualisations of citizenship. The postdigital perspective, acknowledging and articulating this blurring, provides useful conceptual tools to navigate it critically. In this regard, critical digital literacies become the foundation for what we call (post)digital citizenship. Following an introductory discussion of the ongoing global shifts in the digital landscape, and particularly the relevance of the shift towards postdigital understandings, this article has focused on how these changes are shaping education policy across the world, with a focus on their influence (or lack thereof) in re-defining the teaching profession.

With the aim of analysing TCFs to find out embedded critical digital literacies for teachers, this study reviewed 24 documents from around the globe. The results showed that critical digital literacies for teachers are still an unresolved issue across the world and calls for action to consider these literacies in their place, considering the situatedness of literacy.

As limitations, the authors acknowledge two central aspects. First, the study relies entirely on the analysis of policy documentation, in isolation from local histories, political landscapes, socio-economic considerations and pedagogical cultures. This limits us to taking the documentation at face value, foreclosing interpretive approaches, and missing the richness and pluralism of pedagogical praxis as developed in offline, online and hybrid classrooms across the world.

Second, the study relied on purposive sampling and was strongly bounded by accessibility and linguistic barriers (the authors can understand 6 languages to the level required for the analysis), inherently limiting the scope of the survey, which has very noticeable gaps in Eastern Europe, the Middle East and Asia.

Future work will consider addressing the above limitations, by triangulating documentary analysis data with primary research (e.g. interviews/questionnaires with policymakers and key staff from Ministries of Education, with teacher educators in teacher training programmes), so as to achieve a more comprehensive and detailed mapping not only of the philosophies and decisions behind teacher competencies, but of their implications for what happens in teacher training and school classrooms. The aim will be to generate impact on two main levels: a) target the classroom and/or institutional level, establishing what practical strategies and interventions might be deployed to promote a more active, cross-disciplinary and critical engagement with digital technologies (e.g. workshops and hackathons), and b) target the national/regional policy level and

develop more detailed and focused policy briefs and white papers to further highlight problematic gaps in existing legislation and frameworks, and propose ways to address them accordingly.

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Digital citizenship and invention: the ecosystem inhabiting of education for social transformation

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Abstract

The emergence of a pandemic world has tensioned the reinvention of many sectors. In the field of Arts, especially dance, professionals were affected by physical distancing, making shows impossible. As a result, the dancers were stimulated to a process of invention, exploring other sensations and ways of communicating art in a network. This article presents and discusses the co-creation process of a Social Technological Startup, from the ESTEAM perspective and connectively constituted in reticular movements, as an inventive process, from which two inventions emerged: projection mapped performance and dressing wearable technology, both co-created, assembling digital technologies in network, members of a social dance project, teachers and student from different field of knowledge and educational levels. From the cartographic method of intervention-research and based on contemporary theories, the results show that both the mapped projection and the wearables have significant potential to hybridize art and education, contributing to create learning situations that enable a greater understanding of spatiality and the body, as well as inventing new ways of experiencing dance, expanding the sensorial and the digital. The concept of wearables emerged from an inventive ecosystem, which was constituted in the field of education in connection with other areas of knowledge, intending to promote social transformation, through digital citizenship. The relevance of the research stands out, as long as it provided a digital thinking that co-engendered education, a social project, wearable technologies and dance, in the conception of a startup, in an ecosystem arrangement that problematizes the way universities also operate.

KEYWORDS: Digital Citizenship, Social Technological Startup, Wearable Technologies, Art, Education.

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1. Introduction

In recent decades, we have experienced a profound process of world transformation, enhanced by the expansion of computing capacity and digital networks. Digitalization, which transubstantiates the world made up of atoms, into bits, associated with connectivity, has provoked the emergence of hybrid realities, “arch-

connected” (Santaella, 2021), allowing us to live and coexist beyond the physical and geographical space. Today we inhabit different spaces and times with our avatars, we immerse ourselves into metaverses, we talk to bots, NPCS (Non Playable Character), intelligent communicative agents and robots. Our senses are amplified by the expanded connection of our bodies, connected to plenty of sensors, such as wearable technologies, provided by the “network of bodies”, coined by Matwyshyn (2019) as Internet Of Bodies (IoB). In this perspective, we show that our work, our learning, our creations happen co-engendered with all kinds of digital technology in network.

From a more practical perspective, it makes sense to predict, as studied by Accoto (2020) that IoT devices will turn into IOS (Internet of Senses), that is, a technology that will allow humans to “feel” the world

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through a “sixth digital sense”, which complements, enhances and expands the five traditional senses.

The nonhumans, as different contemporary theorists refer, among them Latour and Di Felice, make up with us a transorganic ecological network that constitutes what we call of “world”, and challenge us to think of new sensitivities and a “new social”. In this new social, many of the concepts we work with, no longer explain the (arch) hyper complexity of these new times/spaces. Di Felice (2017) problematizes both the concept of action and that of socio-technical network (Latour, 2007), since, according to him, we are no longer in an inter-(action) between humans and technical, but in a network, in connection with different entities (human and non-human) and diverse intelligences. Therefore, for Di Felice (2017), the connection and hyper complexity of this network, alter the communicative dimension, which is no longer understood as an informative flow and is understood as a “habitable condition”, in an ecological dimension, where different entities do not act any more, but establish with each other a connective dimension, which Di Felice (2017) calls “connective act”.

The transorganic perspective, in addition to a new perception of the world we inhabit, it also extends to our body lengthens and hybridizes with the digital. This understanding can be found as early as 1998, when Donna Haraway wrote the *Cyborg Manifesto* (2017), questioning a body, nowadays constituted not only by atom, but also by bit, and which continuously produces data, of different natures, which result in an immeasurable amount of data. Information. Therefore, we understand that the thinking of our time is constituted with the digital, it is a “thinking with”, which requires examining the thought (the conjecture / the conception) when referring to different contexts, such as education, health, entertainment, business.

What happens to Education, based on computational thinking, on code, which is the language of our time, and with the emergence of different digital platforms, which even extend to bodies, such as wearable technologies? The bodies themselves are transubstantiated on platforms, coming into life in different games, when inhabiting characters or even when inhabiting avatars in different metaverses. How Education has been thought in the face of the proliferation of “smart things” that live with us (Internet of Thing - IoT), “connected bodies” (IoB) and, of the metaverses, which have the power to create a “new social sensorium” and new horizons of experiences? Would this not be the new language of Education as well?

With this in mind, it is necessary to question the way in which we are appropriating this language, this “new sensorium”, to educate the new generations, so that they can understand, register and undertake, intervening in this world, in the perspective of operating social transformations. In this context, we bring the concept

of “digital citizenship”, which according to Di Felice (2020), can be understood as the expansion of rights and other participatory forms in a new type of common, connected and interactive between different entities, in order to reshape our idea of the human and of society itself. Since, it is based on a transorganic and unmediated idea of interactions, that is, it does not imply a sender and a receiver (Di Felice, 2020). Also, for Di Felice et al (2018) and Kerckhove et al (2022), educating for digital citizenship means educating for responsible participation, for conscious living and coexistence, in an increasingly connected world. Our task is, therefore, to learn how to build smarter networks, capable of thinking, creating/inventing and disseminating new solutions to social problems. These resolutions can emerge, from the perspective of a citizen education, in place of an education for citizenship, since we understand that citizenship is not something external, but rather, developed in daily living and living, not only linked to geographical spaces, but in a continuity to the virtual digital that constitute Cibricity today.

Ribeiro (2020) appropriates the term Cibricity and Schlemmer to refer to this hybrid city, which, from a physical, geographic space, made up of atoms, is hybridized with an infinity of digital spaces, therefore, made up of bits. In this hybridization, the different geographic spaces of the city are connected, extended and potentiated in different digital spaces (software, environments, platforms) enabling a co-engendered and atopic inhabiting, thus, involving the individual, biodiversity, technique, information and territory in the constitution of a network ecology (Schlemmer, 2020).

This way of understanding the territory, space and inhabiting led to the emergence of the concept of “econnectography”. according to Schlemmer and Di Felice (2022) econectography comprises the study of the connective movement between different surfaces, whether geographical or digital, constituting different spatialities, which form an ecology of transorganic connections, between human and non-human entities, constituting others/new spaces, informational, interactional, connective, networked, in flow. As it is distinct, according to Schlemmer and Moreira (2022), it is necessary to understand its virtuality (understood as power) so to transubstantiate the inhabiting of teaching and learning, which requires new epistemologies, new theories that make it possible to invent new methodologies and pedagogical practices.

Our moving about cities or cibricity, in an econectography, have taken place in an onlife perspective, that is, we inhabit this time-space, without the perception of the absence of a border, between being “on” and “off” (Floridi, 2015). And it is for this onlife context that the author understands that “rethinking and developing new forms of education are certainly among the most exciting challenges of our time” (Floridi, 2015, p. 22). The pandemic boosted the

“use of” DT (Digital Technologies) in education and served to demystify them, at a time when teachers became familiar with them, from the perspective of the “use” it becomes relevant to understand how to teach and how to learn in a reality hyper connected. For Floridi (2014), it will still take some time for paradigmatic changes to emerge, making a new type of education and sensitivity necessary for us to realize that the infosphere is a common space.

During the pandemic, in addition to teachers, professionals who make a living from some form of art, were severely affected by the need for physical distance. However, many artists, dancers, also reinvented themselves creating other ways of sensitivity and of communicating their art in a network. With the social project of dance, which is linked to this research, the group started to appropriate digital technologies, to continue to impact their community and take the art of dance, beyond the walls of their homes, creating digital dance spectacle in network. The present research sought to investigate the aforementioned group, in order to problematize new forms of citizenship that developed in connection, in order to co-create a startup with social impact and technological base in a pandemic period. In this context, it presents and discusses the co-creation process of a social technological startup – from the perspective of digital citizenship and education – inventiveness, experimentation, entrepreneurship and social change. This research perspective is based on a new concept of digital citizenship seen as an expansion of rights and other forms of participation in society, whose understanding of social also extends to non-human entities.” Understanding it, according to Di Felice (2017), as a “new citizenship”, plural, which takes place in a network, connecting, beyond the human, diverse entities in an expansion of rights and participation. Therefore, the creation of a “Social Technological Startup (STS)” emerges as a proposition, from the ESTEAM perspective (Entrepreneurship, Science, Technology, Engineering, Arts and Mathematics), which was constituted in reticular and connective movements, as an inventive process, of where two products emerged: a Mapped Projection spectacle and a wearable technology that we call “Wearable Pulsus”. Both co-created agencying digital technologies in a network, members of a social project, professors and student researchers, from different areas of knowledge and levels of education. The motivation, as well as the research context, its processes and results constituted the emergence of OnLIFE Education, connected in the present time, in a perspective of Pandemic Citizenship (Di Felice & Morais, 2021) or “Pandemic Cybercity”. In the next section, we present the materials and methods that guided this research.

2. Materials and Methods

The level of complexity and importance of the themes of citizenship and education, in a context of digitality and connectivity, has been studied by the research group, which has been conducting this investigation since 1998. These were the challenges highlighted in the latest research developed by the group, in what refers to social transformation, which promoted the development of the research that gives rise to this article. In the course of these investigations, since 2010, the Cartographic Research-Intervention Method has been appropriated, linked to the concept of invention (Kastrup, 1999), within the scope of reticular and connective epistemologies and of an atopic habitat (Di Felice, 2012), as long as potential for the development of inventive pedagogical methodologies and practices (Schlemmer, 2018), as well as a way to monitor and evaluate learning processes in hybrid and multimodality contexts, from the perspective of an OnLIFE Education (Schlemmer, 2020; Moreira & Schlemmer, 2020; Schlemmer & Moreira, 2020; Schlemmer, Di Felice & Serra, 2020; Oliveira, 2021; Schlemmer, Oliveira, & Menezes, 2021). From this perspective, in the section that follows, we present the cartographic method and the Workshop Design WEinPulsus device, suggested by the research as a inhabiting territory from which problematizations emerge and which it also produces inventive movements, from which there is a condition for the production of new realities.

2.1 Cartographic Research-Intervention Method

This investigation is characterized as qualitative, exploratory and descriptive and uses the Cartographic Research-Intervention Method proposed by Kastrup (2008), Passos, Kastrup & Escóssia (2015) and Passos, Kastrup & Tedesco (2016) as a “hodos-meta” for the production and analysis of research data. Cartography is a method to follow investigation processes, made up of “clues” that guide the cartographer’s work, to the detriment of “rules to be applied”, as found in more traditional methodologies. In view of this, we understand that in addition to “collecting data” in a “predefined” context, with cartography we “produce data” and reality (research context) in a territory in motion, that is, in a constant process of constitution. That is why the combination of “intervention-research”, that is, in the movement of following up the processes, “we produce data with different entities (human and non-human)” and we also constitute a research territory, inventing it, since it did not exist before the research, that is, it was not “pre-defined” in advance. We understand that, from the perspective of this investigation, inventiveness also emerges from the research method.

The choice of the method that, since 2010, has been appropriate by the research group who develops the

investigations, is justified as it responds to the challenges of following a path of production/invention (in the case of this research the co-creation process of a Social Technological Startup, from the ESTEAM perspective) as it occurs, understanding that all research is also intervention. As an intervention, it implies the – cartographer researcher inhabiting the experience that mediates subject and object, theory and practice, in the same production plan; while cartography, it implies the cartographer researcher tracing the plan of experience while he/she follows up the effects of the investigation path on the object, on the researcher him/herself and on the production of knowledge. The method considers the inseparability between knowing and doing, researching and intervening. It is also important to highlight the choice of this method, due to its coherence with the theoretical basis that guides the research, which co-engenders the concept of Invention (Kastrup, 1999), from the Reticular and Connective epistemological perspective (Di Felice, 2012) and an Atopic Dwelling (Di Felice, 2009). We consider that such a theoretical contribution co-engendered to the method is potent for the co-creation of inventive processes and products while developing inventive pedagogical methodologies and practices, as well as a way of accompanying and evaluating learning processes, in hybrid and multimodal contexts, in the perspective of an Education OnLIFE. Next, we present the movements of the cartographer's attention, which configures one of the clues of the method.

One of the clues of the cartographic method, guides the work of “attention of the cartographer”, that is, of the researcher, being characterized by four movements: Tracking, Touch, Landing and Attentive Recognition (Kastrup, 2007) and (Kastrup, 2019), as shown in Figure 1.

INTERVENTION RESEARCH CARTOGRAPHIC METHOD



Figure 1 - Four movements of the cartographer (Kastrup, 2007; 2019) - Adapted by the authors.

Tracking is characterized by the exploration/scanning movement of a research field, it is a flight whose attention is open and unfocused (Kastrup, 2007). The Touch movement is the one that is triggered when something in the field of observation calls the researcher's attention, putting him on alert, that is, a quick sensation, something that happens and demands attention. When a specific point is analyzed more closely, a stop in the general perception and an approach (zoom) of a specific element, the cartographer's attention triggers the third movement, called Landing. After noticing that object/individual/thing that has been detached from the whole, a “magnifying glass” becomes necessary to approximate the details. The fourth movement, called Attentive Recognition, is configured as the activation of a detailed and investigative look at what caught the cartographer's attention and motivated the landing previously. In Attentive Recognition, the space of observation is reconfigured, while the researcher performs the analysis of the data produced and there is the emergence of new knowledge.

It is important to highlight that in the course of the research, these movements may happen in sequence, as described in Figure 1, but they may not complete this cycle either, that is, the researcher may do an exploration (tracing) and not have any element that touches it in that context. However, this attention cycle when materialized, metaphorically assumes the form of an ascending spiral, since with each attentive recognition, new knowledge emerges about a certain research context.

The Cartographic Research-Intervention Method is not just a phase in an investigation process, but permeates the entire process of constituting an existential territory that will be inhabited by a research. Which implies understanding that the “methodology” was not “applied” at a given moment of the investigation when a researcher “observes” a field and “collects data” about it. This is an important point to be highlighted, since this research differs from “traditional” research, in the sense that it was not developed in phases but, in an ecosystemic, connective and reticular perspective, connecting different entities (human and non-human) and their networks, as they emerged in the course of the investigation and constituted the existential territory of the research. In this sense, for the authors De Barros and Kastrup:

“Unlike the method of modern science, cartography does not aim to isolate the object from its historical articulations nor from its connections with the world. On the contrary, the objective of cartography is precisely to draw the network of forces to which the object or phenomenon in question is connected, accounting for its modulations and its permanent movement” (De Barros & Kastrup, 2015, p. 57).

The research work with cartography is done through the engagement of the one who knows, in the world to be known, that is, when researched and researcher are in an existential territory, cultivated by investigation (Alvarez & Passos, 2015). In this research, the existential territory will be constituted as the immersive WEinPulsus Design workshop, described in the next section.

2.2 WEinPulsus project Workshop - Wearable and Education in Pulsus

In 2020, the social dance project was invited by the authors of this article to participate in an Entrepreneurship Hackathon, in order to start a movement to think about a STS. It has the purpose to enhance the performances of the aforementioned dance group, since they were reinventing themselves in the online context, due to the coronavirus pandemic that prevented them from performing shows with physical presence. This participation made us realize that the concept of “social technology” is reinventing in the online context. This participation made us realize that the concept of “social technology” that we were constituting was still far from a product, a “startup” or a pre-incubation/incubation process outlined by that event. And, although away from our theoretical and epistemological conceptions intended for the conceptualization of a “social technological startup”. Our participation in this event, as a proposed intervention in the research movement, was of singular importance, considering that it stressed us in two ways: a) to problematize this model of constituting a business. We understand that a possible future incubation could happen in a network, not requiring a physical space, geographically located, which would imply payment of fees, for its occupation; b) why a problem emerges from this event, that is, we invent a problem – we conceived a wearable technology. However, to become reality, as an invention, it would need to be “cultivated”. For Luiz Orlandi, so that a problem could emerge as an invention, it is necessary to “create lines of solution and constitution of devices that enhance its emergence” (Kastrup, 1999, p. 11) In this sense, in the context of this research, the Project WEinPulsus worknderstood as a connective and collective research territorshop was proposed, as a place where the problem was fostered. The WEinPulsus Design Workshop is ury, which was invented in the course of the research, permeated by the movement of problematizations that were emerging, by the interventions that were being provoked by the different entities (human and non-human) that agency the process and the cartographic attention of the researcher (Kastrup, 2007; 2019). It is characterized as a “space-time-code” that, over 10 immersive encounters, was constituting a territory of investigation, from which an inventive, ecosystemic and reticular process emerged, articulating undergraduate and graduate students, a social dance project, research

professors and; as non-human entities, digital network technologies such as WhatsApp, Microsoft Teams, Evernote, Google Jamboard, Miro, Tinkercad, Arduino prototyping board, sensors, fabrics (textiles and biomaterials), images, dance, choreographies, photographs, that is, those entities that left traces (digital or physical), as highlighted in Figures 2 and 3.

The meetings took place mostly completely online, since we were in a period of physical isolation, caused by the coronavirus pandemic, inhabiting the Microsoft Teams platform. However, we managed to hold two meetings in the physical space of the University, in the hybrid perspective, that is, some subjects were physically present at the place while others were online and some spaces were transubstantiated to digital. We understand that WEinPulsus, in addition to being an action-only device (human intervention), were meetings and connection, which articulated: a) students and teachers of different educational levels (Basic Education, Higher Education and stricto sensu) from different fields of knowledge (Education, Physical Education, Arts, Design, Electrical Engineering, Computing, Management); b) a social dance project (where two members who participate in the project as dancers and choreographers, (undergraduate students in Physical Education); c) imbricated with three research projects (Education and Design).

We understand that both the inventive process and the products that emerged from it, such as the Pulsus wearable technology and the Mapped Projection, are inventions, co-creations that are implied by theoretical concepts and by an “inventive policy” (Kastrup, 2008; 2019). These can be appropriated, expanded, reinvented in other educational processes and instigate the invention of new pedagogical practices, expansion of learning spaces to digital, rethinking formative processes and appropriating other wearable technologies (off-the-shelf products/technologies). In the context of this existential territory, entities of different natures, materiality or transubstantiality are acting in the inventive process, in the research movement. And it is constituted in several ways, as a collective and connective space of intervention, expression, sharing of experiences, co-creation, co-engendering and consequently of invention and, from which emerges the concept of “Social Technological Startup” in ESTEAM perspective, which involves a projection-mapped spectacle and wearable technology, described in the results section.

3. Results

With regard to digital citizenship and inventiveness, in this investigation we presented as results, the emergence of a “Social Technological Startup” in the ESTEAM perspective, consisting of two products

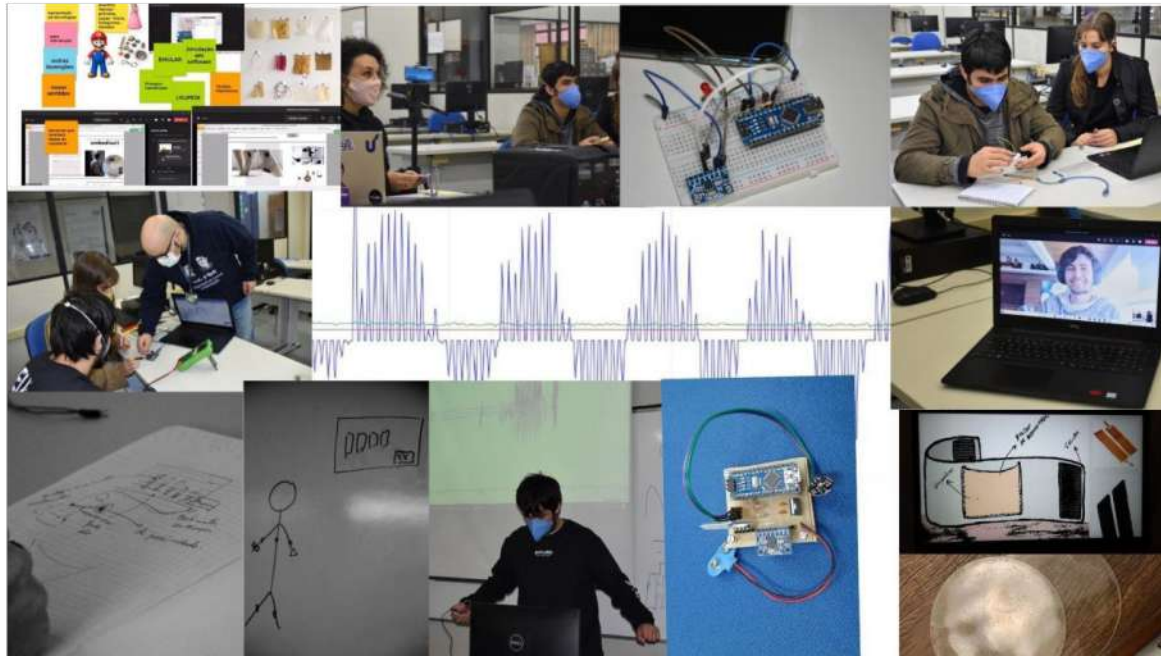


Figure 2 - WEinPulsus Design Workshop and the inventive process from which Pulsus wearable technology emerges.
 Source: research archive.

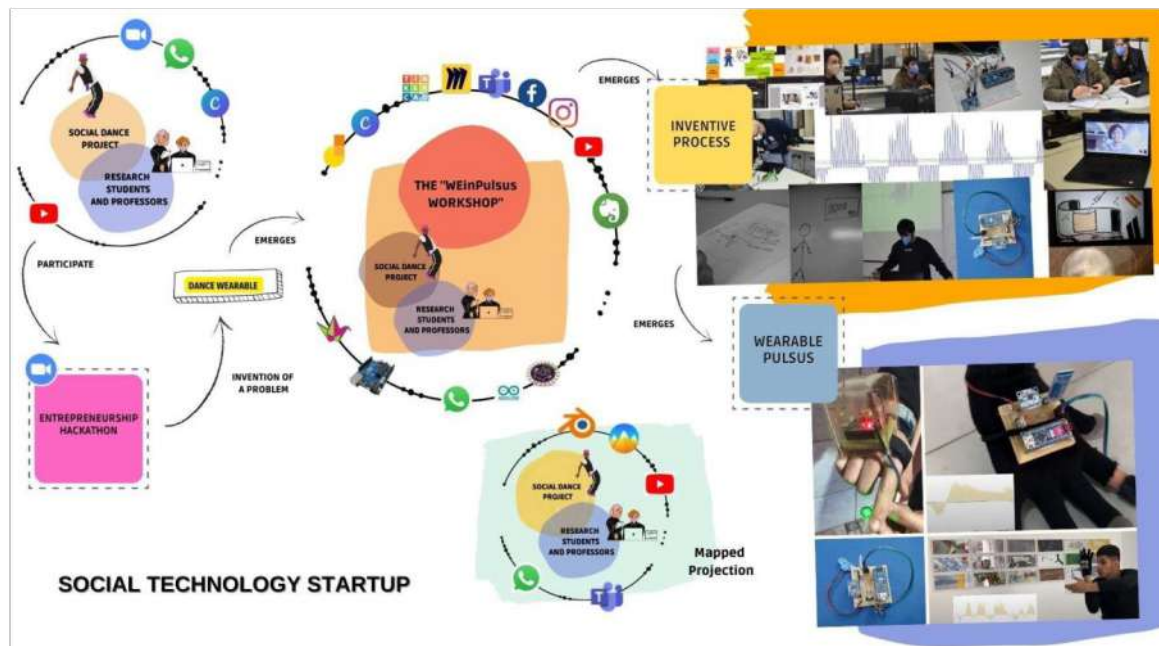


Figure 3 - Context of the “Social Technological Startup”.
 Source: research archive.

(inventions), in the context of dance: a Mapped Projection spectacle and a wearable technology, both in the sense of expanding the actions already developed by the social dance project and enhancing the possibilities of spectacle developed by it, in a pandemic period and beyond.

In Figure 3, we present the context of the emergence of the Social Technological Startup and in it we detail aspects of inventions as the entities involved and the

inventive process of their constitution. The mapped projection spectacle was the result of a co-creation process, which originated with a training carried out by the research group that conducts this investigation with the members of the social dance project, so that they could appropriate Blender technology, which enables the modeling of 3D scenarios. The qualification of the involved students from the final grades of Elementary School at a municipal public school, located in a socially vulnerable zone, which members of the



Figure 4 - Presentation of the Dance Social Project with Mapped Projection co-created by them in coupling between digital technologies and bodies.

Source: research archives.

aforementioned social dance project are also studying. Throughout the training, participants learned different 3D modeling and animation techniques, developing the skills needed to create mapped projections. This knowledge resulted in the composition of the spectacle, as shown in Figure 4.

With regard to Pulsus wearable technology, the concept of a STS emerged, in the research-intervention movement, when the collective participated in an “Entrepreneurship Hackathon” (in November 2020) and their immersion in the WEinPulsus Project Workshop (March to August 2021). In Figures 5 and 6, we present the Pulsus wearable technology (in prototype), configured as a glove, whose functionality is to capture the dancer’s movements, in relation to the axes (X,Y,Z) when he performs a choreography. In coupling as an agency of the dancer’s body, choreography and Pulsus wearable technology, together, an entity human and non-human, produces an aesthetic expression.

These products and the inventive process involved in this research constitute the movement of collective research and connectively articulating dancers of a social project, research professors, different digital technologies in a network in order to expand its social reach and who knows, in the future, establish- if economically, in digital, providing the public with another sensitivity, in coupling of different connected intelligences.

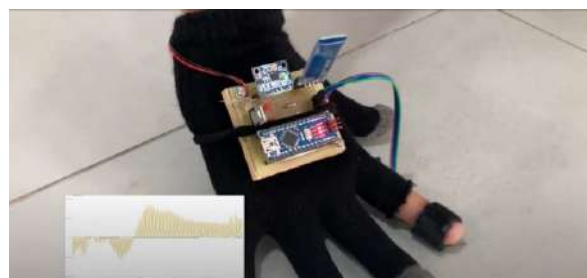


Figure 5 - Wearable Pulsus (prototype).

Source: research archive.

4. Discussion and Conclusions

Regarding to digital citizenship and inventiveness, in this article we present and discuss the conception of a STS, from the ESTEAM perspective, which culminated in a spectacle of mapped projection and the prototyping of Pulsus wearable technology. Both were co-created by managing digital Technologies in network, members of the social dance project, students and teachers from different levels of education and areas of knowledge, as well as researchers from different postgraduate programs. In this sense, we understand that we have developed an inventive process, supported by contemporary theoretical-epistemological and methodological conceptions that problematize digitality and connectivity in education, from the perspective of OnLIFE Citizen Education (Schlemmer,



Figure 6 - Choreography, Wearable Pulsus and an Aesthetic Expression produced by the “coupling as agency” between dancer (body/dance) and wearable.

Source: research archive.

2020). This, understands digital citizenship as something that is lived and experienced in the reticularity, through the continuous connectivity between humans and non-humans, in a world more and more hyperconnected. Therefore, it is not an education “for” digital citizenship as if it were something external to us, since it is no longer understood as something external and starts to be developed in living and coexisting in different spaces and times.

The path that we constituted in this research involved what Di Felice and Morais (2021) called “pandemic citizenship”, since we were forced to inhabit an infected world. We were forced to “inhabit informative geographies and experience distant proximities” Di Felice and Morais (2021, p. 275). And, in this sense, we reinvent ourselves in the face of this new complexity that was presented to us by the cruel pedagogy of the virus. For the research group that conducts this research, this pandemic scenario presented a territory of investigation and encouraging inhabit to the studies that had already been developed since 1998, about digital technologies and education in a social and citizen perspective. For the social project of dance, the pandemic presented limitations, but that awakened in them other perspectives of acting through the digital network.

Regarding the mapped projection and the Pulsus wearable technology, we understand that both constitute an interactive attraction to the spectacle, which provides a differential for the choreography and costumes of the social project of dance. In their constitution process, they intended to empower the dancers themselves and the community, in the sense

that they could appropriate digital technologies and co-create them, in partnership with other entities (human and non-human), developing autonomy and authorship, as well as sustainability and innovation to the process of creating their spectacle.

With regard to the results of this investigation, compared to other studies, we can underline, in an analysis perspective, implications about the methodology that we conducted this study, digital technologies, the inventive process from which products emerge and the inventions themselves: the spectacle of mapped projection and the Pulsus wearable. We understand that in this research, unlike other investigations that follow more traditional methodological approaches, with pre-defined procedures and processes, we co-created a disruptive, ecosystemic and transdisciplinary movement, based on the appropriation of the cartographic method of research-intervention, which allows us to think and conduct a study. It demanded the meeting between researched and researchers, who together co-created an existential territory, where research can be cultivated. Tensioning the traditional representation or processing of information about a supposedly “pre-defined world”, when at each meeting we invented the existential territory of the WEinPulsus workshop, in the movement of problematizations that were arising and we were co-creating an inventive process and a wearable technology. We also understand that the WEinPulsus workshop emerges from this investigation as an “inventive pedagogical practice”, as an alternative to the current practices prevailing in teaching and learning processes in an online context.

In relation to digital technologies, from a pedagogical point of view, we understand them as partners in the learning process. In our research, they are understood as distinct intelligences, coengendered with humans, as environmental forces. To the detriment of research that uses them as mere “tools”, in an exclusively “use” perspective. In this sense, we can still problematize, in relation to other researches, the field of wearable technologies, which make use of ready and closed wearables (of the shelf type) such as glasses, watches, industrialized clothes or action cameras.

In this investigation, we present a study about the cocreation of wearable technology, from the perspective of invention. Therefore, we understand that we have ascended other researches, which investigate from the perspective of “use of”, to the context of “appropriation” and invention. We understand the appropriation of wearable technologies as supporting and potentiating inventive processes, when we incorporate them into inventive learning processes. However, in this research we understand that we moved forward in relation to other studies in the sense of the invention.

This perspective can be followed in the inventive path, pointed out in Figures 2 and 3, from which Pulsus wearable technology emerged. In this way, wearable technology is co-created, in the context of electronic fabrics (e-textiles) involving design and conception (process), from an inter/multi and transdisciplinary perspective rather than the “use of” ready-made wearable technologies. Regarding the limitations of the research, we highlight that: The emergence of the STS happened even in the face of a pandemic period that it affected many contexts significantly worldwide. For our research, it presented aspects that could have limited it, since we were prevented from physically meeting in the same geographic space, whether the University, the laboratories, the city or the headquarters of the social dance project. However, we understand that digital technologies and communication networks have potentiated and expanded the possibility of articulating ourselves in a network, and the configuration that the meetings were assuming allowed all to experience an inventive, immersive, connective and mobilized work format. by the problematizations that were emerging in the research movement.

The meetings, in turn, took place without cost, without physical translation, without needing a physical space to co-create and, sometimes, not even physical materials, considering that they were transubstantiated to Classcraft, Microsoft Teams, Youtube and Whatsapp, by the which the training process for the cocreation of the mapped projections was developed and; more specifically in the context of the cocreation of wearables, Tinkercad, which is an online technology that simulates analog and digital electrical circuits (Autodesk, 2021), in addition to other technologies that were engendering during the course. As we were in

physical isolation and without work or academic activities, there was time available to engage in the activities we developed, both related to training in mapped projection and the WEinPulsus workshop. During this period, it was possible to make several connections with students and research professors from different areas of knowledge, in the sense of mentoring our inventive process, in order to provide knowledge that was necessary, in the movement of problematizations and research.

It is important to mention that Pulsus wearable technology is in the prototyping phase, but we hope that soon, the social dance project will be able to appropriate this social technology in order to bring creative, economic, social and environmental benefits to its community. However, from the perspective of inventiveness, we understand that these limitations inaugurate new problems, that is, they create space and problematizations for a new inventive process and the potential for innovative solutions to problems, thought collectively and connectively, in a network.

As the research group has already been carrying out investigations towards a Connective Innovation Ecosystem in Education; Schlemmer, Morgado & Moreira (2020), we believe that we have a favorable territory for the emergence of a STS that depends on the articulation of several areas, knowledge such as technology, management, law, economics, design. In this sense, we continue in a constant process of articulation to expand the potential for creating new products. It is important to highlight that the characteristics of a wearable technology also imply interdisciplinary and transversal areas, to the knowledge provided by an educational institution, such as strategic design, physical education, computing, electrical engineering, art, social entrepreneurship, which need to be mobilized and articulated with other fields of knowledge beyond the University.

It is important to mention that in addition to the perspective of the University’s habitat related to a campus, being physical, geographically located, or even digital, made possible by traditional technologies such as VLEs and, more recently, by platforms such as Microsoft Teams, Meet, Zoom, the possibilities of the Metaverses, the Internet Everything (IoE) or the Internet of Senses, which enhanced lifelong learning, in different times and spaces. It also provided the constitution of transorganic networks that favored the overlapping between spaces -formal and non-formal times of education, helping to minimize the dichotomy that previously existed between the place destined for knowledge (socially recognized institutions for this purpose, therefore, educational institutions) and places for its “application” (the world of work). This requires from educational institutions, especially Universities, a process of reinvention, so that they can maintain their social relevance in a hyperconnected world.

The inventive process that gave rise to STS, from the ESTEAM perspective, emerged in transorganic connective acts (between different human and non-human entities). These connective acts, as an act and, therefore, unrepeatably, were forming in a particular way with the collective that was built. Thus, it is not a methodology or technique to be applied, but a process to be developed. Inspired by the Cartographic Research-Intervention Method, we understand that the process developed can provide clues that can guide other inventive paths. It is important to mention that due to the pandemic, it was possible to experience the process of cocreation of a STS, from the ESTEAM perspective, in a network, which was becoming an atopic habitat. It should be pointed out that, initially, the proposal was to incubate it in a technology park, with a defined physical location, which would imply different costs related to physical infrastructure, translations, among others. With the pandemic, in addition to the challenges, possibilities emerged, opportunities that also instigated the invention in the sense of thinking a STS-ESTEAM in a reticular and connective architecture, which develops in an ecology of transorganic connections, constituting other/new spaces.

We understand that the results originated from the research expand the knowledge in the area as we invent a wearable technology, from the perspective of cocreation, which presents the concept of “coupling as agency”, where the dancer creates the technology and the technology transubstantiates the dancer’s movements in an implied aesthetic expression of art, sensors and where creator and creature are co-generated. A technology that allows for a “new sensorium” or “a new sensory apparatus” (Accoto, 2020), expanding our ability to perceive the world and straining a look at our body as a network.

The results, in addition to problematizing, expand the understanding of startup, which in the research is co-generated with the concept of social technology in a STS-ESTEAM perspective and is structured and developed in a connective network, without the need for a physical space, geographically located to exist. The network also expands and connects, according to the demands of its movements, some geographic spaces, such as: the place of production of choreography, costumes, laboratory at the university, residence of dancers, teachers, researchers, venue of the show, among others that may be necessary to achieve your goals.

The conception of a STS in the ESTEAM perspective, not only creates an ecosystem for connection, experimentation and inventiveness on the part of the entities that constitute it, but also establishes a favorable territory for the development of entrepreneurship in the social and citizen perspective, from the empowerment and for the collective and connective construction of knowledge.

In this article we presented and discussed the cocreation process of a STS, from the ESTEAM perspective articulated to the concept of digital citizenship and inventiveness. In the research, stressing the very concept of citizenship, as the potency that emerges from it, through the digital network. We understand that when producing investigations from the perspective of digital citizenship, we problematize our actions, now connected to different entities and we can create learning situations that can educate for responsible participation where there is space for collective and inventive thinking, which allows us, in a network and partnership with other intelligences to create innovative solutions to social problems.

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Online working amid COVID-19 pandemic. The role of emotional intelligence as aggression de-escalator: research reported from Islamic Republic of Pakistan

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Abstract

World has transformed to a new era after the outbreak of a virus named COVID-19 in late 2019, a virus that consequently spread worldwide, forced the governments to declare smart, partial, or complete lockdowns. The constant and prolonged lockdowns resulted in the uncertainty over disease status, inadequate information, food supplies and boredom that led to anger and confusion, emotional breakdowns, and development of aggressive behaviors. During the pandemic and constant lockdown, one of the major differences in day-to-day activities was the transformation of the working and learning environment from the physical to the online realm. The prime objective of the study is to highlight that during pandemic how transferring towards online working helped people to stabilize their emotions, anxieties, aggressions, anger and frustration. The study is designed to find out how online working has negatively connected with the development of aggression and how emotional intelligence has mediated this effect. The study design is non-experimental, correlational and comparative, followed by quantitative research analysis. The survey technique used in the data collection process where validated and reliable questionnaire were used for data collection and hypothesis testing. A sample size of 233 (144 females, 88 males, 1 participant did not disclose gender) participants from the metropolis city of Karachi participated in an online survey. Results have indicated that engaging people in online working improved mental and emotional stability as well as the suppressed level of direct, indirect and displaced aggression. Moreover, emotional intelligence has acted as a negative influencing mediator towards different forms of aggression, where an expansion in online working, positively impacted emotional intelligence and negatively co-related with direct, indirect and displaced aggression. No gender difference is found in terms of emotional intelligence, however, a distinctive difference in terms of indirect and direct form of aggression is reported. It is concluded that emotional intelligence is acting as a mediator between online working and direct, indirect and displaced aggression. It means that engaging people in online working helped to stabilize themselves in terms of emotions and helped them to control their anxieties during isolation.

KEYWORDS: Online Working, COVID-19 Pandemic, Emotional Intelligence, Direct Aggression, Indirect Aggression, Displaced Aggression, Islamic Republic of Pakistan, Pakistani Study.

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1. Introduction

The world has transformed to a new era after the outbreak of a virus named COVID-19 in late 2019, a virus that consequently spread worldwide (Chinazzi et al., 2020). Throughout the world, this pandemic forced the governments to declare smart, partial, or complete lockdowns, for the governance of the health contingencies (Fahriza et al., 2020). Constant and

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prolonged lockdowns resulted in inadequate information, food and supplies (Ahmed et al., 2020) led to anger and confusion (Brooks et al., 2020). Sundarassen et al. (2020) reported that the prime aggravations during the pandemic were economic crises, remotely professional and academic engagements and uncertainty about the future with regard to academics and career. Similarly, Chinese level of depression, stress, and fear raised during lockdown (Duan et al., 2020). From an economical point of view, many businesses were ruined such as airlines, hospitality, hotel, and the manufacturing industry. Millions of people in these sectors lose their jobs and caused enormous disruption in businesses (Kaushik & Guleria, 2020).

Due to the pandemic, people developed fear towards invisible disease and an experience of helplessness. These perceptions developed into frustration, agitation, trauma, and violence that led to aggression accessions (Mazza et al., 2020). The fear resulted in the development of chronic emotional stress introducing unfavorable biological impact on people (Bogin & Varea, 2020), with harmful effects on both the psychosocial aspect and mental health (Liang et al., 2020). Chandra (2020) reported that lockdown measures were somewhat responsible for creating a disruption among the people.

Similarly, like adults, the COVID-19 pandemic resulted in a wide range of annoyances on young children, with the terror of the contagion, limited physical interactions, boredom, inadequate information, absence of personal space at home, and family's financial loss. It is reported that emotional stress during COVID 19 in children appeared in the form of clinging, agitation and aggression (Shorer & Leibovich, 2020). In addition, parental stress has also arisen during this pandemic (Brown, 2020), as a result parent-child wellbeing was also suffered (Gassman-Pines et al., 2020). It is concluded by Mazza et al. (2020); Shorer and Leibovich (2020), circumstances during COVID-19 resulted in the development of aggression, anger, anxiety among both adults and children.

To overcome, financial loss and help people to encounter unexpected circumstances, switching towards online working and learning was considered as a key factor that contributed towards acceptance of the situation followed by planning in a new era and using technology-oriented work as a distractor. To overcome, loss of education and to meet objectives designed for an academic year, the disproportionate rise of e-learning was observed where academic tasks were undertaken remotely and on digital platforms. The Higher Education Commission in Pakistan ordered Universities to conduct online classes to overcome any academic losses and to meet educational goals designed for the academic year or semester (Today, 2020). In the same way, administrations of schools and colleges introduced online classes so that education would not be compromised and face-to-face teaching was shifted towards online teaching (Abid et al., 2021). In

continuation, other businesses also moved towards online services such as advertising companies, food delivery services, online grocery stores, telemedicine housing, etc. (Hashim, 2020; Rehman, 2021; Nagra et al., 2021). Uzzaman and Karim (2017) have supported the fact that respondents showed a reduced negative emotional outburst when associated with technology-oriented tasks. In this way they were able to divert negative feelings into different constructive activities. During pandemic engaging faculty in online working also showed positive results with Indian faculty members. A study conducted with Indian faculty members showed an above-average level of emotional intelligence in the COVID-19 pandemic (Baba, 2020) when physical on-campus classes were suspended and routine tasks were completed through other means. MacIntyre et al. (2020) reported that the fear and anger developed due to lockdown situations were controlled by engaging people in online working which has not only helped for stabilization of economy as well as it has brought positive impact on human psychology, emotional stability and helping people in coping stress, where engagement with online environment demonstrated acceptance of the situation and distractions from negative thoughts resulted due to uncertainty.

Emotional intelligence is defined as "A type of social intelligence that involves the ability to monitor one's own and others' emotions, to discriminate among them, and to use the information to guide one's thinking and actions (Salovey & Mayer, 1990)", whereas Emotional Stability is the aptitude to persevere emotional balance under challenging circumstances. Abdel-Fattah (2020) expounded that emotional intelligence is directly associated with emotional stability and people with a higher level of emotional intelligence show better emotional stability. Researcher further explained that we use emotional intelligence when empathizing with coworkers, speaking deeply about our relationships, or managing an unruly or distraught child. Living a more authentic, healthy, and happy life requires connecting with others, understanding ourselves better, and understanding others. Therefore, online interactions allow people to use their emotional intelligence to empathize with others and provide moral support, thereby contributing to stability and acceptance of a transforming era.

Emotional Intelligence (EI) has also been discussed in multifold researches in relation to aggression control and has proven to be effective in controlling unwanted unfriendly behavior outbursts. (Brackett et al., 2004; Bibi et al., 2020; Castillo et al., 2013; García-Sancho et al., 2014; Masum & Khan; 2014). Moreover, several studies have highlighted that emotionally intelligent people have a tendency to overcome aggression developed due to anger and anxieties (García-Sancho et al., 2014; Masoumeh et al., 2014; Shahzad et al., 2013). In this study, the repercussion of online working in addition to emotional intelligence is associated with aggression and its subtypes. Aggression is defined as an

unacceptable behavior that is planned to damage or property or harms an individual (Baron & Richardson, 1994). Aggression has been further classified into many subtypes but in the current study three main expressions of aggression are used for annotation. Direct aggression, a behavior that provokes the person to retaliate face to face through physical or verbal means and the individual is ready to risk a direct confrontation (Richardson & Green, 2006). Indirect Aggression as explained by Buss (1961) is retaliation when a person is not ready to disclose its identity against the provocateur. A relatively contemporary reflection of aggression is displaced aggression which is defined as the behavior when a person instead of direct confrontation, displays aggression against an innocent target (Denson et al., 2006).

Previous researches have reported that online engagement and online support systems, when used effectively, have positive effects on emotional stability and emotional intelligence (Chandra, 2020). Similarly, increasing emotional intelligence has been shown to be a strong factor in controlling aggression and its consequences (Bibi et al., 2020). However, the present study seeks to understand how these factors interact during the pandemic, when a sudden shift to online tasks was imposed and high levels of anxiety and aggression were repeatedly reported (Mazza et al. 2020; Shorer & Leibovich, 2020). In this paper, the researchers attempt to show that emotional intelligence can be an effective tool for controlling anxiety and was equally effective during the pandemic.

The positive outcomes of online engagement in different settings are reported globally but in order to evaluate the circumstances in Pakistan, this study was devised. This research study is designed to explore that during pandemic how transferring towards online working and learning helped people to stabilize their emotions and how emotional intelligence helps to control anxieties, aggression, anger, and frustration. Moreover, it is reported that the level of emotional intelligence and expression of aggression varies with gender (Ahmed et al., 2019; Siddiqui et al., 2021a). This study is also intended to conceive the influence of gender differences on emotional intelligence and aggression during the pandemic lockdown.

1.1 Purpose

In the midst of the COVID-19 pandemic and constant lockdown, one of the major differences in daily routine was the transformation of working and learning from the physical to virtual realm, which led to social distancing and a sense of solitude. When interactions with humans were forbidden, anxiety and aggression levels increased. Since we are social animals, and for emotional stability, interacting with people is crucial, which was initiated through online networking during the pandemic. The study is designed to find out how this online working has correlated with the development of aggression and how emotional intelligence has mediated this effect. A

correlational study with quantitative approach was carried out with reliable and valid questionnaires through an online platform to investigate associations without manipulating or controlling variables. A correlation reflects the strength and direction either positive or negative of the relationship between two or more variables (Bhandari, 2021).

2. Literature review

2.1 Introduction to online working and its negative consequences

To overcome, loss of education and to meet objectives designed for an academic year and to control economic crises the distinctive rise of e-learning and online working was observed where teaching, learning and other professional assignments were undertaken remotely and on digital platforms (Hashim, 2020; Nagra et al., 2021; Rehman, 2021; Today, 2020). For many people working online was discomfoting as the home environment was reported as stressful and discouraging experience by the workers (Joshi et al., 2021). The constant rise in online tasks also brought the development of technostress among the people working online which was the potential cause of job loss or motivation to leave the professional organization in Pakistan (Siddiqui et al., 2022a). It is also reported that constant working on online media can result in the development of aggression (Sparby et al., 2017). Constant online working is responsible for the expansion of internet addiction among people leads to further complications. Machimbarrena et al. (2018); Siddiqui et al. (2021b) reported that addiction to online activities is one of the prime causes of augmented cyber aggression and displaced aggression. Similarly, internet use is also associated with the amplification of passive aggression (Waqas et al., 2016), development of direct aggression (Lim et al., 2015; Martínez-Ferrer et al., 2018), solicitude, boredom (Akin & Iskender, 2011; Glaser et al., 2018), degradation of quality of life (Cheng & Li, 2014) marital dissatisfaction (Ahlstrom et al., 2012) and loneliness (Koyuncu et al., 2014). In contrast, Glaser et al. (2018) reported that if the objective of social media use is to strengthen existing relationships it positively impacts mental health.

2.2 Online working a positive step towards pandemic frustrations

A literature review has suggested that online learning and working has positive impacts on human psychological many aspects such as motivation towards completion of tasks, self-efficacy (Siddiqui et al., 2020b) and is the source for achievement of satisfaction of psychological needs (Siddiqui et al., 2020a). Uzzaman and Karim (2017) also supported the fact that engagement with technology-oriented tasks is helpful to divert stress into different activities. Advocates of technology supportive tasks believe that it is positively

associated with an amelioration in mental health (Silva, et al., 2005) individuals wellbeing, social connections (Huang, 2012), improvement in academic achievements (Lee et al., 2016), the opportunity for the development of 21st-century skills (Pirani & Hussain, 2019), improved communication, research, discovery and collaborations skills (May & Abreh, 2017), enhancement of satisfaction (Maulana et al., 2016), increase motivation and competence (Edward et al., 2018). Beaudry and Pinsonneault (2010) expressed in their research paper that the use of information technology is positively correlated with happiness and social support. During pandemic engaging faculty in online working also showed positive results and enhances emotional intelligence level with Indian faculty members (Baba, 2020). From this study it is concluded that in the times of lockdown and pandemic, social support via online working and networking suppressed emotional trauma and anxiety faced by people that helped them to stabilize their emotional state. Similarly, MacIntyre et al. (2020) reported that the fear and anger developed due to lockdown situations were controlled by engaging people in online working which has brought a positive impact on human psychology.

2.3 Emotional intelligence association with aggression

World Health Organization's global report on violence (WHO, 2010) expressed that every year more than 1.5 million people die due to aggressive acts and being victims of violence. To inhibit and regulate aggressive behaviors, Emotional Intelligence (EI) has appeared as a reasonable relevant conception (Brackett et al., 2004). Bibi et al. (2020), García-Sancho et al. (2014), Masum and Khan (2014) reported that people with a lower level of emotional intelligence have more chances of aggressive personality and negative social associations. Castillo and associates (2013) applied two years of interventions to control aggression and to develop empathy among Spanish students using the ability model of EI, and found robust results. Liao et al. (2003) study supported outcomes that emotional intelligence is negatively correlated with aggression and hidden delinquencies in nature. García-Sancho et al. (2014); Shahzad et al. (2013); Masoumeh et al. (2014) researches also supported Liao et al. (2003) findings and suggested that there is a strong and negative association between EI and aggression. It is inferred that EI serves as a protective factor against the problems behaviors and emotionally intelligent people have a greater tendency to understand and regulate their emotions. Quebbeman and Rozell (2002) studied association of EI and workplace aggression and suggested for incorporation of emotional intelligence with the help of training for emotional intelligence, through counseling, through rewards for positive behaviors and through organization's performance appraisal to reduce triggering events. From the literature review, it is already proven that online engagement and online support systems, when used positively, has positive effects on emotional stability and

emotional intelligence (Chandra, 2020). Similarly, the increase in emotional intelligence has been shown to be a strong factor in controlling aggression and its consequences (Bibi et al., 2020). However, this study seeks to understand how these factors interact during the pandemic, when a sudden switch to online tasks was imposed and high levels of anxiety and aggression were repeatedly reported. In this paper, the researchers attempt to show that emotional intelligence can be a powerful tool for controlling anxiety and was equally effective during the pandemic.

3. Research methodology

The study design is non-experimental, correlational and comparative, followed by quantitative research analysis. The survey technique used for the data collection where validated and reliable questionnaires were used for data collection and hypothesis testing. Data analysis and hypothesis testing is achieved after factor analysis of the instruments through Pearson's Correlation, independent sample t-test and testing mediation. Research model is used to identify how online working in COVID-19 has associated with emotional intelligence and development of aggression. Furthermore, emotional intelligence relation with different forms of aggression also concluded (refer to Figure 1). SPSS version 20 and AMOS version 24 were the two main software packages used for analysis. After confirmatory factor analysis and establishing validity and reliability for the questionnaires, model fit criteria were identified and approved. Pearson's correlation was used to determine the correlation between duration of online use, emotional intelligence and sub-factors of aggression. Independent sample t-test was run to find gender differences in terms of emotional intelligence and aggression. The last part of the analysis section focuses on highlighting direct, indirect, and total effects among the variables to demonstrate emotional intelligence as a mediator between duration of online working and different types of aggression. The level of significance for all statistics was set at $p < 0.05$.

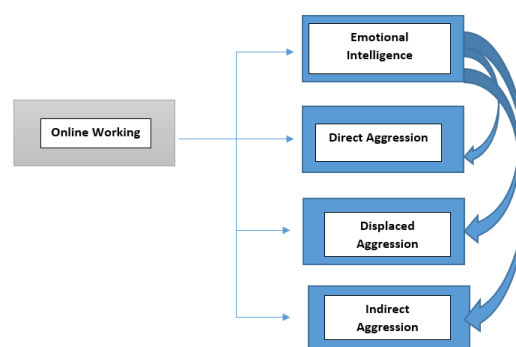


Figure 1 - Impact of Online Working on Emotional intelligence and Aggression.

3.1 Sample

A survey research questionnaire of 40 items has been used to collect the data from 233 participants. Researchers have used the convenient sampling technique, where data is collected through google forms from the participants of metropolis city Karachi. For voluntary involvement in the research activity, more than 500 forms were sent to known contacts on emails, WhatsApp, and through social media networks and were requested to fill and forward to more respondents in contact for maximum participation. A total of 233 questionnaires were returned within a time frame of one month. Due to time constraints, responses returned after the selected time frame were not accepted and data was analyzed on the final sample of 233 participants. The final sample comprises of the participants with command in the written and spoken Urdu language. In order to minimize error while entering data manually and to ensure validity, data from the Google forms converted directly to EXCEL sheets (Love, 2014). Demographic presentation of participants has shown that 211 participants were working online during the COVID-19 pandemic whereas only 22 participants were

associated with jobs with a physical presence. The online tasks included teaching students online, preparing instructional materials for online classes, preparing and conducting exams through online platforms, preparing excel spreadsheets by administrators and accountants, attending meetings with colleagues and supervisors on Zoom or Google Meet platforms, and conducting research and data collection via online forums such as Zoom, Google Meet and Microsoft Teams etc. Students and professionals associated with education have used online forums for online study and to submit regular academic assignments. Among those involved in physical jobs were beauticians (though it was a lockdown, some reported that they were providing services by visiting homes), medical workers, some banking staff, personnel associated with law enforcement agencies etc. The age and gender of the participants are shown in Table 1. Moreover, information related to time spent on online work was also gathered and it was found that most of the participants (77, 33%) average time for online use was 2-4 hours per day. Figure 2 has shown the distribution of online working w.r.t time duration.

	Count				Total
	Prefer not to say	Gender		Female	
		Male			
Age	Less than 15 years	0	1	0	1
	15-20 years	0	16	23	39
	21-25	1	18	41	60
	26-30	0	24	13	37
	31-35	0	9	19	28
	36-40	0	10	27	37
	41-45	0	4	10	14
	46-50	0	2	7	9
	More than 50 years	0	4	4	8
Total	1	88	144	233	

Table 1 - Demographics.

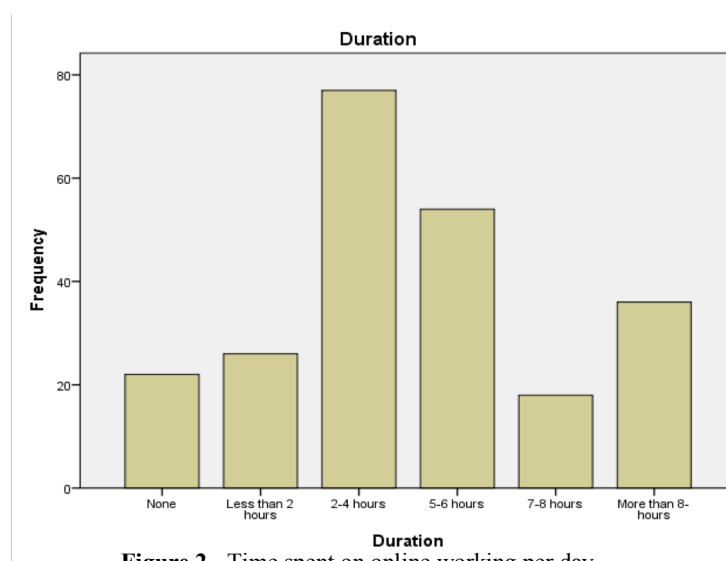


Figure 2 - Time spent on online working per day.

3.2 Measurement Instruments

3.2.1 Urdu Aggression Questionnaire

Different aspects of aggression were measured through newly developed and revalidated Urdu Aggression Questionnaire (UAQ) by Siddiqui et al. (2021a); Siddiqui et al. (2022b). UAQ (2021) is a 24 items self-report questionnaire with 5 points Likert scale (never, sometimes, to some extent, often and always) with 3 factors construct: Direct Aggression (8 items) (Example item with translation: جب چیزیں میری مرضی کے خلاف ہوتی ہیں تو با آواز بلند تلخ کلامی شروع کر دیتا/دیتی ہوں When things go against my will, I start speaking loudly and bitterly), Displaced Aggression (4 items) (Example item with translation: غصہ ، غصہ دلانے والے پر نہ نکال سکوں تو کسی کی چیز پر غصہ نکال کر میں پر سکون بوجاتا /بوجاتی ہوں If I can't take out anger on the person causing the anger, I get relief by taking it out on something), Indirect Aggression (12 items with 1 reversed statement) (Example item with translation: انصاف کا تقاضہ ہے ، بے عزتی کے بدلے بے عزتی ، اٹھنا اور تھپڑ کے بدلے تھپڑ اور تکلیف کے بدلے تکلیف ، I believe in the principle of vengeance: an eye for an eye). After factor analysis number of items reduced to 15 (6 items for Direct Aggression, 3 items for Displaced Aggression and 6 items for Indirect Aggression) (refer to Table 2 and Figure 3).

3.2.2 Emotional Intelligence

The EI was assessed through the Urdu translated version of Wong and Law Emotional Intelligence Scale (WLEIS; Wong & Law, 2002) translated by Zahra et al. (2020). WLEIS developed by Wong and Law (2002) is a 16-item self-report measurement on a 7-point Likert scale ranging from “1 strongly disagree to 7 strongly agree”. (Example items with translation: میں ہمیشہ جانتا جانتی ہوں کہ میں خوش ہوں یا نہیں/ It is always easy for me to recognize my feelings, whether I am happy or not, میں دوسروں کے جذبات اور احساسات کے لیے حساس ہوں I am sensitive to the emotions and feelings of others). Factor analysis of the instrument is shown in Table 2 and Figure 3.

3.2.3. Online Working/ Online Learning

Online engagement was evaluated with the number of hours people were engaged with online working or learning. Some people were not associated with online professional or academic tasks and they mentioned “zero” hours of online work per day.

4. Data analysis

For confirmatory factor analysis and calculating mediating effects, AMOS version 24 is used.

Factor Loadings	Emotional Intelligence (EI)	Direct Aggression	Displaced Aggression	Indirect Aggression
EI-1	.594			
EI-2	.771			
EI-3	.649			
EI-4	.630			
EI-5	.621			
EI-6	.665			
EI-7	.691			
EI-8	.567			
EI-9	.647			
EI-10	.622			
EI-11	.696			
EI-12	.796			
EI-13	.576			
EI-14	.565			
EI-15	.465			
EI-16	.561			
Direct Aggression-1		.546		
Direct Aggression-2		.725		
Direct Aggression-3		.731		
Direct Aggression-4		.682		
Direct Aggression-5		.713		
Direct Aggression-6		.622		
Displaced Aggression-1			.759	
Displaced Aggression-2			.815	
Displaced Aggression-3			.780	
Indirect Aggression-1				.728
Indirect Aggression-2				.819
Indirect Aggression-3				.906
Indirect Aggression-4				.470
Indirect Aggression-5				.437
Indirect Aggression-6				.537

Table 2 - Factor loadings.

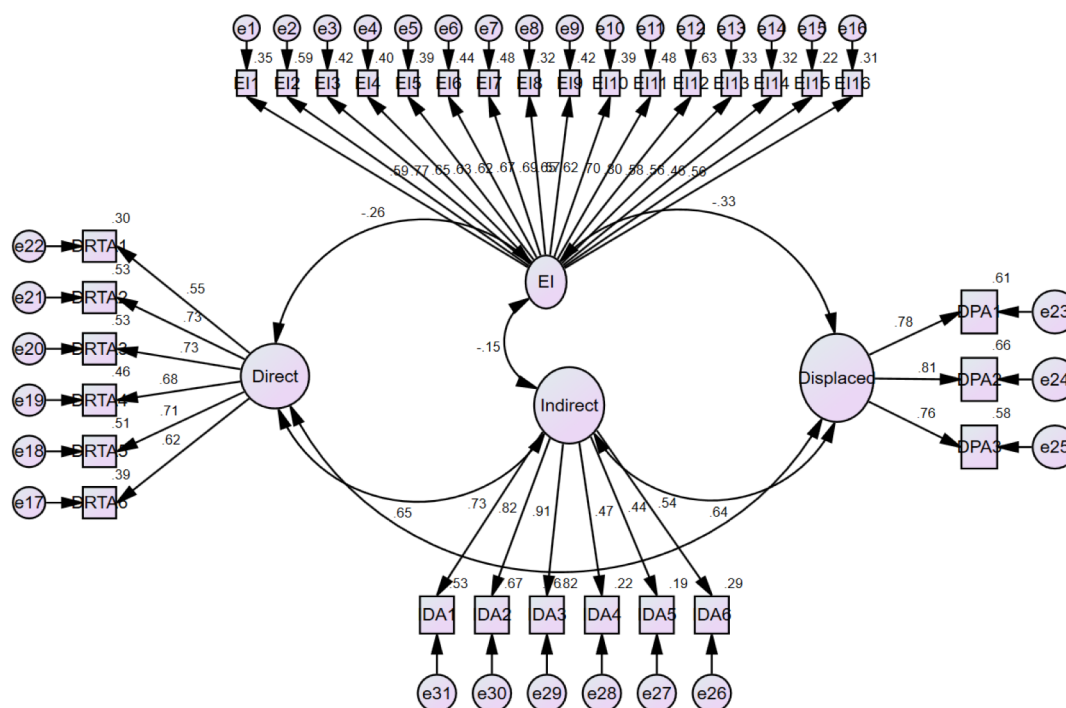


Figure 3 - Factor loadings for the model.

Independent sample t-test and Pearson’s Correlation were also performed for the data analysis, using SPSS version 20. The level of significance for all statistics was set at $p < 0.05$. Data analysis and hypothesis testing is achieved after factor analysis of the instruments through Pearson’s Correlation, independent sample t-test and testing mediation.

4.1 Factor Analysis, Validity and Reliability

Both confirmatory and exploratory factor analysis are statistical methods used to uncover latent variables with the help of observed indicators. However, in CFA, researcher has prior assumptions and model construct. Main purpose of confirmatory factor analysis is to confirm or reject construct based on existing measurement theory or factors of instrument already tested, validated and used. Usually in confirmatory factor analysis researcher confirms or rejects hypothetical model based on theoretical framework or previously used references. For confirmatory factor analysis for Emotional Intelligence Scale and Urdu Aggression Questionnaire AMOS version 24 is used.

Factor loadings for each factor are shown in Table 2 and Figure 3. Reliability statistics and model fitness criteria for emotional intelligence and factors of aggression are reported in Table 3.

Theoretical constructs after factor analysis elaborated that a 4-factor for assessing emotional intelligence and three forms of aggression may provide the most meaningful interpretation. Factor loadings with value above 0.32 are acceptable and has also assured construct validity of the instrument (Tabachnick & Fidell, 2014; Tavakol & Wetzel, 2020). Construct validity is defined as how well a test measures what it is claims or supports to measure. Data reliability is measured through Cronbach’s alpha values that should be greater than 0.5 for each variable (Cronbach, 1951). In this case data is reliable as Cronbach’s values are higher than 0.5 for every construct (Refer to Table 3).

Model Fitness describes the relationship between a response variable and one or more predictor variables. Parsimony fit indices values are between 0 to 1 where values above 0.50 are considered acceptable (Mulaik et al., 1989, Soleimani et al., 2016).

S.No	Factor	No. of Items	Cronbach’s Value	Model Fitness
1	Emotional Intelligence	16	0.913	PCFI 0.671
2	Direct Aggression	6	0.826	Recommended >0.5
3	Displaced Aggression	3	0.828	PNFI 0.606
4	Indirect Aggression	6	0.808	Recommended >0.5
5	Overall Aggression	15	0.896	

Table 3 - Reliability statistics and model fitness.

4.2 Pearson's Correlation

Associations between duration of online use, emotional intelligence and sub factors of aggression such as direct aggression, displaced aggression and indirect aggression were expressed with the help of the SPSS version 20 following the procedure suggested by Hair et al. (2006). Table 4 has manifested significant negative correlations between emotional intelligence with different forms of aggression. It is interpreted that increase in emotional intelligence is negatively correlated with different forms of aggression. Moreover, it is seen that duration for online working has a positive correlation with emotional intelligence and is negatively affiliated with direct and indirect aggression but has an insignificant impact on displaced aggression. Additionally, it is highlighted that rise in one form of aggression are positively associated with other forms of aggression too. It is concluded from correlation results that an increase in online use is acting as a source of emotional intelligence and is negatively associated towards different forms of aggression.

4.3 Gender

Difference on Aggression and Emotional Intelligence

A significant difference in terms of direct and indirect aggression among male and female participants concluded from Table 5, where independent sample t-test used for concluding gender differences at p-value <0.05. The comparison of mean values has indicated that male participants have significantly higher level of direct and indirect aggression as compared to women. However, no differences in terms of displaced aggression and emotional intelligence reported.

4.4 Emotional intelligence mediating effect between duration of online working and aggression

Table 6 regression analysis at the set significant value of 0.05 has clearly indicated that duration of online working has significantly and positively influenced emotional intelligence, where the rise in duration is responsible for a higher level of emotional intelligence. Moreover, direct and negative association of online working is also pointed out toward the direction of aggression, which shows that engagement in online working is suppressing the level of direct aggression. In addition, higher level of emotional intelligence is negatively associated with direct and displaced aggression.

The indirect (mediated) effect of duration of online working on indirect aggression is -.007. That is, due to the indirect (mediated) effect of duration on indirect aggression, when duration goes up by 1, indirect aggression goes down by 0.007. This is in addition to any direct (unmediated) effect that duration of online engagement may have on indirect aggression. Similarly, the indirect effect of duration on displaced aggression is -.021 and on direct aggression is -.013 that is clearly indicating that emotional intelligence is acting as a mediator between online working and different forms of

aggression (refer to Table 7 and Figure 4). It is found that working online has direct as well as indirect associations with different forms of aggression where emotional intelligence mediated effect is proven.

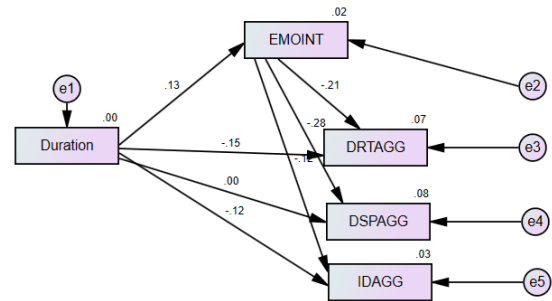


Figure 4 - Emotional Intelligence acting as a mediator between online working/learning duration and aggression (Duration = Online Working Hours; EMOINT =Emotional Intelligence; DRTAGG= Direct Aggression; DSPAGG= Displaced Aggression; IDAGG= Indirect Aggression).

5. Discussions

Multifold studies have indicated that lockdown situation during pandemic had negatively influenced both the psychosocial aspect and mental health (Liang et al., 2020) and the measures taken to suppress health crises were somewhat responsible for creating disturbances in the routine lifestyle of the people (Chandra, 2020). The inadequate information and household supplies resulted from constant and prolonged lockdowns (Ahmed et al., 2020) led to anger and confusion (Brooks et al., 2020) and emotional stresses resulted in the development of frustration and aggression among the children and elders (Shorer & Leibovich, 2020). To overcome such boredoms and to maintain economic status of the country as well as for continuous education, online working and learning was adopted as a replacement of regular routine physical jobs and schools. This study was designed to check how online engagement has impacted the emotional intelligence and stability of the people as well as controlling level of aggression.

The results of the current study expounded that the duration of online assignments has positively significance towards emotional intelligence and is negatively correlated with aggression. The study is supporting the outcomes of Beaudry and Pinsonneault (2010) where technology is positively correlated with happiness and social support. From this study it is concluded that in the times of lockdown and pandemic, social support via online working and networking suppressed emotional trauma and anxiety faced by people that helped them to stabilize their emotional state. The study results are in support of the results of MacIntyre et al. (2020), Uzzaman and Karim (2017) where the fear and anger developed due to lockdown situations were controlled by engaging people in online

	Duration	Emotional Intelligence	Direct Aggression	Displaced Aggression	Indirect Aggression
Duration	1				
Emotional Intelligence	.132*	1			
Direct Aggression	-.174**	-.231**	1		
Displaced Aggression	-.040	-.283**	.622**	1	
Indirect Aggression	-.139*	-.136**	.563**	.558**	1

*. Correlation is significant at the 0.05 level (2-tailed).
 **. Correlation is significant at the 0.01 level (2-tailed).

Table 4 - Correlations.

	Gender	N	Mean	Std. Deviation	T	Df	Sig. (2-tailed)	Mean Difference
Emotional Intelligence	Male	88	5.1527	.87433	-.947	230	.345	-.12334
	Female	144	5.2760	1.01215				
Direct Aggression	Male	88	1.7955	.69238	2.752	230	.006	.24569
	Female	144	1.5498	.63932				
Displaced Aggression	Male	88	1.7576	.81136	.906	230	.366	.10017
	Female	144	1.6574	.82119				
Indirect Aggression	Male	88	1.8617	.82048	4.606	230	.000	.41498
	Female	144	1.4468	.53967				

Table 5 - Impact of gender on variables, Independent Sample t-test.

			Estimate	S.E.	C.R.	P
EI	<---	Duration	.088	.043	2.026	0.043
Direct Aggression	<---	EI	-.146	.044	-3.319	***
Displaced Aggression	<---	EI	-.237	.053	-4.448	***
Indirect Aggression	<---	EI	-.085	.046	-1.842	0.065
Direct Aggression	<---	Duration	-.067	.029	-2.300	0.021
Displaced Aggression	<---	Duration	-.002	.036	-.051	.959
Indirect Aggression	<---	Duration	-.058	.031	-1.894	.058

At P-value <0.05
 ***. Significant at the 0.001 level

Table 6 - Regression Weights.

Variables			Direct Effects	Indirect Effects	Total Effects
EI	<---	Duration	.088	-----	.088
Direct Aggression	<---	EI	-.146	-----	-.146
Displaced Aggression	<---	EI	-.237	-----	-.237
Indirect Aggression	<---	EI	-.085	-----	-.085
Direct Aggression	<---	Duration	-.067	-.013	-.080
Displaced Aggression	<---	Duration	-.002	-.021	-.023
Indirect Aggression	<---	Duration	-.058	-.007	-.066

Table 7 - Direct, Indirect and Total Effects.

working that helped people in coping stress, where engagement with an online environment demonstrated acceptance of the situation and distractions from negative thoughts resulted due to uncertainty. Online engagement at the time of the pandemic was also helpful to reduce negative and unexpected emotional outbursts and are able to divert stressful thoughts into different activities knowingly or unknowingly, which is one of the coping strategies. These conclusions were aligned with the recommendations suggested by Abdel-Fattah (2020) where adaptability to the rapidly changing environment through the use of technology was significantly and positively associated with emotion intelligence and stability. Chandra (2020) also demonstrated that engagement with online activities suppressed negative feelings of social distancing since students were able to see that the separation was physical, rather than psychological. Additionally, innovation and the creation of online communities after the COVID-19 pandemic have expanded the use of online platforms to promote social, emotional and psychological wellbeing (Beard et al., 2021). Moreover, online platforms were also used by educators as an outlet to provide emotional and social support to students during pandemic (Zieher et al., 2021).

In continuation of the studies by García-Sancho et al. (2014), Shahzad et al. (2013), Masoumeh et al. (2014), the current study has supported the fact that emotional intelligence is negatively correlated with aggression. The current study has revealed that the rise in the use of online assignments not only positively influenced level of emotional intelligence but also helped in the suppression of aggressive behavior. These results are supporting research of Castillo and associates (2013) who applied two years of interventions to control aggression and to develop empathy among Spanish students using the ability model of EI.

It shows that emotional intelligence is acting as a mediator between online working and direct, indirect, and displaced aggression. It is inferred that engaging people in online tasks helped to stabilize themselves in terms of emotions and assisted them to control their anxieties.

This study is in contrast to the study conducted by Ahmed et al. (2019) but supporting outcomes of a study conducted by Kazmi et al. (2021) in terms of emotional intelligence, where no significant differences among male and female participants observed. It is concluded that despite differences in the brought up of male and female participants in Pakistan (Mahmood & Kausar, 2019; Siddiqui et al., 2021a), the pandemic has equally affected the emotional intelligence and stability of participants. However, a significant difference in terms of direct and indirect aggression observed among the men and women respondents. These are results in contrast with the study conducted by Siddiqui et al. (2018) and in support of the study conducted by Siddiqui et al. (2021a) where a significant difference in terms of indirect aggression observed. The mean differences have

indicated that male participants have more tendency to release their anger and frustration through the direct and indirect forms of aggression. However, females' participants have shown a lesser tendency to show their anger.

COVID-19 gave institutions and professionals a new insight into online working and its huge applications in a variety of fields. A distinct rise in online working and learning was initiated during the pandemic to address the educational shortfall, meet targets for an academic year, and save the economy from collapsing. Nevertheless, recent studies in the same vein have produced many different and novel results from a variety of researchers extending the use of online platforms for a variety of purposes. According to Chandra (2020), engagement in online activities suppressed negative feelings of social isolation among students and despite physical separation, online interactions saved them from feeling lonely in spite of their physical segregation. In the same way, the expansion of online communities and social networking during pandemics, for example, has led to a change in the way that online networking can be used for psychological well-being and for remote counseling and guidance (Beard et al., 2021). Moreover, initiatives were taken to keep the masses aware of the situation, precautions, preventions and treatments through online mental health education with communication programmes, such as WeChat, Weibo, and TikTok during the outbreak (Liu et al., 2021). In addition, several books on COVID-19 prevention, control, and mental health education have been swiftly published and free electronic copies have been provided for the public (Liu et al., 2021). The current study also provided a new insight that technologically-oriented developmental models can be used to reduce anxieties, aggressions, and to enhance emotional intelligence by using online communication and activities.

6. Recommendations

Though online learning is an influential step towards the working in a new era but there are certain harms associated and one of the issues is called internet additions. Siddiqui et al. (2021b) have reported that the rise in the level of internet addiction is one of the major causes of cyberbullying and other forms of aggression. So, it is suggested that interventions should be introduced to avoid the development of negative impacts of technology on human nature.

Moreover, it is reported by Siddiqui et al. (2022a) that rise in the use of technology developed technostress among the pupil, so it is recommended to plan interventions and trained people before engaging them for technology-oriented tasks and to maintain their emotional stability.

Emotional intelligence has acted as a key factor in the suppression of aggression. It is recommended to introduce platforms for online training, where people

can be provided with emotional support to reduce anxieties and to elevate their level of emotional intelligence.

7. Limitations and directions for future research

The sampling strategy adopted was convenient sampling as due to the lockdown, access to participants was limited. Convenient sampling is non-probability sampling strategy and is considered weak to generalize findings for the whole population (Siddiqui et al., 2019). It is suggested to replicate the studies with probability sample technique. The second limitation of the study is the self-reported instrument. The use of self-completed questionnaires is reasonable and inexpensive, however, it is not considered flawless, as information gathered may be inaccurate owing to recall problems (Siddiqui et al., 2021a). It is recommended to use multiple measures for each construct to ensure more reliable results. The study design is cross-sectional that used to investigate measures and the outcome of the study of participants at the same time (Setia, 2016) where forecasting is comparatively difficult to achieve. It is recommended to recreate the study with longitudinal research approach. One of the other major limitations of the study is the skewed data where there is considerable difference between the number of participants working online (211) and on-site (22). Due to the lockdown, physical contact was restricted, which made it difficult for researchers to trace and meet more people still engaged in on-site jobs. Moreover, it was uncertain when the government would lift its lockdown and everyone would begin working physically again. Therefore, researchers analyzed the data collected within one month of the lockdown and did not continue to collect more data. It is recommended that in the future, for comparative analysis, there should be less difference in the number of participants in two groups when compared.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee.

Conflict of interest

The authors declare that they have no conflict of interest.

Informed consent

Participants voluntarily involved in the survey research and were informed about maintenance of anonymity before data was collected.

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An exploration of STEM students' and educators' behavioural intention to use mobile learning

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Abstract

This study sought to find factors that Science, Technology, Engineering, and Mathematics (STEM) students and educators in a developing country consider important when accepting mobile learning. The study developed a new model by extending the Technology Acceptance Model (TAM) using the construct perceived resources. Using stratified random sampling, a total of 160 STEM students and 100 educators were selected to participate in this study. The study employed a quantitative design where partial least squares structural equation modeling was used to examine STEM students' and educators' behavioural intention to use mobile learning. The developed model explained 74.1% of the variance in STEM students' and educators' behavioural intention to use mobile learning. Perceived resources, perceived ease of use, and perceived usefulness variables explained 54.8% of the variance in attitudes of STEM students' and educators' behavioural intention to use mobile learning. Attitude was the strongest indicator of STEM students' and educators' behavioural intention to use m-learning. The results indicated that both educators and students have a positive attitude towards mobile learning, given how important online learning is becoming nowadays. Additionally, there is no statistically significant difference between educators' and students' attitudes towards mobile learning. The implication is that developers of mobile learning systems should make their platforms easy to use and have more resources available for both teachers and learners to increase the overall acceptance of mobile learning in STEM subjects.

KEYWORDS: Mobile Learning, Educators, Students, Attitude, Acceptance, TAM, STEM.

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1. Introduction

STEM education refers to the teaching and learning of science, technology, engineering, and mathematics (STEM) in both formal and informal classroom settings (Gonzalez, & Kuenzi, 2012). STEM education has evolved into a meta-discipline, a holistic endeavour that focuses on creativity and the process of producing answers to complex contextual circumstances using existing methods and technologies, rather than

traditional topic boundaries. STEM education has been a hot topic on a global scale in the last decade. This is motivated by the changing global economy and labour requirements that indicate that there will be a shortage of staff and educators trained for STEM around the world (Kennedy & Odell, 2014).

Since STEM education is still in its inception in developing-country secondary schools, it faces many challenges that result in poor performance of students at the matriculation level (Makgato, 2007; Modisaotsile, 2012; Visser, Juan, & Feza, 2015). This dissatisfactory achievement in STEM-related subjects was attributed by Makgato (2007) to the scarcity of learning resources, science laboratories, and tools to facilitate successful teaching and learning. Modisaotsile (2012) blames the low performance of students in STEM-related subjects on to absence of parental participation in the education of their children. Visser et al. (2015), on the other hand, attributed the shortage of learning materials and textbooks to these poor results in STEM-related

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subjects. Based on the findings of these studies, (Visser, Juan, & Feza, 2015; Modisaotsile, 2012; Makgato, 2007), it can be concluded that in developing countries, many obstacles negatively influence effective STEM teaching and learning.

Mobile learning (m-learning) can be utilized to address the issues of STEM education (Criollo-C et al., 2018; Pinker, 1997; Wong et al., 2019). Odiakaosa, Dlodlo, and Jere (2017) described m-learning as learning that incorporates the use of a mobile device like a smartphone, PDA, iPod, palmtop, or tablet computer, laptops, or even digital cameras and USB keys. Major education and content providers, like Blackboard and Coursera, offer free apps for accessing course materials (Hao, Dennen & Mei, 2017). What can be learned from Hao et al, (2017)'s concept and evaluation is that the introduction of mobile gadgets into the classroom has the ability to impact educators' and students' academic performance and experiences (Callum, Jeffrey & Kinshuk, 2014).

Mobile learning helps students to access materials for learning at anywhere and anytime (Criollo-C et al., 2018). M-learning allows visualized science experiments to be used to strengthen the comprehension of science concepts by students and to provide complete explanations of scientific concepts (Pinker, 1997). In addition, m-learning enhances parental interest in the learning of their children, which in turn enhances the motivation and success of students in STEM-related subjects (Wong et al., 2019). The takeaway from these researches is that, while STEM education faces numerous problems, m-learning can mitigate the effects of these obstacles in secondary schools (Criollo-C et al., 2018; Pinker, 1997).

In spite of the advantages, Davis et al., 1989, claimed that the effective implementation of any information system (IS) be determined by the acceptance of the users. It can be claimed, based on the evaluation by Davis et al. (1989), that the acceptance of m-learning for STEM learning is dependent on its acceptance by educators and students. As a corollary, it may be claimed that effective deployment of m-learning in developing-country secondary schools needs research on its reception by both educators and students (Kim et al., 2013). For example, a plethora of studies in tertiary institutions based on the acceptance of m-learning by lecturers and students, hence its successful adoption (Alrajawy, Isaac, Ghosh, Nusari, Al-Shibami, & Ameen, 2018; Akinbode, Agboola, Senanu & Adeniji, 2020; Sánchez-Prieto et al., 2019). However, the views of secondary school STEM educators and students of m-learning remains dearth in the body of knowledge.

A few studies in secondary schools in developing countries have focused on m-learning (Mutambara & Bayaga, 2021; Osakwe et al., 2017). Osakwe et al. (2017) assessed the real use of m-learning by secondary school educators and students in Namibia. Mutambara and Bayaga (2021) emphasized the importance of developing nations doing studies on educators' and

students' attitudes toward m-learning rather than mindlessly following models from developed countries. The current study sought to assess the views of the attitudes of secondary school STEM educators and students towards m-learning. This study is inspired by the work of Kim et al. (2013), who indicated that more studies must be carried out, especially in STEM, on the views of educators and students towards m-learning. This is principal because researchers (Osakwe et al., 2017; Odiakaosa et al., 2017) did not concentrate on students' and educators' attitudes towards m-learning, nor did they compare whether there was a noticeable difference between STEM educators' and students' attitudes towards m-learning, necessitating the current study.

The following research questions were posed in an attempt to explore the factors that affect secondary school STEM students and educators to embrace m-learning, as well as the interrelationships between students' and educators' attitudes toward m-learning acceptance:

1. What factors do STEM students and educators think are significant when it comes to accepting m-learning?
2. Is there a substantial difference in the attitudes of STEM students and educators about m-learning?

2. Literature review

2.1 Mobile learning in developing countries

Many developing countries encourage the utilisation of m-learning. For example, the South African Department of Basic Education (DoE) encouraged educators and students to utilise m-learning for STEM learning (DoE, 2020a). The DoE argued that students and educators should take advantage of the ubiquitous presence of mobile devices in our daily lives. The DoE had been gradually introducing digital technologies in schools (Mhlanga & Moloi, 2020). However, during the nationwide lockdown caused by the Covid-19 outbreak, the DoE developed a STEM lockdown digital school in collaboration with Africa Teen Geeks, a non-profit coding organization (DoE, 2020a). Additionally, the DoE partnered with network providers (Vodacom, MTN, Telkom, and Cell C) to make students access mobile learning platforms for free (Mhlanga & Moloi, 2020). According to the DoE, Siyavula Maths and Science assistance was also available to students for free, which was offered in collaboration with MTN (DoE, 2020b).

Despite all these interventions, the DoE noted with concern that the rate of m-learning usage was below the expected levels (Mhlanga & Moloi, 2020). As a result, research was conducted to determine the variables that educators and learners deem crucial when accepting m-learning (Akinbode et al., 2020; Lin et al., 2020). The

key characteristics that consistently influence students' and educators' adoption and use of m-learning are perceived usefulness (PU) and perceived ease of use (PEOU) (Lin et al., 2020). Educators' and students' perceived attitude was also found to influence their intention to utilise m-learning (Lin et al., 2020). Lin et al. (2020) also noted that the students' and educators' intentions to utilisation m-learning is influenced by their availability of resource, perceived enjoyment, and perceived social influence.

2.2 Comparing secondary school students' and educators' acceptance of m-Learning

Montrieux et al. (2014) explored the acceptance of m-learning by educators and students. A computerized questionnaire was developed to gather data from 83 educators and 694 pupils on three occasions. The data was analysed using multiple regression. For educators, the models explained variance in behavioural intention (BI) of 60% in the first phase and 71% in the second and third phases. For students, the models explained 60%, 59%, and 61%, of variance in their BI to utilise m-learning. Only PU, perceived attitude toward (ATT), and PEOU had a significant impact on their BI in the first wave, according to the educators' findings, although status and perceived enjoyment (PEN) had no effect. These findings corroborate the research outcomes of Kim and Lee (2020), who indicated that when educators accept m-learning, they assess the benefits as well as the effort involved to learn how to use m-learning. Contrary to educators' findings, PEN had the strongest influence on students' BI. All five determinants (status, ATT, PU, PEN, and PEOU) had a noticeable influence on BI in the first wave.

The second wave of results revealed that educators' PU, PEN, and PEOU had a significant impact on their BI to use m-learning, whereas BI, on the other hand, was unaffected by status (Montrieux et al., 2014). Only ATT, PU, and PEN, on the other hand, proved to have a substantial effect on students' BI. Only the PEOU of students had a negligible effect in the third wave, whereas the other four factors had a large impact on their BI for adopting m-learning. These findings are in agreement with those of Osakwe et al. (2017), who found that students have a good attitude toward m-learning and believe it is beneficial. All five determinants (status, PEN, PEOU, ATT, and PU) had a substantial impact on educators' willingness to employ m-learning. These findings, however, contrast those of Callum et al. (2014), who found that educators' PEOU does not influence their BI while adopting. The students' results reveal a mix of enjoyment and utility, which influenced their adoption of m-learning. The researchers came to a conclusion that educator and student models reasonably mimicked one another (Montrieux et al., 2014). However, the findings of the study did not reveal whether there was a notable difference in the attitudes of students and educators towards m-learning.

2.3 Theoretical Frameworks and Hypotheses Development

A variety of models have been proposed to promote understanding of the aspects that influence the acceptance of a new information system (IS) (Lin et al., 2020). The Technology Acceptance Model (TAM) and Unified Technology of Acceptance and Use Theory (UTAUT) are the most commonly used models to describe the acceptance of m-learning. UTAUT, however, has been chastised for its inability to forecast actions that are not entirely under the control of a person (Estrieganaa et al., 2019). It is possible to incorporate m-learning, and users are compelled to use it. STEM students and educators, for example, were forced to use m-learning in this study due to the sudden closing of schools due to the spread of the Covid-19 virus. UTAUT can't be used in this study since it can't predict behaviours that are completely under a person's control.

This research utilised TAM to examine the intention of STEM educators and students to use m-learning. The TAM was chosen as it is thought to be accurate in explaining user adoption of technology in a variety of scenarios (Estrieganaa et al., 2019). "TAM is a well-regarded and widely validated theory of technology acceptance and use" Estrieganaa et al. (2019, p.4) added. TAM was also effectively used in education to forecast the adoption of m-learning (Mohammadi & Mahmoodi 2019; Mutambara & Bayaga, 2021).

In educational contexts, some scholars criticized the TAM (Carlsson et al., 2006; Venkatesh et al., 2003). The TAM is accused of the poor explanatory capacity of the users' perspectives on the IS (Venkatesh et al., 2003). Carlsson et al. (2006) criticized the TAM for being too generic and applicable to technology adoption in a variety of fields. Based on these studies (Carlsson et al., 2006; Venkatesh et al., 2003), it can be inferred that TAM alone is insufficient to explain and clarify m-learning adoption. In addition, Lim (2018) proposed that the TAM offers the two foundations of the acceptance of the IS (PEOU) and PU), from which a fully fledged model can be established to clarify and forecast the technology acceptance in various circumstances, including the contextualization of acceptance constructs. Centred on the Lim (2018) proposal, this study expanded the TAM by adding perceived resources (R) to clarify the adoption of m-learning by STEM students and educators in developing countries.

2.4 The TAM

Davis, Bagozzi, and Warshaw (1989) developed the TAM to determine users' intentions to accept new technologies. IS. The TAM postulates that PEOU and PU are the two key pillars of a new IS adoption (Davis, et al., 1989). PEOU predicts PU. PEOU and PU predict the attitude of users towards the new IS. The PU and ATT predict their BI to use the system, which, in turn predicts the actual usage of the user. PU was defined by Davis et al. (1989) as an individual's belief that using a specific IS will improve his or her job performance. The

PEOU is defined as the degree to which a person believes that using a given IS would be simple (Davis et al., 1989). Venkatesh et al. (2003) defined ATT as an individual's total emotive reaction to the use of new technology in technology acceptance studies. Figure 1 illustrates the TAM.

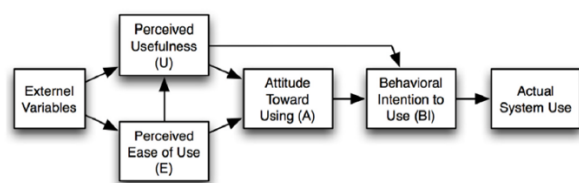


Figure 1 - The TAM Model by Davis et al. (1989, p. 985).

2.4.1. Behavioural Intention (BI)

The BI was described as the cognitive representation of the willingness of an individual to conduct a particular action (Kim & Lee, 2020). The BI is considered the most important determinant of the actual behaviour of the person and has a major and direct impact on the use of technology (Kim & Lee, 2020). Zarafshani et al. (2020) stated that the BI of users to use ICTs in education affects their actual use. The current study posits, based on the results of Kim and Lee (2020) and Zarafshani et al. (2020), that understanding the determinants of BI of STEM educators and students to use m-learning is to understand the determinants of their acceptance of m-learning for STEM learning.

2.4.2. Perceived Usefulness (PU)

The PU was described as “capable of being used advantageously” (Estrieganaa et al., 2019, p.5). PU is described as the belief of an individual that utilising m-learning would enhance his or her performance, in the field of m-learning (Lin et al., 2020). According to Alrajawy et al. (2018), utility value is a key factor of students' inclinations to use m-learning. Alrajawy et al. (2018) agree with the findings of Alrajawy et al. (2017), who discovered that PU has a beneficial influence on BI. PU was also found to be a major determinant of ATT of educators towards m-learning (Zarafshani et al., 2020). If educators and students understand the advantages of mobile learning, their attitudes toward using these technologies will improve.

As a result, the hypotheses are:

H1: STEM students' and educators' PU predicts their ATT toward m-learning.

H2: The PU of STEM students and educators predicts their BI to use m-learning.

2.4.3. Perceived Ease of Use (PEOU)

Perceived ease of use refers to the extent to which users believe that the use of a given information technology would be free from effort (Mutambara & Bayaga, 2021). Ease of use does not only refer to m-learning platforms. M-learning faces many difficulties, such as networking,

restricted processing capacity and decreased input capabilities (Ford & Botha, 2010). Kukulska-Hulme (2007) argued that on devices that are not intended for educational use, m-learning activities continue to take place and that usability problems are commonly mentioned. However, it is claimed that educators' PEOU has no substantial impact on their BI to utilise m-learning (Callum et al., 2014). Saroia and Gao (2018) and Sánchez-Prieto et al. (2019) subsequently concluded that BI is not specifically influenced by PEOU. In comparison, other studies have shown that PEOU had a major direct impact on BI (Kukulska-Hulme, 2007; Sivo et al., 2018). PEOU has a clear favorable influence on the utilization of m-learning through PU, BI, and ATT, according to Estrieganaa et al. (2019). As a result, the three hypotheses were posited:

H3: STEM students' and educators' PEOU predicts their PU toward m-learning.

H4: STEM students' and educators' PEOU predicts their BI to adopt m-learning.

H5: STEM students' and educators' PEOU predicts their ATT toward m-learning.

2.4.4. Perceived Attitude Towards (ATT)

In this research, the ATT can be described as the overall affective reaction of a secondary school STEM student or educator to the use of m-learning. The values and attitudes of students and educators are stated to play a significant influence in either resisting or embracing m-learning (Dutota et al., 2019). For example, if educators think that m-learning is inadequate to meet their own requirements or the needs of their students, they would refuse using it (Dutota et al., 2019). ATT has long been proven to be an important factor of intention to use m-learning in the literature (Saroia & Gao, 2018). As a result, the following hypothesis is proposed:

H6: STEM students' and educators' ATT predicts their BI to utilise m-learning.

2.4.5. Resources perceived (R)

The R is defined as an individual's belief in the existence of an organizational and technological infrastructure that will make it easier to use the system (Venkatesh et al., 2003). Resources availability influences the attitude of users towards m-learning (Sivo et al., 2018). The availability of resources for m-learning helps to boost the attitudes of students and educators towards it. Perceived resources predict actual use (Kim & Lee, 2020). They are more likely to use m-learning if STEM students and educators perceive that they have the resources required for it. Perceived resources was found to affect both PU and PEOU in another study by Zarafshani et al. (2020). Therefore, the hypotheses:

H7: STEM students' and educators' perceived resources predicts their ATT.

H8: STEM students' and educators' perceived resources predicts their PU.

H9: STEM students' and educators' perceived resources predicts their PEOU.

H10: STEM students' and educators' perceived resources predicts their BI.

Based on the theoretical underpinnings, a conceptual model is shown in Figure 2. This is a combination of all the hypotheses and their associated latent variables, as conceptualised by the authors.

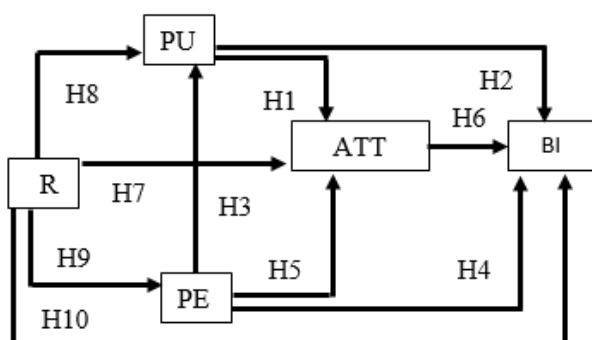


Figure 2 - Conceptual model of the study.

3. Methodology

3.1 Research Design

A questionnaire was utilized to collect survey demographic and opinion-related data from STEM students and educators, and the study used a quantitative method. The educators' and students' perspectives were first discussed using descriptive statistics. Second, the model was evaluated using partial least squares structural equation modelling (PLS-SEM).

3.2 Participants

Stratified random sampling was utilised to acquire data (Creswell, 2017). The quintiles were used to categorize all secondary schools in South Africa's Imifolozu Districts. A stratum was formed by schools from the same quintile. This ensured that a stratum was generated by homogeneous element. The schools formed five strata. Schools were grouped in alphabetical order in a stratum, and a number was allocated to each school. To get two schools in each stratum, computer-generated random numbers were used. This approach was used to provide an equal opportunity for each school in the district to be chosen, thereby providing an impartial the population's representation (Creswell, 2017). Five schools were chosen, and 40 grade 12 students from each were chosen using a simple random sample approach. A total of 200 grade 12 students were handed questionnaires, with 160 (80%) being valid responses of the survey. Around 65 (41 %) of the students who took part in this study were from urban, 53 (33 %) from suburban, and 42 (26 %) from rural areas. Students ranged in age from 17 to 21. The survey included 69 (43 %) female students and 91 (57 %) male students.

The district's STEM educators were then chosen using simple random sampling. A total of 128 educators took part in the study, with 100 (78%) valid surveys collected. Of the 100 educators that took part, 63 (63 %) were male, while 37 (37 %) were female. Of the 100 educators who took part, 13 (13%) were under the age of 30, 33 (33%) were among the ages of 30 and 40, 28 (28%) were between the ages of 40 and 50, and 26 (26%) were above the age of 50.

3.3 Procedure

To evaluate the conceptual model, a cross-sectional field study was conducted. Data was collected from research sites that closely reflected the target environment that the study's findings would generalize to in order to ensure ecological validity: Secondary schools in rural, semi-urban, and urban areas where m-learning is about to be fully implemented. The data was collected soon after schools were reopened following abrupt closure due to the national lockdown which aimed at combatting the spread of the Covid-19. In a bid to alleviate the impact of the Covid-19 pandemic on education during the lockdown, the DoE and Ministry of Communication and Digital Technologies collaborated to ensure virtual learning took place, especially for the examination class (grade 12) (Mhlanga & Moloi, 2020). South Africa's government collaborated with network providers to create zero-rated applications and instructional websites (Mhlanga & Moloi, 2020). This meant that STEM students and educators could make use of these learning platforms free of charge. However, the government did not supply devices to STEM students and educators. The STEM educators and students were not trained to utilise m-learning for STEM learning. Grade 12 students were chosen because these were the students who continually attended classes throughout the lockdown period using m-learning. The researchers distributed questionnaires to STEM students and educators and allow them two weeks to complete on their own time.

3.4 Instrument

The research sought to explore factors deemed significant by high school STEM students and educators when embracing m-learning. To gather data, a questionnaire was used. The questionnaire's first section inquired about the demographics of STEM students and educators. Section two used a seven-point Likert scale to collect data on five latent variables (BI, ATT, R, PU, and PEOU), with options ranging from strongly disagreeing to strongly agreeing. The BI, R, PEOU, and PU items were taken from thoroughly affirmed and precise instruments (Alrajawy et al., 2018). The questionnaire contained 19 indicators.

3.5 Analysis technique

The SmartPLS3 software was used to do data analysis employing the PLS-SEM approach. The PLS-SEM methodology was utilized to evaluate the effects of PU, R, ATT and PEOU on BI. It was also utilized to see if

there was a noticeable difference in the acceptance of m-learning by STEM educators and students. Hair et al. (2017) proposed a two-step approach for evaluating the research model, which was employed in this study. First, the measurement model's validity and reliability were assessed (Garson, 2016). The structural model was then assessed in the second step. This was done to see if the model met the quality standards for empirical work (Garson, 2016).

4. Data Analysis

4.1 Measurement Model

The reflective measurement model was validated using convergent validity, internal consistency, indicator reliability, and discriminant validity (Hair et al., 2017).

Indicator reliability

A construct ought to explain a significant portion of the variance in each indicator, typically more than 50% (Chin, 1998). Hair et al. (2017) proposed a threshold value for the outer loadings of 0.7. All of the indicators had outer loadings greater than the threshold value of 0.7, as shown in Table 1 (Hair et al., 2017), suggesting that the constructs explained all their indicators well.

The findings also indicate that less than 50% of the variance of all indicators was due to error.

Internal Consistency Reliability

The composite reliability (CR) and Cronbach's alpha (CA) tests were employed to determine internal consistency reliability. Cronbach's alpha (CA) is favoured over CR because it provides more precise results (Hair et al., 2017). Table 1 shows that all of the latent variables employed had sufficient internal consistency reliability, since their CR and CA values were all greater than the 0.7 threshold value (Hair et al., 2017).

Convergent validity

Convergent validity refers to the degree to which "a measure positively correlates with alternative measures of the same construct" (Hair et al., 2014, p.102). The convergent validity was tested using the outer loadings and average variance extracted (AVE). Table 1 shows that all of the outer loadings were greater than the 0.70 threshold value. Hair et al. (2017) found that all of the AVE values were greater than 0.50, indicating that the assessments of each latent variable were significantly correlated. The findings show that convergent validity is acceptable.

Construct	Indicator	Convergent validity		Internal consistency reliability		Discriminant validity
		Loadings	AVE	CA	CR	
		>0.7	>0.5	>0.7	>0.7	
ATT	ATT1	0.917	0.803	0.918	0.942	Yes
	ATT2	0.915				
	ATT3	0.884				
	ATT4	0.867				
BI	BI1	0.927	0.792	0.950	0.950	Yes
	BI2	0.755				
	BI3	0.930				
	BI4	0.895				
	BI5	0.930				
PU	PU1	0.843	0.676	0.840	0.893	Yes
	PU2	0.855				
	PU3	0.824				
	PU4	0.763				
PEOU	PEOU1	0.758	0.693	0.852	0.900	Yes
	PEOU2	0.794				
	PEOU3	0.889				
	PEOU4	0.880				
R	R1	0.916	0.840	0.810	0.913	Yes
	R2	0.917				

Table 1 - Measurement model.

Discriminant validity

The amount to which “a construct is actually distinct from other constructs by empirical standards” was defined as discriminant validity (Hair et al., 2014, p. 104). To establish discriminant validity, the Heterotrait-Monotrait ratio of correlations (HTMT) values were utilized (Garson, 2016). The values of HTMT were less than 0.90 (Garson, 2016). Discriminant validity was verified by the results.

The indicator reliability, internal consistency reliability, convergent validity, and discriminant validity tests of the measurement model were all successful. As a result, the measurement model gives the structural model the essential robustness to evaluate it.

4.2 Structural model

After confirming the measurement model’s adequacy, the structural model was evaluated. Collinearity was assessed using the variance inflation factor (VIF). Table 1 shows that the VIF values of all latent variables were all less than four (Garson, 2016), indicating that predictor collinearity was not an issue in the structural

model. As a result, the path coefficients can be calculated.

To test the statistical significance of each path coefficient, we performed bootstrapping (with 5000 subsamples) as recommended by Chin (1998), and the results are given in Table 2. Only two path coefficients were not significant, as shown in Table 2. PEOU to BI ($= -0.016, p > 0.05$) and PU to ATT ($\beta = 0.082, p > 0.05$) were not significant.

Using the f-squared, the contribution of each latent variable to the explained variance of its endogenous concept was assessed. The results are shown in Table 2. According to Cohen (1988), the acceptable f-squared values of 0.02, 0.15, and 0.35 are regarded as a small, medium, and significant effect sizes, respectively. Following the guideline provided by Cohen (1988), the effect size of ATT to BI (0.766), was considered significant. The following paths had medium effect size PEOU to ATT (0.225), R to ATT (0.285), and R to PEOU (0.313). PEOU to PU (0.032), PU to BI (0.054), R to BI (0.073), and R to PU (0.135) had a small effect size.

Path	Std Beta	Std error	T Statistics	P Values	Decision	VIF	f-squared
ATT -> BI	0.663	0.047	14.230	0.000	Accepted	2.214	0.766
PEOU -> ATT	0.371	0.063	5.853	0.000	Accepted	1.355	0.225
PEOU -> BI	-0.016	0.043	0.364	0.716	Rejected	1.659	0.001
PEOU -> PU	0.179	0.072	2.475	0.014	Accepted	1.313	0.032
PU -> ATT	0.082	0.064	1.275	0.203	Rejected	1.303	0.011
PU -> BI	0.135	0.052	2.584	0.010	Accepted	1.318	0.054
R -> ATT	0.438	0.057	7.640	0.000	Accepted	1.491	0.285
R -> BI	0.191	0.043	4.393	0.000	Accepted	1.922	0.073
R -> PEOU	0.488	0.059	8.296	0.000	Accepted	1.000	0.313
R -> PU	0.369	0.072	5.148	0.000	Accepted	1.313	0.135

Table 2 - Bootstrapping Results.

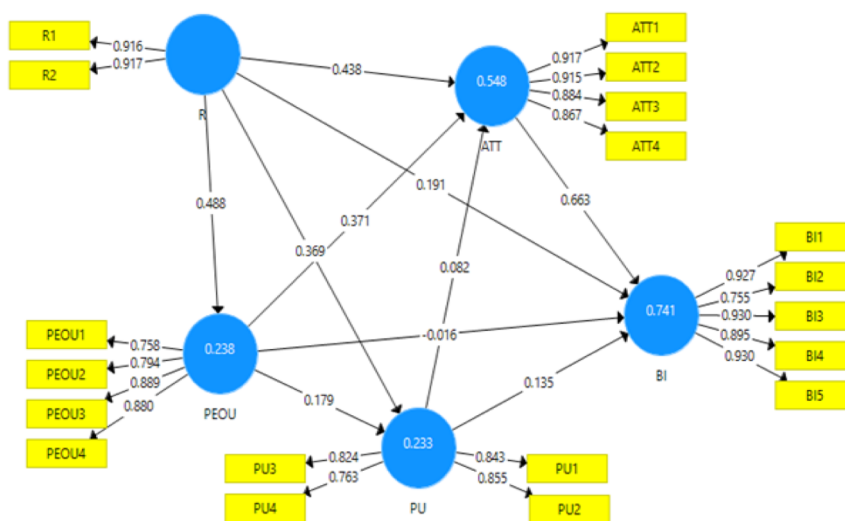


Figure 3 - Structural model.

Figure 3 depicts the model's explanatory value (R-squared). The R-squared value represents the variance explained by the exogenous factors in the endogenous variables (Hair et al., 2017). The model explained 74.1% of the variance in BI. R, PEOU, and PU explained 54.8% of the variance in ATT. R also explains 23.8% of the variance in PEOU. The combined contribution of R and PEOU to PU's explained variance was 23.3%. Following the guideline by Cohen (1988), the variance explained in BI and ATT was considered substantial, while PU and PEOU were considered moderate.

Q-squares were used to assess the model's predictive relevance. All of the Q-squares were greater than zero, indicating that the model can be used to predict whether or not m-learning will be accepted by STEM students and educators.

The standardized path coefficients are also shown in Figure 3. The structural model is made up of five structures (ATT, BI, R, PEOU, and PU). PU, ATT, and PEOU all predict BI. PU and PEOU are antecedents of ATT.

4.3 Multigroup analysis

The multigroup analysis (MGA) was employed to determine whether there was a noticeable difference in the path coefficients of STEM students and educators. The findings of the MGA are shown in Table 3.

Table 3 summarizes the results for all hypotheses and shows that there are no significant differences in path estimates for educator and student groups, as evidenced by an insignificant difference ($P > 0.05$). The findings suggest that there was no difference between the adoption of m-learning by STEM students and educators.

Path	Path Coefficients-diff (EDUCATORS - STUDENTS)	p-Value new (EDUCATORS vs STUDENTS)
ATT -> BI	-0.037	0.707
PEOU -> ATT	-0.174	0.142
PEOU -> BI	0.052	0.562
PEOU -> PU	-0.078	0.625
PU -> ATT	-0.061	0.640
PU -> BI	0.053	0.629
R -> ATT	0.255	0.051
R -> BI	-0.046	0.639
R -> PEOU	0.045	0.698
R -> PU	0.057	0.695

Table 3 - MGA results.

5. Discussion

Objective 1: The findings reveal that the structural model appropriately explains and predicts the BI of high school STEM students and educators to adopt m-learning. All Q-squared values were greater than zero, indicating that the model's predictive validity for endogenous constructs was confirmed (Hair et al., 2017). In other words, R, PEOU, PU, and ATT are strong predictors of students' and educators' willingness to adopt m-learning for STEM learning. The total effect of the factors PEOU, PU, R, and ATT in describing STEM students' and educators' BI to use m-learning for STEM learning was 74.1%.

In line with the findings of Alrajawy et al. (2017), STEM students' and educators' PU influence their BI. The results supported H2 ($\beta = 0.135$, $p < 0.05$). The results imply that STEM students' and educators' belief that m-learning can increase students' performance in STEM-related subjects influence their BI to use m-learning. There are several reasons for these findings. In this research, most STEM educators and students come from under-resourced schools, so their BI to use m-learning is affected by its ability to provide learning materials anywhere and at any time. Additionally, the ability of m-learning to enable students to visualize experiments influenced their BI to use it. This is specifically because most of the respondents in this study were coming from rural and semi-urban areas where most schools do not have science laboratories and equipment (Makgato, 2007). Furthermore, the ability of m-learning to supply learning materials at anytime and anywhere assists STEM students and educators in improving learning productivity by repurposing time that was previously unproductive, such as travel and commuting time.

The findings suggested that, contrary to widespread perception in the m-learning literature, educators and students regard utilizing m-learning to be difficult. The findings also indicated that the effort required to learn to use m-learning has no bearing on their BI. This can primarily be due to the efforts of both developers of m-learning sites and content creators for learning. Learning content designers are designing materials in a way that allows them to be used handheld. On the other hand, developers of m-learning systems are designing easy to learn platforms. As a result, educators and students think of m-learning as simple to use, which showed in this study as an insignificant antecedent of their behavioural intention.

Inconsistent with the findings of Sivo et al. (2018), the results revealed that R influences STEM students' and educators' BI to use m-learning. The findings imply that the availability of resources influences STEM students and educators to utilise m-learning. A possible reason for this finding is that, even though educators and students have smartphones that can support m-learning, they are facing difficulties such as connectivity, restricted computing capacity, small screen size, and reduced input capabilities. This is because smartphones

have not been designed for learning purposes explicitly. Consequently, providing STEM students and educators with data packages and mobile devices that are specifically designed for learning will boost their acceptance and intentions to use m-learning.

It's encouraging to see that STEM students' and educators' attitudes are the strongest indicator of their BI. As a result, it's critical to consider the elements that influence STEM students' and educators' attitudes toward mobile learning. This study's findings contradict those of Padayachee (2017), who discovered that educators have a negative attitude toward mobile learning. Educator training and user-friendly m-learning systems may help to improve educators' attitudes regarding m-learning. This is because the findings suggest that STEM students' and educators' PEOU ($\beta = 0.371$, $p < 0.05$) explains their attitude toward m-learning better than PU ($\beta = 0.082$, $p < 0.05$). Giving STEM educators and students mobile devices that are specifically built for m-learning purposes will reinforce their favourable attitude toward m-learning.

Objective 2: Table 3 demonstrates that there was no substantial difference in the path coefficients of all STEM students and educators. This contrasts with the findings of Odiakaosa et al. (2017), who discovered that students are more enthusiastic about m-learning than educators. This research demonstrates that STEM students believe m-learning can increase their performance just as much as their educators do. STEM educators and students see m-learning as a tool designed to satisfy the diverse learning preferences of students.

Furthermore, the study's respondents were STEM students and educators who saw the benefits of m-learning. Students can visualize experiments and simulations of science concepts via m-learning, which helps them understand the concepts better. Furthermore, the participants of this study acknowledged that even though the schools were closed due to Covid-19, they could still teach and learn STEM related-subjects using m-learning. This utility of m-learning motivates both STEM students and educators to have favourable perceptions of it. These findings show that the same model may be utilised to predict m-learning adoption by both populations (students and educators).

Based on the findings of this study, the following recommendations can be made to mobile application developers, teacher training colleges, education administrators, and faculties of education in universities. Education administrators can collaborate with private companies to provide educators and students with mobile devices such as laptops and tablets that are specifically built for education purposes. Difficulty navigating, downloading, searching, and sharing a mobile device from a small screen can affect the interest of STEM students and educators in using m-learning. The R affect STEM educators' and students' attitude towards m-learning and their intent to use it. Mobile developers should continue to improve m-learning platforms to make them more user-friendly.

Instructional designers should continue to improve m-learning learning material to make it more suitable for handheld usage.

They should also make additional m-learning and evaluation materials available to STEM students and educators. This is due to the fact that the PU of both STEM students and educators determines their behavioural intention to use m-learning. The provision of assessment materials on a user-friendly platform encourages STEM students to use m-learning because it makes it easier for them to practice and prepare for exams. The availability of learning and evaluation content on a user-friendly platform reduces the amount of time STEM educators spend preparing lessons. Teacher education institutes can work with the Department of Basic Education to train STEM educators on how to effectively employ m-learning to fulfil the different learning needs of STEM students. This is because the PEOU of STEM educators predicts their ATT usage.

6. Contribution of the study

- When embracing m-learning, both STEM students and educators consider the availability of m-learning resources important. Smart devices that are specifically designed for learning must be supplied to all STEM students and educators.
- ATT is the strongest indicator of STEM students' and educators' BI to use m-learning. For m-learning to be adopted for STEM learning, students and educators required to have a positive attitude toward it. STEM students' and educators' attitudes toward m-learning could be enhanced by using user-friendly platforms, providing them with mobile devices specifically designed for learning, uploading quite enough learning and assessment material on m-learning platforms, and training STEM students and educators on using m-learning platforms.
- When it comes to m-learning, STEM students and instructors appreciate the same things. The time and effort required to learn how to use m-learning platforms, the accessibility of m-learning resources, the utility of m-learning, and their attitudes toward m-learning are all issues to consider.

One drawback of the current research is that it focused only on STEM students and educators in grade 12. Therefore, it should be done with caution to generalize the results of this research to educators and students of other lower grades. Educators and students from other lower grades and parents should also be included in future research. It will be important to find variables that impact the continuous use of m-learning by STEM students and educators for STEM learning.

7. Concluding remarks

It is reasonable to assume, based on the study's findings, that grade 12 STEM students and educators have a positive attitude toward m-learning. The model explained 74.1% of the variance in students' and educators' behavioural intentions. Overall, the results provide empirical evidence for the applicability of the TAM in explaining users' acceptance of mobile learning. Students' and educators' behavioural intentions are directly influenced by perceived usefulness, perceived resources, and perceived attitude toward, although perceived ease of use has an indirect impact. Students and educators accepted m-learning for a variety of reasons, including their sentiments about it, the availability of resources, and its potential to improve teaching and learning. This was confirmed by the finding that perceived attitude toward m-learning was the most important factor of acceptance, followed by perceived resources and perceived usefulness for both educators and students. When it comes to accepting m-learning, the survey demonstrates that both students and educators recognize the benefits that m-learning provides to the classroom and are willing to adopt it. Furthermore, the availability of materials has a substantial impact on students' and educators' acceptance of mobile learning. This may imply that they require mobile devices that are specifically designed for learning.

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Appendix A: Questionnaire

Construct	Code	Indicators
Perceived attitude towards	ATT1	I believe it is beneficial to use mobile learning to learn STEM
	ATT2	My experience with mobile learning to learn STEM will be good
	ATT3	I feel positive about using mobile learning for learning STEM
	ATT4	The mobile learning application will improve my online learning experience STEM
Behavioural Intention	BI1	Assuming I have access to mobile learning, I intend to use it to learn
	BI2	I will frequently learn STEM using mobile learning in the future.
	BI3	I would like to use many different mobile applications for learning STEM in the future
	BI4	It is worth it to use mobile learning for learning STEM
	BI5	I am planning to use mobile learning in learning STEM
Perceived Usefulness	PU1	Using mobile learning in class will improved my work efficiency in learning STEM
	PU2	Using mobile learning to learn STEM will enhance the quality of my learning
	PU3	Using mobile learning to learn STEM would increase my productivity
	PU4	Using mobile learning would enhance my effectiveness in learning STEM
Perceived Ease of Use	PEOU1	It will be easy to learn how to use mobile learning to learn STEM
	PEOU2	I will find it easy to use mobile learning to teach STEM.
	PEOU3	I will find mobile learning easy to use in STEM class
	PEOU4	I would find mobile learning to be flexible to interact with.
Resources perceived	R1	I have the mobile learning resources I would need to use for learning STEM.
	R1	I would be able to use mobile learning for learning STEM if I wanted to

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Digital Storytelling as a tool for reflecting on university students' future professional competencies

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Abstract

The paper presents the findings of a study of the application of a teaching model (Digital Storytelling for Competencies—DSCM) which used Digital Storytelling to encourage students enrolled in a second-cycle degree program in Social Work to reflect on their future professional competencies. Students analyzed and discussed particularly significant stories (critical incidents) drawn from real-life work situations, which they then made into short digital story videos, casting themselves as actors in a role-play process. Students' perceptions were analyzed to determine the model's effectiveness, particularly as regards the extent to which the process of creating the digital story was able to stimulate reflection on the most important competencies required in the students' future working careers. The findings were highly encouraging, and the model will be tested with students and professionals together in the field.

KEYWORDS: Digital Storytelling, Professional Competencies, University Students.

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1. Introduction: storytelling in educational and organizational settings

Studies have found to be important in a variety of social and educational settings because of its potential for improving communication effectiveness and for reflecting on stories of work or life experience. The brain, in fact, appears to be predisposed to impose order on experience in the form of stories, and storytelling can improve the understanding of content by synchronizing the neural processes in the brains of both the speaker and the listener (Stephens, Silbert & Hasson, 2010) in a sort of “brain coupling” that thus facilitates successful communication. Storytelling is essential in constructing meanings, as it is a process where speaker and listener interact trying to generate shared interpretations (Scaratti, Gorli, & Heldal, 2019).

Storytelling also helps in exchanging knowledge that would be difficult to convey in other ways: while data and information can be readily codified in formal supports (text, graphics, databases), practical knowledge (“knowing how”, as opposed to “knowing that”) is difficult to formalize because it belongs to the submerged part of that enormous cognitive iceberg, most of which is out of sight, that we call “tacit knowledge” (Polanyi, 1966; Whyte & Classen, 2012). One of the preferred ways of communicating tacit knowledge between people is storytelling, i.e. talking about personal experiences that involve both the cognitive and the emotional domains (Orr, 1996; Hayes and Maslen, 2014). In this connection, the neurophysiologist Damasio (2011) maintains that “there is no cognition without emotions” (Bondebjerg, 2014; Aldama, 2015).

2. Storytelling and the role of “war stories” in problem solving processes

Tacit knowledge is made up of a cognitive dimension – mental models, points of view, values and beliefs that determine our perception of reality – and a technical/practical dimension (know-how) consisting of skills from the experience gained in tackling problems. In professional settings, the knowledge that is

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explicitated and shared as stories often attempts to describe what are called “ill-structured problems”, or problems difficult to solve using known procedures or standard methods. These stories become the so-called “war stories” that become part of the memory of the community. People then draw on this memory as they seek to solve similar problems (Milton, 2010). War stories can thus be seen as “transitional objects”, as they enable practical knowledge to be readily retrieved and usually feature three important dimensions (Boje, 2008): (1) the emotional dimension, (2) a rich description of a setting or a situation, and (3) a clear statement of the problem and its solution.

Remembering the story, we try to understand whether the solutions adopted in the past can, with some adjustments to suit the new context, be reused or at least serve as a springboard for new solutions (Denning, 2002). Schön (1983) invites us to reflect on the similarities and differences we perceive when comparing the current situation and the remembered or narrated story, thus contributing to enriching the repertoire that can be drawn on in analyzing subsequent cases encountered in practice. Similarly, Lave and Wenger (2006) maintain that learning during apprenticeships is often aided by telling stories about particularly significant cases. Today stories can be told and shared on video: digital storytelling is now a consolidated practice in teaching (Lambert & Hessler, 2018) and is also becoming more common in broader professional settings (Challinor et al., 2017) as that in social work practice (Chan & Sage, 2019).

3. Digital storytelling as a tool for reflective practice in a university course

3.1 Competencies and reflective practice

The literature on the topic of professional competencies has long emphasized the importance of reflective processes: experiences do not lead directly to improved practices, but it is very important to reflect on these experiences (Schön, 1983) in order to then take action for improvement. A key role in this process is played by autobiographical thinking, which uses storytelling as a self-reflective practice by organizing experiences. The question is thus one of being able to manage critical reflective practice to arrive at transformative learning (Mezirow, 2018). The literature generally defines competency as the ability to use specific knowledge and skills in the work setting for daily activities and to solve problems (European Qualifications Framework, 2009) (Council of the European Union, 2018). In the study presented here, the instructors used digital storytelling with students enrolled in second-cycle bachelor degree program in Development and Management of Educational Services (Social Work) in Italy: it prepares specialists competent in the organization, coordination and evaluation of educational, rehabilitation and training

services with a peculiar attention to individual with special educational needs.

We use it as a means of stimulating the students to reflect on their future professional competencies, particularly as regards: 1) relational and communication skills (Nair & Yunus, 2021); 2) evaluative, reflexive and problem solving skills (Walters, et al., 2018; Stork, 2020; Poonsawad, Srisomphan, & Sanrach, 2022); 3) professional skills in the specific work setting (Douglass, Martínez & Holmes, 2022; Kotlyarova, Rudenko & Shubina, 2020). These competencies are implicit in many frameworks such as that developed by the US Council on Social Work Education (CSWE, 2015), which states that social workers must “apply critical thinking”, and in particular “critically analyze, monitor, and evaluate intervention and program processes and outcomes.”

3.2 The DSCM model: Digital Storytelling for Competencies

During the course, each student was asked to share a story on an online forum about a particularly interesting real life situation (i.e., a “critical incident”) that they themselves had experienced in a professional community, either at work or in an informal setting, and how it was solved. Students were divided into groups (3 to 5 people) and each group decided which of their stories to develop. In a short workshop, they gained the technical and methodological skills needed to work with audio/video editing software. In many cases, the students recreated the original settings and cast themselves as actors in the videos they made.

We created a model to help students to carry out the activity: the DSCM (Digital Storytelling for Competencies Model), partially based on Kolb’s experiential learning framework and Schön’s reflective and transformational learning. The approach taken by Schön (1983, 2008) is particularly pertinent here because analyzing the story brings tacit knowledge to the surface, along with the “hidden” competencies that are rarely brought out in formal reports, forms, meetings and the like (Bhardwaj & Monin, 2006).

The DSCM model consists of four steps:

- (1) Remember a personal experience or listen/read an experience told by others (surrogate experience).
- (2) Analyzing the narrative completing a Story Analysis Rubric, reflecting specifying who the characters in the story are, the setting, the problems and how they were solved, the competencies required for an effective solution, and lastly, the emotions that were perceived.
- (3) Preparing the storyboard for the video or the slideshow. In this stage, the students must use the Story Analysis Rubric to construct a story with a consistent narrative structure with all the characters involved, the description of the problem and the solution. The narrative structure employed is the classic Dramatic Arc (Campbell, 2008), first outlining the setting

(Exposition), then the problem (Incident, Rising Action, Climax) and lastly the solution (Falling Action & Resolution), describing the character’s emotions at each step.

(4) Finally, realizing the short digital video (max. 4 min.). In the video/slideshow creation process, they try to use their voice to personalize the story and the most suitable music or other sounds that support the storyline (Robin, 2008). The resulting video can be shared with other people and can itself become a real surrogate experience. The narrative form, in fact “offers the listener an opportunity to experience in a surrogate fashion the situation that was experienced by the storyteller” (Sole & Wilson, 2002).

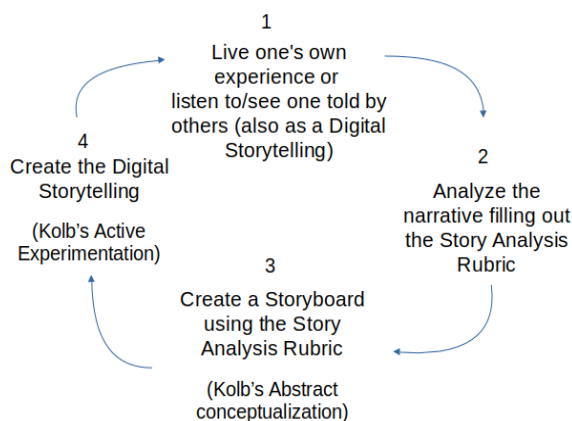


Figure 1 - The DSC model followed by the students to realize the video and to reflect on the competencies needed to solve the problems in the stories.

The students were also asked to indicate the emotions of the characters in the stories; these are what make a story “interesting” and worthy of attention, as they indicate the characters’ level of emotional engagement and, consequently, the importance they assign to the problem (McDrury & Alterio, 2003). The process of identifying emotions obliges the listener to identify with the characters’ point of view and try to make sense of their thoughts and feelings (Christiansen, 2011), thus developing the emotional intelligence that is one of the basic competencies that social workers must have (Grant, Kinman & Alexander 2014).

Lastly, it should be emphasized that the students engaged collaboratively in all these stages, that of reflecting on competencies in particular: the reflection took place during the elaboration of the Story Analysis Rubric on a forum where competences and actions taken were discussed and where instructor and tutors gave formative feedback. To assess the overall quality of the Digital Storytelling produced we used the same SAS Rubric items and other elements such as the point of view, dramatic question, emotional content (Barret, 2006) and other technical elements such as audio, music and video quality.

4. Research Questions and Methods

4.1 Research Questions

This exploratory study seeks to understand students’ perceptions of digital storytelling as a tool for reflective practice, and thus to answer the following research questions:

- (1) What is the perception of digital storytelling as a tool for reflecting on professional problem solving practices?
- (2) What do students perceive to be the most important competencies stimulated by creating the digital story?
- (3) How effective do students perceive digital storytelling to be as a teaching tool in a university course?

4.2 Methods

The mixed method study was based on a questionnaire for a total of 22 items, (5 of which open-ended) which above all investigated the perception of Digital Storytelling as a process that stimulates meta-cognitive processes relating to the specific skills of the future work context specifically about: Collaborative, relational and negotiation skills, Communication and expressive skills, Reflective, critical and problem solving skills,

Furthermore, we tried to explore the potential of the Digital Storytelling creation process to increase learning motivation and as a tool to develop Digital/Multimedia skills. For the close-ended questions, a 5-point self-anchoring Likert scale was used where 3 is the neutral central option, 1 and 2 reflect negative judgments, and 4 and 5 reflect positive judgments. A pre-analysis was carried out for each question to determine whether the respondents could have been influenced by how the question was phrased, and whether the response scale was appropriate.

As a probabilistic sample was not used, the results were analyzed using simple descriptive indices and, where possible, ANOVA. After the last class they could choose to fill out the questionnaire or not and use only a nickname. In the open-ended questions, the students were asked to expand on their answers to the closed-ended questions, in particular as regards the effectiveness of the analysis and video creation stages in triggering reflection on professional competences. Qualitative data analysis was carried out using the Maxqda software package.

A total of 73 out of 83 students attending the course ($F=63$, $M=10$), completed the questionnaire with a response rate of 88%. Students groups for the activity were formed spontaneously. Average age was 26 years.

5. Analysis of Results and Discussion

5.1 Reflection on professional competencies

When asked whether digital storytelling stimulated reflection about their professional competencies, the majority of students (85.1%) answered in the affirmative (43.2% a lot, 41.9% a very great deal). An interesting correlation with students' age was found in a subsequent ANOVA analysis: those over 25 years old tend to express a more positive opinion than the younger participants ($F=3.165$, $Pr=0.04$) may be that this is because the older participants are chiefly working students who were more readily able to imagine how effective digital storytelling might be as a reflective tool in their own jobs.

5.2 Competencies stimulated creating the Digital ST

The answers to this question chiefly indicated three macro-competences (see Tab. 2): 1) reflective skills for professional problem-solving; 2) teamwork, communication-relational skills; 3) digital and media skills. The competencies that were most frequently mentioned were reflective and problem solving skills (79.8% a lot or a very great deal) and teamwork-relational skills (81% a lot or a very great deal), while the least mentioned were digital and media skills (63.5% a lot or a very great deal).

Digital Storytelling was thus perceived as stimulating reflection on the competencies needed to solve a concrete problem in a professional setting, while teamwork skills were seen as useful for group discussion and review of the story to be represented. Digital skills, though indicated by a fair percentage of participants, were probably mentioned less frequently because many students stated that they were already able to create videos and how to edit them.

Competence	1	2	3	4	5	M	SD
Reflective and professional	1.3%	2.7%	16.2%	48.7%	31.1%	4.09	0.77
Teamwork, relational and comm.	0.65%	3.4%	14.9%	52.7%	28.3%	4.08	0.73
Digital and media	0.0%	2.7%	33.8%	39.3%	24.2%	3.87	0.80

Table 2 - Students' perception of digital storytelling as a tool that can stimulate specific competencies.

5.3 Advantages of digital storytelling have compared to activities done in other courses

Students perceived digital storytelling as a process that stimulates their meta-cognitive processes (69.1% a lot or a very great deal), and that also increases their intrinsic

motivation to learn (68.7%) and is effective in helping learn subject-specific content (71.4% a lot or a very great deal) (Tab. 3).

Dimensions	1	2	3	4	5	M	SD
Meta-cognition	0.0%	5.4%	23.1%	39.0%	30.1%	3.90	4
Intrinsic motivation	0.0%	4.5%	24.2%	45.4%	23.3%	3.90	4
Explicitation of content	0.0%	1.3%	24.4%	53.2%	18.2%	3.96	4

Table 3 - Students' perception of digital storytelling effectiveness in teaching.

5.4 Analysis of the responses to the open-ended questions

- EFFECTIVENESS FOR REFLECTION ON PROFESSIONAL COMPETENCIES

Students saw the experience to be very positive, especially because it helped them learn to act and reflect professionally in a university course that they had thought was mostly theory-oriented (Jonas-Dwyer, Abbott and Boyd, 2013). Many students thus realized that self-reflection processes are not so easy to activate (Ryan and Ryan, 2013), and that special training is needed in order to acquire these metacognitive skills. In our case, unlike other researches (see Challinor, Marín & Tur, 2017, p.15), the reflective process seems to have been helped by participation in a group rather than when activated on an individual basis. On the whole, the open-ended questions confirmed the previous responses regarding digital storytelling's ability to stimulate reflection on professional competencies, an activity that might be difficult to engage in if the stories were told in person. Respondents also noted the distinction between simply listening to a "war story" and working it up into a shooting script for the video:

"The digital story has to take a lot of later reflections and exchanges of ideas into account that are needed to create it [the shooting script], so it's not like simply telling about the experience. In addition, the digital story lets you spend time on the setting and the circumstances, not just the action".

- EFFECTIVENESS OF NARRATING PROBLEMS IN REAL-LIFE SETTINGS

A number of interesting points emerged regarding the importance of storytelling about real-life problems and settings. In fact, all the digital stories created by the students represent professional settings similar to those

they will work in after they receive their degree, and in which it was possible to narrate actual experiences focusing on problems and solutions.

“The group was pleased to see a fact represented that had really happened in the community some of them belonged to. It was exciting for them to see once again how the situation evolved: from the problem to the solution thanks to teamwork”.

In this connection, the literature confirms that when experts in a certain field are faced with a critical problem, they frequently prefer to base their approach on concrete, actual past experience rather than following abstract rules (Calderwood, 1988). Storytelling is also a fundamental component of case-based reasoning (Kolodner, 1997), a process focusing on analogy that seeks to solve a new problem on the basis of previous solutions to similar problems. Polkinghorne (1988) emphasizes that professionals prefer to frame clarifications and explanations in narrative form, while Schön (1993) found that architects, engineers and even psychotherapists give preference to narrative in talking about their own professional experiences. In this sense, some students emphasized the “transformative” power of storytelling:

“The practice described in the video affected me a lot [...] because when I stopped to think I found a number of aspects that will lead to an improvement in my practices”.

Scholars such as Mezirow (2018) speak of the transformative value of storytelling, referring to the role of reflection in reconstructing knowledge gained in the past and the ways in which it was gained. In her “Map of Learning”, Moon (2004) places most reflective activities in the last two steps, “Working with Meaning” and “Transformative Learning”: here, students should activate metacognitive processes that are fundamental for improving their future professional practices in real-life settings.

- EFFECTIVENESS IN SURFACING TACIT KNOWLEDGE

Students also mentioned digital storytelling’s ability to bring tacit knowledge to the surface. In this connection, it was interesting to note that the earlier responses to the closed-ended questions showed a good positive correlation between responses to 1) Digital Storytelling as a tool that can highlight the emotional dimension and responses to 2) Digital Storytelling as a tool that helps bring tacit knowledge to the surface ($\rho=0.629$, p value=0.000). It is likely that making emotions explicit when creating the video was seen as useful in communicating tacit knowledge more effectively: a number of studies of speech acts (Turner, 2012) which are in general emotionally charged, have found that they

can facilitate an understanding of complex content, if communicated as a story.

- EFFECTIVENESS OF THE STORY ANALYSIS RUBRIC

For many students, the process of designing the digital story using the Story Analysis Rubric was fundamental in developing the shooting script and identifying the characters, problems and professional competencies involved:

“Thanks to the Story Analysis Rubric we were able to reconstruct the whole sequence, reflecting on and precisely identifying the problems and how [with what competencies] they were overcome.”

A good correlation was found between the positive responses concerning the use of the Story Analysis Rubric and the positive responses concerning the digital story as a means of stimulating reflection. This probably indicates that a clearly structured rubric can be an important aid in identifying the elements of the competencies involved and thus trigger reflection ($\rho=0.624$, p value=0.000).

- EFFECTIVENESS OF DIGITAL STORYTELLING AS TEACHING METHOD AND LEARNING RESOURCE

Digital storytelling was also seen as a very effective means of improving teaching, and the responses to the open-ended questions confirm the quantitative data:

“Creating the digital story is educational [...] because to be able to make the video you have to have very clear ideas and concepts, without realizing it you’re much better prepared on a topic than with another academic assignment.”

“I took on something I’d never done before, I found it entertaining and something you really get caught up in: it’s by no means true that activities at the university always have to be boring, and I’d also like to use it in other courses.”

Here again, there was a significant correlation between the perception of digital storytelling as motivating for learning and its effectiveness in helping learn subject-specific content ($\rho=0.775$, p value=0.000), and between digital storytelling as motivating for learning and the desire to use it in other courses ($\rho=0.732$, p value=0.000). In other classes they used teaching / learning methods that included technology and multimedia and their opinion was quite “neutral”. So, it appears that the positive judgment may have been stimulated by the new storytelling approach we used, but the “novelty” factor was not specifically examined in this study.

6. Conclusions

The overall study's findings indicate that students can perceive digital storytelling as an effective tool for reflection, with all the potential to be used as an approach that can complement other teaching/learning methods.

It can thus be regarded as both a *process* and a *product*: a process, because the reflection on practice that takes place when making the videos can become really transformative; as a product because the digital story reconstructs the problem solving practices and documents them for future use in professional communities of practices. Indeed, the students chiefly emphasized digital storytelling's capacity to stimulate reflection on the competencies called for in their future professional practices and the ability to effectively communicate content dealing with experiences, processes and emotions.

It was also found that reflective and learning processes seem to be effective in direct proportion to their ability to mediate stories that are perceived as authentic real-life experiences with a wealth of personal considerations: the students' responses confirm the studies that indicate that reflection on past experience is essential for "future actions" (Schön, 1995) (Moon, 2004; 2013) and for creating situated knowledge that can be used to solve new problems (Kolb, 2014) (Hillon and Boje, 2017). In our case, the actual experiences narrated in the digital stories are the result of a process employing a structured method (the DSC model) that can reproduce professional settings where students can gain an understanding of the competencies that will be required in their future professions and reflect on the best practices to adopt (Boud & Walker, 1998).

Digital Storytelling has also been used to bridge micro-macro practice gap (see Chan & Sage, 2019, p.10), in this sense, future development of the model will be carried out in close collaboration between the university and social work practitioners: direct contacts will be made with expert professionals in the field who are willing to tell their stories, which the students will then make into short videos and share with the entire community as a means of improving professional practices.

7. Limitations

This study has some limitations: there is not yet a specific validated tool to determine the perceived usefulness of the Digital Storytelling creation process for the improvement of professional skills, so we had to create our own questionnaire. A further limitation is that it was not possible to verify the potential positive effects of a Digital Storytelling creation process directly in the working context.

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