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Data citizenship: rethinking data literacy in the age of disinformation, misinformation, and malinformation

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Abstract: In this paper we examine what 'data literacy' – under various definitions – means at a time of persistent distribution of 'dis-/mis-/mal-information' via digital media. The paper first explores the definition of literacies (written, media, information, digital and data literacies) considering the various parameters and considerations they have gone through. We then examine the intersection of dis-/mis-/mal-information and 'fake-news' and these literacies. The paper explores what types of literacies are needed today and the important role of variations in citizens' social context. We highlight three main gaps in current data literacy frameworks – 1. going beyond the individual; 2. critical thinking of the online ecosystem; and 3. designing skills for proactive citizens. We discuss these gaps while highlighting how we integrated these into our survey of UK citizens' data literacies as part of our Nuffield Foundation funded project - Me and My Big Data. By discussing our theoretical and methodological challenges we aim to shed light on not only how the definition of data literacy changes but also how we can develop education programmes that take into account information distortions and put proactive citizens at the centre.

Keywords: Data literacy, Literacy, Disinformation, Misinformation, Fake news, Networks of literacy

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INTRODUCTION

Citizens' engagement with media and the ways in which they develop their agency have long been discussed through the lens of written, media and information or digital 'literacy'. More recently, as algorithmic decision-making processes have become widespread, data literacy has joined this conversation (Gilster, 1997; Eshet, 2004; Bawden, 2008; Gummer and Mandinach, 2015). In this field of literacies, the emphasis has been around the need to include disadvantaged citizens in society's everyday activities by improving and supporting specific literacy skills and knowledge. There has been a focus on research that explores where a lack of key literacy skills intersects with inequalities across economic or social status, health and disability (physical and mental), racial and cultural position, or gender. This set of 'required' skills have become more complex as the technologies, services and devices people use have rapidly evolved.

In the UK context, the Facebook/Cambridge Analytica scandal in 2017 (Cadwalladr, 2017), revealed that people received disinformation content and advertisements based on their social media profiles and activity, designed to influence their decisions on the 2016 UK Referendum to leave the European Union, and the 2016 US presidential election. These two cases made clear the extent to which citizens are unaware of the uses and abuses to which our data can be put. This lack of data literacy opens citizens up to risks and harms – personal, social, physical and financial – but also limits their ability to be proactive citizens in an increasingly datafied society. However, it is clear that this is part of a wider set of issues that need to be considered and that the current definitions of 'data literacy' (for example, Pangrazio and Selwyn, 2019) are not addressing the issue of mis/dis/mal-information. These gaps in data literacies and their connection to disinformation, misinformation and malinformation are exactly what this paper is focusing on.

When talking about information distortions these similar concepts often get confused or

conflated; yet they have important specific differences. According to the Council of Europe (Wardle and Derakhshan, 2017) there are three different definitions determined in part by the 'intention' of those creating or distributing the information:

1. Dis-information - information that is false and deliberately created to harm a person, social group, organisation or country.
2. Mis-information - information that is false, but not created with the intention of causing harm.
3. Mal-information - information that is based in reality, but is used to inflict harm on a person, organisation or country.

Though the term 'fake-news' was coined to capture the use of dis- and mis-information in news reporting it has now been deployed as a dis- and mis-information tactic by political actors in the attempt to discredit news reporting and reported facts they dislike. Despite different intentions, these strategies influence citizens' opinions and actions both online and offline in various capacities. Recent examples can be seen in various types of misinformation around the Covid-19 pandemic, where people blamed 5G radiation for causing the disease and consequently telecoms "engineers are facing verbal and physical threats during the lockdown" (Waterson, 2020). These messages, then, can impact on citizens' agency, freedom of choice and their perceptions, especially when undertaking their everyday civic engagement with different authorities and fellow citizens.

With these changes to the media and digital landscape in mind, we want to examine how the field of digital and data literacy should address these harms and risks, particularly focusing on what kinds of skills, thinking and actions are needed in information distortion times. In this paper we present the first phases of our project which includes mapping the media, data and digital literacy field in relation to 'mis/dis/mal-information' – building on longer-term discussions that have been made around media and literacies. Specifically, we focus on what digital and data literacy means in the age of information distortions and what scholars, activists and educators should take into account when developing literacy programmes. We have developed a framework of *data citizenship* (Yates et al., 2020) that builds on the understanding of data literacy presented here. We specifically attend to the challenges and gaps that previous literature and organisations did not include in their conceptualisations of literacy. In this paper we highlight three of these challenges and gaps that our framework attends to, and show how we approached them in our UK survey.

We explore the data literacy element of *data citizenship* and how we have applied this to the design of our UK nationally representative survey of citizens' data. We used the survey company Critical to conduct in-home survey work, using a computer-aided personal interview methodology. 125 sampling points were used to achieve a maximum of n = 1,500 interviews. These points were selected to be a representative cross section of UK addresses. Quotas were set to be reflective of the UK internet using population by age, gender, and household socio-economic group, and urbanity. After analysing the survey we identified six types of digital technology users based on the activity they undertake online:

1. **Extensive political users (10% of users)** – High probability of engaging in all forms of digital media use – including political action and communication
2. **Extensive users (20% of users)** – High probability of engaging in all forms of digital media use – except political action and communication
3. **Social and media users (17% of users)** – High likelihood of engaging with social media (social networking sites - SNS) and entertainment media (e.g., Netflix and YouTube)
4. **General users (no social media) (31% of users)** – Lower likelihoods of engaging in most digital media forms but not SNS

5. **Limited users (22% of users)** – Limited engagement with all forms of digital media
6. **Non-users** – Currently non-internet users

We will get back to these user types to show preliminary findings from the survey and how that informs our data citizenship framework, and what we think needs to be included in contemporary data literacy programmes. In the following sections we will first define the evolution of different types of literacies to understand the nuances behind them. We then move to understand what types of challenges we face with dis- mis- and mal-information. After this we discuss the politics and ideology behind literacy to set the discussion for the three gaps that we identified in the two fields and show how our survey and frameworks tackle them. We therefore make several interventions in this paper:

1. Consider the longer history of debates and research regarding citizen literacies.
2. Draw connections and point to the gaps between ideas of literacy and mis-dis-mal/information.
3. Develop a definition of data literacy that accommodates contemporary media and communication developments.

UNDERSTANDING CONTEMPORARY MEDIA AND DIGITAL LITERACIES

In this section we provide brief definitions of the different types of literacy. Like any definition in the field of social sciences and humanities, we want to emphasise that they are by no means universal or unanimously agreed upon. Literacy, as in the context of reading and writing of text, has been the focus of educational, social and cultural research for several centuries. Yet, as Brian Street (2005) noted the term literacy in regard to written materials has multiple meanings – many contested – that have invoked particular foci for research and issues in society. Before the arrival of the web or broader digital media, as Ruth Finnegan (1989) pointed out, perceptions of written literacy have tended to favour specific modes (e.g. reading literature) and to forget that reading, writing and print are just one of many communications technologies. As a result, there is a need to understand literacy as the skills and competencies in using multiple media via communication technologies and not just the 'written' word. We will return to the ideological component of literacies later in the paper.

Over the last 50 years we have seen arguments for: information literacy, media literacy, digital literacy and data literacy. According to Christina Doyle, *information literacy* is "the ability to access, evaluate and use information from a variety of sources" (1994). According to Patricia Aufderheide (1992), a *media literate* person "can decode, evaluate, analyse and produce both print and electronic media. The fundamental objective of media literacy is a critical autonomy relationship to all media" (Aufderheide, 1992). According to Paul Gilster *digital literacy* is "the ability to understand and use information in multiple formats from a wide variety of sources when it is presented via computers" (1997). And finally, the most recent iteration of literacy is *data literacy*. According to Luci Pangrazio and Neil Selwyn (2019) data literacy is about the way "individuals might better engage with and make use of the 'personal data' generated by their own digital practices" (Pangrazio and Selwyn, 2019, p. 420). Pangrazio and Selwyn propose the 'personal data literacies' that focus on five domains: 1) data identification, 2) data understandings, 3) data reflexivity, 4) data uses, and 5) data tactics.

Clearly these ideas significantly overlap, especially when viewed from the perspective of today where nearly all media are digitally mediated. Yet they each relate to thinking in the specific

technological, political and social context and time that they were developed. Each type of literacy came in a time where policymakers made assumptions about media and how different groups of people should use them and for what purposes. 'Media' literacy reflected the growth of networked mass and audio-visual media, from newspapers, radio, television through to video tape, cable and satellite. 'Information literacy' was developed in the beginning of the 1970s around libraries and their privatisation through the use of computers in school and education. Definitions and literature around digital literacy was the focus when the internet became more widespread in the late 1990s and early 2000s as academics and organisations were trying to make sense of it and how people should engage with it. Data literacy has arisen as researchers and policymakers sought to understand the implications of our datafied society.

In many ways, all these definitions still apply to the datafied society, as our media have been transferred to digital/data formats. In this way, we could say that digital/data literacy encompasses these older forms of media and information seeking but expands on them as more services and everyday life activities are conducted through digital platforms. What is different with data literacy, though, will be elaborated below with three key points: moving beyond the individual to networked literacies, developing critical thinking about the online ecosystem and finally – providing literacies which empower people to become active citizens. Like we emphasised with previous literacies, it is not that these three gaps were not as important in the past, however, as we will show below, with algorithmic processes engineering our societies and accelerating inequalities there is an increased need for them. As Sonja Špiranec et al. argue "data literacy is also being considered as a critical concept with the purpose of promoting social justice and the public good, understanding power relations and power asymmetries as well as reducing social, economic, political and other types of inequalities" (Špiranec et al., 2019). In short, data literacy today means understanding and being able to challenge, object and protest contemporary power asymmetries manifested in datafied societies. In the next section we want to understand the current climate of dis-/mis-/mal- information and what new challenges they bring to literacy.

DISINFORMATION AND THE CHANGING MEDIA LANDSCAPE

The topic of dis-/mis-/mal-information is not new. The fields of psychology and political science (Loftus and Hoffman, 1989; Bittman, 1990; Kates, 1998) have examined these issues with their own emphases mainly around manipulation of opinions, memories and emotions in relation to political parties and elections. Media and communication scholars have also paid attention to disinformation strategies, mainly around wars between countries and propaganda (e.g., Kux, 1985; Snyder, 1997). More recently there has been an increased focus on dis-/mis-/mal-information in connection to its use within social and digital media contexts. As Bennet and Livingston argue: "[c]ompared to the mass media era, the current age displays a kaleidoscopic mediascape of television networks, newspapers and magazines (both online eand print), YouTube, WikiLeaks, and LiveLeak content, Astroturf think tanks, radical websites spreading disinformation using journalistic formats, Twitter and Facebook among other social media, troll factories, bots, and 4chan discussion threads, among others" (Bennett and Livingston, 2018, p. 129). Dis-, mis- and mal-information proliferate in the online attention economy where sensational and click-bait content attracts more clicks and hence more profit. This has led to concerns about and demands for citizens to have the understanding and skills to interpret and respond in a meaningful and educated way to dis-/mis-/mal-information strategies employed

via digital media.

The use of digital dis-/mis-/mal-information methods has become widespread by various types of entities, from governments, to companies and onto individuals. As Samantha Bradshaw and Phil Howard argue, different actors use "different tools and techniques to manipulate public opinion, such as political bots, content creation, targeted advertisements, fake personas, and trolling or harassment" (Bradshaw and Howard, 2017, p. 28). These multiple types of digital manipulations happen more easily in platforms, and this means that people need to have new types of knowledge and skills as well as being able to use and apply them according to each case.

In recent elections across the world, from the UK to the USA (Allcott and Gentzkow, 2017; Faris et al., 2017; Guess et al., 2018), India, France (Ferrara, 2017), Israel and onto Brazil, disinformation has been used by governments, organisations and individuals to influence citizens political opinions and subsequent behaviours towards a particular goal. For example, in the 2018 Brazilian election citizens received millions of false messages and photos via WhatsApp for several months (Evangelista and Bruno, 2019). Similarly, the *New York Times* revealed that:

> [t]here were doctored photos and videos edited out of context. There were stories exaggerating Mr. Bolsonaro's heroism and spreading rumours about his rivals. There were conspiracy theories promoting the rumour that Mr. Bolsonaro, who was stabbed at a rally in September, had faked his own injuries as part of a preplanned stunt (Isaac and Roose, 2018).

While that particular news story focused on citizens' use of the WhatsApp messaging platform, others reveal the contribution algorithms that link similar content. For example, on the video streaming service YouTube "users who watched one far-right channel would often be shown many more. The algorithm had united once-marginal channels — and then built an audience for them, the researchers concluded" (Fisher and Taub, 2019). Though it is hard to pinpoint a direct influence of such human or algorithmic interventions on subsequent action, it is clear that such strategies have become more visible and widespread since the rise of social media. There is therefore a pressing need to understand how the manipulation of social media content and algorithms to distort information can potentially influence citizen's perceptions and behaviours around various topics including politics, health and economics.

The reason for this prevalence of disinformation in digital media contexts, argue Alice Marwick and Becca Lewis (2017), arises in part from broadcast media's current vulnerability and weakness. As they argue, the mainstream broadcast media has been targeted via social media because of:

> ... low public trust in media; a proclivity for sensationalism; lack of resources for fact-checking and investigative reporting; and corporate consolidation resulting in the replacement of local publications with hegemonic media brands (Marwick and Lewis, 2017, p. 42).

Therefore, with the increased power of platforms like Facebook, Google, Amazon and Microsoft, as well as the proliferation of mobile telephone use, and weakening media landscape (Pierson, 2017), citizens face new challenges with the way they engage with digital and social media

platforms. In the next section we will explore how different regions have approached these challenges.

DIFFERENT RESPONSES TO INFORMATION DISTORTIONS

In light of the challenges associated with citizens' digital and data literacy education, the European Union (EU) has invested in research around internet safety, digital well-being and digital skills aimed at developing the critical awareness of citizens (European Commission, 2019). In January 2018, the EU developed "The Digital Education Action Plan". This plan emphasises:

> ... the risks disinformation poses for educators and students and the urgent need to develop digital skills and competences of all learners, in both formal and non-formal education. The Digital Competence Framework for Citizens, developed by the Commission, sets out the wide mix of skills needed by all learners, from information and data literacy, to digital content creation, to online safety and well-being (European Commission, 2018a, p. 12).

One of the pillars of the European Commission Action Plan against Disinformation (European Commission, 2018b) is raising awareness and improving societal resilience. As they argue, the public's awareness is vital for societal resilience of dis-/mis-/mal-information and this mainly involves improving citizens' media/digital/data literacies with a particular focus on identifying and 'combating fake news'.

While it is difficult to know the kinds of effects dis-/mis-/mal-information messages produce, governments have started to see them as something they have to address and started to call for research that will investigate potential interventions. In Belgium, for example, the government has since 2018 established an expert group made of journalists and scholars to try and find a solution while also launching a media literacy campaign to inform people about misinformation. In Canada the government has launched a Digital Charter titled 'Trust in a digital world' to defend freedom of expression and protect against disinformation aimed to undermine democracy, and also proposed to invest funding in projects aimed to raise public awareness and digital literacy especially in relation to dis- and mis-information. And Nigeria has developed a media literacy campaign in 2018 which was said to include a collaboration between digital and traditional media together with the National Orientation Agency to provide Nigerians with the appropriate education to fight dis- and mis-information. (for a detailed account of how different countries developed anti-misinformation actions go to Poynter's project).

The UK's Department for Digital, Culture, Media and Sport (DCMS) for example, published a report in February 2019 on 'Disinformation and "fake news"', where they highlight the importance of digital and data literacy, arguing that:

> It is hard to differentiate on social media between content that is true, that is misleading, or that is false, especially when those messages are targeted at an individual level. Children and adults need to be equipped with the necessary

> information and critical analysis to understand content on social media, to work out what is accurate and trustworthy, and what is not. Furthermore, people need to be aware of the rights that they have over their own personal data, and what they should do when they want their data removed (DCMS, 2019).

DCMS has in fact proposed to include digital literacy as part of the four education pillars (along with reading, writing and maths) though this has not yet been taken up as an action by the Department of Education. The report also notes that UK citizens need to know about their opportunities to complain and protest about misleading digital campaigns by addressing them to relevant UK regulators such as communications regulator Ofcom, the Advertising Standards Authority (ASA), the Information Commissioner's Office ICO and the Electoral Commission.

The DCMS's report also highlights one of the persistent approaches taken when seeking to address dis-/mis-/mal-information online – that is the application of technological solutions. For example, one of the suggestions in the report is introducing 'friction' in algorithmic design to slow down the time citizens engage on platforms and by doing so allowing them to think about what they write and share on social media platforms. Meaning, that platforms should develop computational 'obstacles' to make processes of sharing more meaningful and slower. Another technical design solution the DCMS offers involves developing online tools that distinguish between quality content and disinformation sources.

However, the challenges that dis-/mis-/mal-information poses are far more complex. In fact, it is not only the dis-/mis-/mal-information of 'messages' that is deceiving citizens but what is also known as 'dark patterns'. These are interface features designed to mislead, potentially deceive and 'nudge' citizens into a particular behaviour. For example, accepting default settings that 'consent' to their data being shared with third party companies. The Norwegian Consumer Council demonstrated in its research, *Deceived by Design* (Forbrukerrådet, 2018), how social media platforms use 'dark patterns' to manipulate citizens' behaviour. Its report analyses platform compliance to the General Data Protection Regulation (GDPR), and they have examined the privacy settings of "Facebook, Google and Windows 10, and show how default settings and dark patterns, techniques and features of interface design meant to manipulate users, are used to nudge users towards privacy intrusive options" (Forbrukerrådet, 2018, p. 3).

Some of these dark patterns include privacy intrusive default settings, misleading wording, giving users an illusion of control, making it hard to find privacy-friendly choices, and take-it-or-leave-it choices. Similarly, Nouwens et al. (2020), have recently shown that many websites use 'consent management platforms' (CMPs) that retain 'dark patterns' so as to on the surface 'conform' with the EU's General Data Protection Regulation. Nouwens et al. found that only 12% of the CMPs they examined met the minimum EU regulatory criteria. The majority retained interface designs that are likely to mislead or make difficult to reject options where citizens provide data to third party companies.

In most of these debates we see how academics or governments provide technological solutions or expect citizens to take action to force companies to act ethically or legally. Though we support such initiatives, we note that they put the responsibility on the individual to be trained and have appropriate skills. Additionally, citizens are expected to act in ways that support the quality assurance for platforms and their regulation, potentially removing the onus from regulatory bodies, institutions or the state. Similar to the current situation where governments suggest technological solutions to Covid19 (with 'contact tracing apps'), we argue that these are social problems that are entrenched in structural inequalities and therefore cannot be 'solved' only

with technological means.

As these various studies and policy interventions show, citizens have to engage not only with potentially dis-/mis-/ or mal-information and content (like 'fake news') but also deliberately misleading or complex interface design that prevents control over privacy, content delivery and content sharing. Hence, the types of digital and data literacy that citizens need today are complex. They involve not only being able to read and verify news and content, but also, understand the technical and media economics of digital platforms, how they are funded, what their different features and affordances mean and how they function, how to change their privacy and content settings and importantly their individual and collective rights. Digital and data literacy therefore have a strong political, civic and ideological aspect which we explore in the next section.

UNDERSTANDING LITERACY AND THE IDEOLOGY BEHIND IT

Many scholars have pointed out the ideological aspects of literacy ideas (Street, 2005; Collard et al., 2017). Though such scholars do not deny the value of literacy and the skills that are attained through its development, they specifically point out (Street, 1984) that there is a strong ideological component to most definitions and education programmes of literacy. In school "essay writing" literacy skills are valued over others, in the workplace formal writing over casual forms may be preferred. In contemporary society older literate forms (books) may still hold greater value than Facebook posts. Importantly, Street warns us that many views of "literacy" carry with them this ideological baggage – presenting specific literacy practices as though they are 'neutral or universal' or implying that they are better or preferred to others:

> The 'autonomous' model of literacy works from the assumption that literacy in itself - autonomously - will have effects on other social and cognitive practices ... The model, I argue, disguises the cultural and ideological assumptions that underpin it and that can then be presented as though they are neutral and universal (Street, 2005, p. 13)

In this way, literacy skills and competencies become a political ground. For example, in the case of digital and data literacy, training citizens to become more productive workers or consumers are more valued, while skills for their wellbeing, entertainment or activism are seen as unimportant and do not appear in government policy and educational curricula. The idea that literacy has a strong ideological component was also one of the founding arguments of cultural studies. Richard Hoggart's (1957) exploration (for all its faults) of what we would now term the "literacy practices" of working-class citizens sought to grasp the fundamental impacts of close to universal literacy (reading and writing) in the context of a society with rapidly changing print and broadcast media.

These moral distinctions around the economic values of digital and data literacy have also been examined by Payal Arora (2019). In her study on digital literacy in the Global South and Asia, Arora argues that most people use their literacy skills to access films or more controversially - pornographic sites. According to Arora, such informal uses of literacy are seen as 'less important' or 'less productive' by governments and NGOs. We would therefore note that any definitions of literacy – written, media, digital or data – need to be cognisant of these issues.

Such definitions often mix practical skills, broader social or critical reading skills, ideas of cognitive impact and effects.

Social values in regard to types of 'text' and types of 'skills' are integrated into education and skills programmes. As a result, we cannot simply view digital and data literacy through a lens of basic skills. The literacies that citizens need as they begin to conduct most of their lives through data services and platforms are complex and varied. Having a strong understanding of how lives and practices have become centralised and interconnected by platforms and digital systems is key to how contemporary literacy is developed. If media, work, and health used to be conducted in different locations and through different instruments, now they are centralised through our computers and our mobile phones. Perceptions and understandings of digital and data literacy will be shaped by social and political contexts that citizens find themselves operating and living within. In the next section we elaborate on our project and how we integrated all these thoughts into our data literacy framework and survey.

DATA LITERACY AND INFORMATION DISTORTIONS

In this section we focus on the idea of data literacy and how we have linked this to the notion of *data citizenship* - a theoretical framework developed by the Me & My Big Data team (Pawluczuk et al., 2020). We highlight three main ways that our data literacy is different from previous literacies and how we tailored that into our nationally representative UK survey that was circulated to UK citizens in summer 2019. The *data citizenship* framework was crafted following a broad literature analysis and the analysis of secondary survey data (Yates et al., in press). *Data citizenship* is a framework that outlines the importance of citizens having a critical and active agency, at a time when society's datafication and algorithmically-driven decision-making has become normalised. As digital data have become the core element of our cultural, social, political, and economic worlds, *data citizenship* aims to create a framework that explores links between data, power and contextuality. Through *data citizenship* citizens are encouraged and supported to carry out an individual *and* collective critical inquiry to participate in their communities in a way that is meaningful and proactive. The framework consists of three areas:

- **Data thinking** - Citizens' critical understanding of data (for example, understanding data collection and data economy).
- **Data doing** - Citizens' everyday engagements with data (for example, deleting data and using data in an ethical way).
- **Data participation** - Citizens' proactive engagement with data and their networks of literacy (for example, taking proactive steps to protect individual and collective privacy and wellbeing in the data society as well as helping others with their data literacy).

We argue that inequalities in regard to digital systems and media are better understood around types of users and their correspondence to other key social variables – rather than solely individual skills and access. To explore how data literacies and issues of dis-/mis-/mal-information intersect we highlight three avenues where *data citizenship* provides deeper insight into citizens engagement with digital media:

1. going beyond the individual focusing on the networked
2. understanding critical aspects of media
3. developing proactive skills rather than passive engagement

We highlight where our conceptions differ from past ideas of digital and data literacy. In addition, we explain how we addressed these issues in our UK citizens survey and provide some

initial findings to help illustrate our framework.

NETWORKED AND CONTEXTUAL LITERACIES

One of the main differences between previous ideas of data and digital literacy and our model of data literacy is the need to focus on literacies beyond the individual. As we noted earlier about the DCMS approach, policy often focuses on measurement and development of skills of the individual in isolation. For example, Helsper and van Deursen (2015) point to the challenge of self-reports which usually result in people over or under rating their engagement with digital systems. They emphasise the need to go beyond the techno-determinist approach and to focus on the social aspects of digital skills, adapting skills to individuals and their local contexts. Overall though people's skills are often measured individually and usually detached from their everyday use of multiple digital services and devices.

Trying to tackle some methodological challenges, Helsper et al. later (2016) developed a measurement instrument called the Internet Skills Scale (ISS). Using the ISS, they measured if people know which information they should not share and when. However, in the case studies from the UK and the Netherlands that they outline, measurement of skills is conducted in an individual way online, taken out of people's everyday context and without focusing on critical engagement with the internet. In addition, since they try to make the measurement broad and applicable to multiple internet platforms and website, the scale misses nuanced practices that people engage in, depending place (people behave differently on WhatsApp, Facebook and Twitter).

Similarly, the digital rights NGO Mozilla's Internet Health 2019 report notes that the challenges for digital literacy go beyond skills. As they point out, most people do not understand how internet technologies work and the implications of using them in their everyday lives. As they emphasise:

> … basic Web literacy skills are important. But they don't necessarily prepare us to identify and address the big questions and serious challenges like bias, harassment and concentration of power in our connected world (Mozilla Foundation, 2019, p. 86).

Yet Mozilla advocates in this report for a universal 'Web literacy' which will support educators and activists in diverse communities. Though we support and advocate for more proactive citizens through literacy (as we discuss below), it is not quite clear what is included in this universal literacy and at whom it is aimed. As we have already argued above, the notion that a 'universal' one size fits all solution can be developed to tackle literacy problems goes against most of the contemporary literature on the issue (including our report's findings - see Yates et al., 2020), highlighting that people with different backgrounds need different literacy programmes.

Others have highlighted the need for tailoring skills development to key social groups. Agencies such as the International Telecommunication Union (ITU), adopt Van Deursen et al.'s (2017) skills frameworks and adapt it focusing on: 1) operational skills; 2) content creation skills; 3) information management skills; 4) social skills. The key findings from ITU's latest report is that as activities get more complex, fewer people undertake them. The organisation is quite broad

and general when it comes to what they actually mean by 'negative outcomes' of lack of skills. However, they emphasise the need for specially tailored digital skills training and learning formats for specific disadvantaged groups, such as the unemployed, lower educated, elderly, disabled, illiterate, migrants and families in precarious conditions. While it is important to tailor literacy programmes to disadvantaged groups, these education programmes are usually aimed at individuals who should integrate as efficient workers and/or consumers.

Although such measures can be useful, especially in identifying socio-demographic variations in reported skills, they potentially fall foul of Street's (2005) concern that literacies, in this case digital and data literacies, are reduced to universal skills that are 'autonomous' and automatically lead to certain cognitive or social outcomes. As a result, whichever skills measure you select may carry with them ideological assumptions about the best or more important skills, and hence the type of citizen you want to have at the end. In order to take into consideration the different skills and competencies different groups of people value and need, according to their life course and their communities, our project design will follow up the survey work with in-depth citizens workshops. We want to understand how data literacies can assist people in multiple avenues of their lives, beyond work and consumerism, and highlighting the collective potential of literacies for their communities.

But when we talk about thinking beyond the individual we are also talking about the need to expand the responsibility of training literacy beyond individual people. As Monica Bulger and Patrick Davison (2018) argue, media literacy is often broadly defined as a set of individual skills which promotes a critical engagement with different media messages. One of the shortcomings is that media literacy training mainly focuses on individual responsibility rather than questioning the role of the community, state, institutions or technology companies. As a result, media literacy interventions suffer:

> … from issues plaguing education generally; primarily, the longitudinal nature of media literacy creates difficulty in evaluating the success of particular training initiatives. Across education, a diversity of goals leads to incoherent expectations of outcomes, making decisions about what is measured, how, and why very important (Bulger and Davison, 2018, p. 16).

As Bulger and Davidson point out, education is not about one short term programme, but a longitude project. This is especially true considering the fast-changing nature of media. Therefore, in the current landscape of short-term literacy and education programmes it is difficult to assess whether they work in the long run. It is also difficult to know who is accountable for the way these programmes are implemented. In addition, literacy programmes are usually aimed at young people who have institutions (like schools), unlike adults. If the responsibility to be literate lies on individuals, then we can expect socio-economic inequalities to influence their ability to have access and resources to such education programmes.

In our research we wanted to zoom into, not only the practices of sharing things on social media, but also on how people engage in relation to other people and in multiple environments. Instead of portraying people as using digital systems and apps as individuals, we wanted to situate them in their social networks – their families, friends, communities, neighbourhoods and other networks. We call this 'networks of literacy', meaning how people engage with others, where and with which media to gain the understanding, skills and competencies in a way that fits them. We see these networks operating across all aspects of our *data citizenship* model, but we view it as

being most evident in the way people engage with data (what we call *data doing*) but especially in the way they proactively create new things and collaborations with data (what we call *data participation*).

We asked a set of questions focused on their digital media participation, interactions or relations with others, for example:

- 'Have you ever used internet search during a conversation with your friends or family to verify information that you discuss? ("let's Google this…")'
- 'Have you ever encouraged/ taught others how to stay safe online (e.g. by showing them privacy settings of software tools? (e.g. virus checkers)'
- 'Have you ever encouraged others to fact-check? (e.g. by conducting other searches or using other media)'
- 'Have you ever helped others to protect their personal data online?'

What our data shows is that these practices differ according to the user type, so while our *extensive political users* would participate the most in different settings, others who come from lower education and socio-economic condition are less likely to encourage people to stay safe, to fact check or help others to protect themselves online. These insights can help us in understanding who are the proxy points, people who are most likely to be approached for assistance and see how we can make interventions in those social spaces. Nevertheless, in order to get a better understanding of the way people use specific technologies and how they interact with others we will, in subsequent phases of our research project, meet citizen groups to discuss with them about the everyday 'data day' that they have. With this approach we also want to avoid developing literacies from above rather than together with people and the way it makes sense in their lives.

CRITICAL UNDERSTANDING OF THE DIGITAL ECOSYSTEM

Another important aspect that is unique to our view of data literacy is around the understanding and critical thinking of the digital ecosystem. Of course, scholars have been advocating for critical thinking as part of all forms of literacy before the datafication of our everyday lives. For example, for Tibor Koltay (2011), media literacy describes being able to access media *and* to critically understand, produce, and negotiate meanings in a culture of images, words and sounds. Koltay argues that there are five levels of media literacy:

1. Actively using media while feeling comfortable with all types of media.
2. Having a critical approach to quality and accuracy of content.
3. Using media creatively.
4. Understanding media economy.
5. Awareness of copyright issues.

Here we can see that being 'critical' towards content is important, but it is not so clear what 'critical' specifically means. It clearly includes what citizens need to do in order to verify and counter problematic content, such as dis-/mis-/mal-information, but it does not include being critical towards platforms' interface design. However, we argue that understanding the digital economy, including how algorithms work and who is funding social media platforms is a key issue in regard to data literacies. In the context of the broader question of understanding the media economy of digital systems, the UK telecoms regulator Ofcom (2019) has conducted annual surveys to understand the current state of UK adults (16+) media use. From recent

Ofcom data (Ofcom, 2019) the proportion of citizens who can correctly identify the main source of income for broadcast TV drops from 80% for BBC (public service) to 53% for subscription services and lower for Youtube (44%). These figures have remained pretty stable since 2005. In addition, and unchanged from 2017, in terms of personalised advertising, six in ten internet users recognise that some people might see different adverts to the ones they see. As Ofcom emphasises – there are differences in socio-economic status when it comes to awareness of funding and online advertising. This points to the challenge of citizens' ability, especially marginalised ones, to understand media economies and how that shapes what and how they engage with platforms. Therefore, critically understanding media economics and ecosystems is important when it comes to knowing how social media are sponsored and how that may affect the way algorithms are ordering content as well as tempo-spatial relations between people (Carmi, 2020a).

Similarly, the UK NGO doteveryone report (Miller, Coldicutt, & Kitcher, 2018) argues that there are measurements of digital skills (such as those noted above) but not for deeper understanding of digital media and systems. Therefore, doteveryone has developed a model that defines what *digital understanding* means for citizens in practical ways that they can recognise in their own lives. They have split the types of understandings into the main roles people take in their communities: individual, consumer, worker and member of society. The model shows how people can move from basic awareness to deeper questioning of the implications of technologies in each part of their lives as they need it. As members of society, citizens need to understand how to use the internet to become a part of the public sphere, which doteveryone argues includes being aware of the role of the internet in civic and political life, thinking critically about the trustworthiness of information, knowing about filter bubbles and their impact, and being aware of their legal rights online (Miller, Coldicutt, & Kitcher, 2018).

Following these approaches to critical thinking, we wanted to expand on this dimension further in our *data citizenship* model and call it *data thinking*. Examples of types of questions that we asked in our survey under this domain were:

- Which, if any, of the following information do you believe that a company like Google, Amazon or Facebook collects about its users? (financial situation, health and wellbeing, their friends and family, location, what they do on social media etc.);
- In your opinion which, if any, of these reasons apply as to why companies like Google, Amazon or Facebook might collect information about users? (targeted advertising, selling users' data to other companies, tailor prices for products and services, personalize their experience when using a website/app etc.);
- Thinking generally, when you find factual information online, perhaps on search engines like Google, do you ever think about whether the information you find is truthful?

Interestingly we found that people (in all of our user types) do not want to be tracked over time. They think that platforms like Facebook and Google do not make it easier to change privacy settings and they do not want to share their data with these companies in exchange for a free service. However, when asked if they think it is acceptable for these companies to personalise their experience through apps and websites there is around 50% agreement across the user groups. This is a clear indication that people do not understand the online ecosystem of how these companies produce profiles and segmentation and then trade their data through different brokers to provide their 'free' services (Carmi, 2020b). Educating people on how these ecosystems work can help people understand better these connections and object to these practices (Worledge & Bamford, 2019). But to be able to properly oppose these asymmetric power structures people need to be proactive, which leads us to the next big gap in literacies.

PROACTIVE CITIZENS AND NOT PASSIVE CONSUMERS

There has been a distinct shift in the debate around media literacy in the context of digital systems with a focus on two issues: skills and a more "mechanical or technical" understanding of the media economy of digital systems. There may be an obvious reason for this new focus: digital media are much more interactive and technically varied compared to traditional broadcast media and require such things as media production (posting on social media) and security skills (such as changing privacy settings) – skills that are *proactive* digital and data literacy practices. However, echoing again the ideological aspects of literacy we discussed above, both policy and education programmes have not been developed around citizen's proactive skills to protest, object, unionise and conduct other collective actions against various civic issues.

A good example of how digital skills education programmes were aimed to keep citizens passive and not proactive is the European Union's Safer Internet Programmes that were running from 1999 until 2013. As Elinor Carmi (2020b) illustrates in her analysis of these programmes, citizens were taught to report on harmful content and to avoid actions that could harm the protection of reputation and intellectual property. However, teaching citizens how the internet works, how to encrypt their communication or to use more privacy friendly services was never part of these programmes. Not to mention that teaching citizens about laws that they can use to object, protest or negotiate things on the internet were never developed or promoted. As Carmi argues, these:

> [E]ducational programs have helped to cement and institutionalize EU citizens' roles as consumers and products in the online market territory. Although framed as 'safety' education for people, the material that EU citizens were taught was mainly about maintaining the safety of all the organizations that create, manage, and control the internet: governments, copyright holders (of various types of content), ISPs, publishers, digital advertisers, browsers and others (Carmi, 2020b, p. 163).

This is a clear example of how digital and data literacy programmes have an ideological component. Just like written literacy key skills and competencies are often tied to economic need (Street, 1984), or in relation to valuing new media forms and their social status (Hoggart, 1957). Therefore, literacies with a critical element need to address skills and thinking that can provide citizens with tools to shape, object and protest their datafied realities.

To reflect the idea of proactive and potentially critical digital literacy we sought to have a better understanding of how citizens participate. In our *data citizenship* model we called these activities *data participation*. This dimension focuses on how citizens participate and especially those connections between practices which integrate online and offline activities and how they inform each other. Data participation therefore helps us to examine the collective and interconnected nature of data society. Through *data participation* citizens can seek opportunities to exercise their rights and to contribute to and shape their collective data experiences. Our survey therefore asked how often respondents had engaged in examples of *data participation*. This might include a person who actively contributes to online forums, citizens using open data for the benefit of their community, helping others to set up a secure password, engaging in privacy or dis-/mis-/mal-information debates, showing people how to fact-check things online or create an online campaign around a specific cause.

Although our *extensive political users* did show more proactive practices with their datain relation to others, none of our user types show evidence of deep engagement with data as part of their personal and civic lives. We will further focus on these particular practices in the focus groups, but what this indicates is that people mostly do not know about proactive options, do not know how to actually unleash them, or choose not to engage in more proactive activities around civic actions.

CONCLUSION - WHERE NEXT?

In this paper we examined what the ideas of literacy mean in the age of dis/mis- and mal-information – especially critical digital and data literacy. We did this by building on the work of our *Me and My Big Data* project to examine two fields which have been discussing these issues in parallel but not always together:

• Digital and data literacy

• Dis-/mis-/mal-information

Our project literature review and secondary data analysis work helped us to identify what we view as several key gaps. From this we built a model of *data citizenship* and of data literacy (Pawluczuk et al., 2020). We then used this model to develop a national representative survey of UK citizens. Our main focus in this paper was to further explore our idea of data literacy in the context of dis-/mis-/mal-information so as to:

- Examine the ideological aspects (after Street, 1984) of viewing digital and data literacy policy and theory in terms of individual skills.
- Highlight the networked and contextual nature of citizens' everyday digital and data literacies.
- Highlight the need for citizens' digital and data literacies to include a critical understanding of the economy and 'ecologies' of digital platforms.
- Emphasise the need for proactive participation of citizens in these digital platform economies and ecologies – especially the potential for critical participation.

We have also indicated how we sought to translate these *data citizenship* and data literacy models into a survey tool. In addition, we highlighted how different user types have different literacies practices and understanding and hence should have different education programmes tailored to them. We believe that exposing such challenges can help other researchers who are trying to understand what to ask, how to measure and how to phrase it. We hope this paper is a starting point to bridge fields of study, which have become critically dependent on one another over the last few years.

Literacies – written, media and datafied – keep on changing, so unpicking the new from the old and the changing from the consistent is key at any historical point. With the rise of persistently high levels of dis-/mis-/mal-information online we argue that there needs to be an emphasis on evaluation and critical understanding of media, its design, and especially its political economy. Importantly, the history of literacy and media literacy research makes clear any understandings and interventions need to address different social contexts, but especially marginalised ones such as lower socio-economic status, disabled, elderly and racial communities. We also need to take on Bulger and Davison's (2017) point that this is not just about individuals but that other social, government and industry institutions should be a part of this process. This means that such education programmes should be running on an ongoing basis to tackle new emerging media changes and make sure people from various background have appropriate access and

resources to gain such literacies. Importantly, a focus on individual skills and technologies narrows the understanding of digital literacy and hence the development of proactive activities which suit people's everyday needs.

Nevertheless, and as we mentioned above, we believe that surveys of skills and practices can be highly informative, but they are not enough on their own. To get a better understanding of how people engage with data and what it means to their lives and in their communities, there is a need for qualitative methods such as citizen workshops. It is crucial to understand how different groups of citizens engage with content, how they learn to use and understand different devices and applications. In particular, we believe it is important to provide people with tools and knowledge to engage in more critical understanding and actions to fully enjoy their agency and civic participation. What we want to ask citizens is how they establish a network of literacy, support systems but also systems of trust between their peers and communities to develop their digital skills. A key component of this is to explore how and to what extent people's networks can help (or hinder) them from developing the critical data literacy skills they need to evaluate and counter digital dis-/mis-/mal-information and content.

We especially want to expand the understanding of digital literacy outside the 'digital' realm and see it as a more holistic and networked experience that involves practices which are conducted in various spheres, some online and some offline, as these cannot be separated. We also want to emphasise that these insights and skills should be done locally (instead of trying to 'scale up'), citizens in different places in the world have different considerations, backgrounds, understanding and resources. There should not be a one-set-of-skills-fits-all sort of approach. Nevertheless, scholars and practitioners would benefit from sharing their findings and insights and trying to build a central hub where these skills can be shared, and especially for NGOs, governments and journalists to access as well.

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