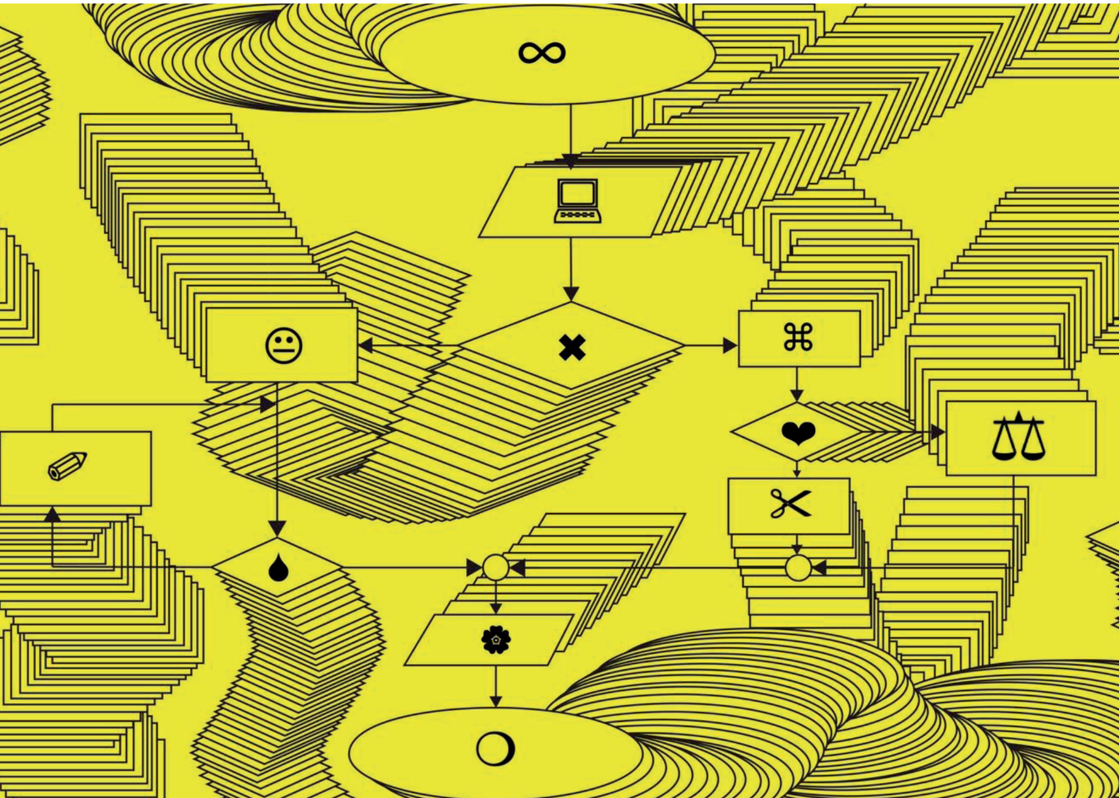
ETHICS OF CODING

A REPORT ON THE ALGORITHMIC CONDITION



ETHICS OF CODING
A REPORT ON THE ALGORITHMIC CONDITION

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ONE

INTRODUCTION: THE ETHICS OF CODING

[EOC]

1.1
EoC – AIMS AND SCOPE

This report on the *Ethics of Coding* [EoC] presents a snapshot view through an investigation on the current state of what we call "the algorithmic condition". By speaking of the algorithmic condition, we pick up today, in critical manner, Hannah Arendt's question of the condition of possibility for leading an "active life" as the conditions of possibility for politics. For Arendt, this question emerged out of an altered status of knowledge that resulted in her time from being related to nature of the earth as investigated from a viewpoint in the universe, rather than one situated firmly on earthly grounds (Arendt, 1958). In doing so this report brings together discourses and objects, of the sciences and the humanities, and seeks to present a spectrum of the diversity of issues generated by this altered, novel condition, and survey of the wide-ranging considerations and potential applications of this topic. Further, this report *on the ethics of coding and the algorithmic condition* asks: How can we think adequately about the relation between knowledge and ethics in societies that are governed by algorithmic digital systems and objects endowed with agency? In order to attend to these latter questions, we looked at Jean-Francois Lyotard's report from 1979 on the altered status of knowledge in "computerized societies". Raising Arendt's question of critique (and transcendentality of conditions of possibility) with regard to how we think about "human nature", as well as by relating coding and programming to Lyotard's particular notion of language games and paralogisms (Lyotard, 1979), we propose to take into account, from both viewpoints, an emerging novel "literacy" which we propose to call a "quantum literacy". With this, we want to direct attention to the principle inadequacy of thinking about numbers and letters, mathematics and language, as two separate domains of which the former is concerned with the necessary whereas the latter deals with the contingent and interpretable. Code confronts us with an "impure" reason that cannot rid itself of amphiboly, but that is nevertheless "computable".

An algorithm is a finite set of instructive steps that can be followed mechanically, without comprehension, and that is used to organise, calculate, control, shape, and sometimes predict outcomes, applied across various fields. Algorithms are as old as mathematics itself (Ritter, 1989a, 1989b) and are used in multiple domains of human life; from making food using recipes, solving math problems in engineering, to controlling complex transport and distributions systems. Developed for calculating, and reasoning problems in a computational manner, algorithms are classically used in math. With the rise of computers and computation especially since the 1980s, more and more problems from more and more diverse fields are being treated as "computable" problems; which means they are being tackled in algorithmic manner. The outlook of Quantum Computing (cf. Chang et al., 1998; Shor, 1994), or even Universal Quantum Computing (propagated e.g. by IBM) prognoses to be able to treat *all* problems – be they as "wicked", i.e. socially complex and principally unsolvable (Rittel et al., 1973; Churchman et al. 1967) as they may – as "computable" problems" that compute in term of Qubits rather than Bits.

The use of algorithms (for the detection of patterns in information; the organisation and analysis of data; the implementation of data codes and sequences; and other computational systems) in societies not only effects a practice-based shift in knowledge production and acquisition, but also produces a logic which is symbolic but also which manifests as a reality. This logic - which is logistically constituted – is what we refer to in this report as the *algorithmic condition* – that alters the cultural and social reality it organises, through its procedural dynamics – which we address as *the ethics of coding*. Algorithms engage the data as they are written, but their codes can and do evidence degrees of bias (Amoore, 2009; Bishop, 2018; Cheney-Lippold, 2011; Hayles, 2017); and the degree of code bias thus requires consideration of the ethics of coding.

The domain of ethics is a customarily contingent, yet also dynamic field. In consideration of technology, culture, philosophy, and all fields of Information and Communications Technology [ICT], that enable an algorithmic condition, we focus here on the notion of "ethics" and make the distinction between the discourses and practices of ethics and morals; where "morals" refer to belief systems that impose value judgments, we think about ethics as referring to the encoding and decoding of types of practices; we think of this as an ethics because all encoding and decoding process involve encryption and deciphering that can embed different degrees of contingency and ambiguous determination. Hence, we find it useful to speak of an 'ethos' of coding, maybe even different 'ethos of different eras' (Hodge, 2017). An 'ethos' includes: 1. codes of practices (generally engaged by groups and individuals for regulation purposes); 2. rule-based systems that advocate specific groups and individuals; and or 3. existing orders of knowledge linked to those rules, governing what is deemed appropriate and or inappropriate behaviour (for example, when applied in relation to contemporary conditions that designate national identity and its ethos; as practice, power structures, and implementation "contracts" (Braidotti, 2006; Hodge, 2002, 2017).

When one considers ethical guidelines for research innovations, as they are in use today, one usually encounters a perfunctory (or "tick-box") approach to the consideration of "the ethics of research" involving degrees of human sampling, confidential information, and or security issues for data acquisition, storage, retrieval and processing has been the dominant practice when considering the "ethics" of a thing, design, practice, process, or situation. However, when we take into account some of the essential changes that innovations in ICT have brought to European communities across the sciences, business, healthcare, education, and social models, and at the level of the possibilities of "life" itself – such as in the field of bioinformatics as the science of collecting and analysing complex biological data such as genetic code (cf. Kennedy, 2016; Schäfer and Van Es, 2017), or in the area of technological developments of robotics, automation, and artificial intelligence (AI) (cf. Burrell, 2016; Greenwald, 2017; Powell, 2017), or in the arena of changing modes of work (Moore, 2018), or in the domains of energy (Hovestadt, et al., 2017), then it becomes clear that this radical change in the conditions for life and biosocial relating requires a more specific form of ethical guidance; an ethics that is able to meet the demands of an algorithmic environment, and the forms of information and "knowledge" generated by this environment. Where ethics currently exist in ICT research and innovation their focus usually lies on the consideration of privacy, the security of data, or copyright law information (see Floridi, 2013). While these considerations are unquestionably necessary, for the use and implementation of new ICT models there are other aspects that have changed since the computerisation (and thus datafication) of societies since the late 1970s (Nora & Minc, 1980; Hayles, 2012; Lyotard, 1979); namely the ethics of the production and implementation of forms of knowledge in a digitised economy (as, for example, the "data economies" that are part of the Digital Single Market [DSM]). The question of the veracity of news information (highlighted in stories ranging from "affective visualisation" to "fake-news" in 2017) are a case in point of the significance of the question of ethical knowledge formation. For example, a focus in news is frequently of the 'personal' use of data, rather than the account of the effects of the algorithm/s in use (Edwards & Veale, 2017); and information on how the algorithm works remains opaque (De Laat, 2017).

Points of comparison for the scale of change and significance of the algorithmic conditions of society, governance, and lifestyles include the Industrial Revolution (1760+), and the Datafication of Society (1978+).

This report argues for an involvement with ethics that extends beyond existing tick-box models; instead advocating that an ethics of coding be responsive to the specificities of future ICT design, infrastructural forms of services, production types, and the types of applications required in the Digital Single Market (DSM) (including all of the initiatives in establishing the codes of conduct related to the DSM, such as the electronic communications code), the future Internet, and for the proposed development of multi-scaled networking technologies for the European Federated Experimental Infrastructure for Future Internet Research & Experimentation (FIRE).

This report is meant to be of use for any infrastructure, system, network, organisation, institution, or individual engaging or participating with/within an algorithmic condition. Algorithms are not only a component of research – they are simultaneously part of the "toolkit" in the world of the Internet of Things (IoT). In view of this, their ethical implementation should be considered in terms of their contribution to any decentralised or cybernetic system, in terms of its use, transparency, data sovereignty, and any algorithmic procedures. The report is written in a generic way that enables it to be applied, not only to specifically European models of ICT, but also to non-European technologies, suggesting how they might be utilised within the European Union [EU].

With this ethics of coding comes the requirement for a new literacy that is able to be expressive and articulate within the algorithmic condition; not simply a case of media literacy, but rather, as the report describes, the need for a new quantum literacy. Information, ICT and Media literacies are part and parcel of contemporary curricula (or they are simply assumed to have been acquired by students) at all levels of education in European countries, and globally, contingent upon access to ICT (see also Lambert, 2001). Informed by the transition to datafied societies, such literacies assume an interface culture of spatial navigation through texts, images and the built environment with mobile phones, tablet computers and laptops. We argue that the algorithmic condition extends beyond, and fundamentally changes, such spatial modes of relating by foregrounding the temporal logics upon which both interfaces and navigational practices rely. Navigating through nonlinear time changes the critical, albeit rather predictable, "jumping of scale" (Smith, 1992) and introduces unpredictable critical and creative activities in, and by, the data-technology-human apparatus (cf. Barad, 2007; Bühlmann et al., 2017).

This report highlights the significance of understanding what it means to take an ethical stance in relation to the processual dynamics of algorithms, through an awareness of the types of codings produced in algorithmic societies. Firstly, the EoC report adopts the philosophical approach of Jean-François Lyotard (1979) to knowledge production, and resituates it in the three core coding spheres in which we find occurrences of the algorithmic governance of society; the social, ethical and educational realms, which collectively give rise to what we want to call "knowledge sovereignty". Secondly, the report is informed by the ethical position of Hannah Arendt (1958, 1961, 1963, 1978, 1989, 1994, 2003), whose work reconsiders what the notion of *ethics* could possibly be after the types of human behaviour that occurred in Europe after the atrocities of the second world war. Arendt's work asks how questions of the inequities of human rights might be resolved, and how the creation of a shared and common responsibility can be enabled through the collective actions of a community (see Birmingham, 2006). Further, the report notes that the algorithmic condition is altering what comes to be recognised as 'human rights,' if the condition lends itself to a state not only of change of the legal status for entities of all kinds, for example, through a change in militarisation practices (Schuppli, 2014); but also a change in the very notion of 'community,' through new forms of digital citizenship generated through algorithmic gatherings, and cloud-based commons (cf. Amoore 2013; Bühlmann et al., 2017; Colman 2015; Manovich, 2013; Terranova, 2004; Thacker, 2015; Tselentis & Galis, 2010; World Bank, 2016).

1.2
KNOWLEDGE: CODING ETHICS

When we consider the relation between ethics and knowledge with regard to an "algorithmic condition" of possibility for "leading an active life" (Arendt, 1957), we need to acknowledge the immediate precursor of this condition; that of the relatively rapid uptake of computerisation across European societies. Lyotard's report on what was termed "the postmodern condition" (Lyotard, 1979, 1984) describes this transition period – between the early paradigm of operations research, the cybernetics systems era (described in Wiener, 1961; and its consequences in Galison, 1994; Guattari, 1995; Kline, 2015; Rindzeviciute, 2016), and the era of personal computating after the 1980s (Lyotard, 1984).

Examining the period from the 1950s to the end of the 1970s, Lyotard describes the "transition" in the information economy brought about by ICT (Lyotard, 1979, 1984). Lyotard's philosophical approach to the alteration of knowledge argues for the need for new kinds of narratives, both for – and of – computerised societies. At its core, Lyotard's report offers a critique of the "metanarratives" that had structured accounts of knowledge prior to the reconstruction of Europe. Lyotard highlights how the end of the so-called "great narratives" of knowledge marked a shift from their previously central and hierarchical role to a devolved understanding of knowledge production in societies. With this came a change in understanding the ways in which models of knowledge are generated and implemented. In terms of understanding this shift, Lyotard focusses on methods of expressing new forms of knowledge that are generated by computerisation, examining the forms of arguments, the concept of deductive reason, axiomatics, claiming statements, probable (modal) reasoning, rule-sets (computational grammars, transformational syntaxes, dealing with semantics in terms of corpora of data), and so on. Through the post- industrial digital devolution of hierarchical knowledge, Lyotard proposes a generalisation of Wittgensteinian "language games" instead of arguments and deductive reasoning as a means by which to engage with the new models of knowledge that were emerging in the computerised society of the late 1970s. Using a framework of play, Lyotard picks up the computational role of algebra. Thinking about algebra, we understand that play (the Wittgensteinian game) has a set of definite rules, but the rules can be combined into various systems and their terms can, accordingly, be factorized (or raised to their exponentials) in a principally indefinite amount of manners. In terms of their algebraicness, Lyotard's notion of play deals with a "logistic logic", with a symbolical system of substitute positions that establish a vicarious order and amphibolic order. Lyotard seeked to addressed this with his notion of "paralogisms". The structure of a symbolic system differs from a system in analytical terms (fixed axioms and elements (basic notions), rather than a set of fixed but cominable and articulatable rules). In a game, the position of these basic notions are "empty", "unoccupied" (vicarious) and hence, within a certain limits, *open* (variously endowable/entitle-able with capacities and kinds of values, and hence adaptable in a great variety of manners), whereas, for example, in an axiomatic system, the rules are fixed as well as the definition and (predicate) valuation of the basic terms. Where predicate logic is fundamental for analytical (axiomatic) systems, in the play paradigm of Lyotard's language game there is a logistic disposition on which the symbolic system depends. Following this logic of non-fixed meanings; speculative functions; and other novel modalities and behaviours (which have been observed in relation to "algorithm" and "data" [described at 2; 3.1]), the consideration of the ethics of coding in the plurality of algorithmically established and induced (generated and generative) economies that need to play together in one single market (Digital Single Market) ask for a manner of governing that accounts for all that challenges the EU's project of a DSM, like digital (non-national) import/export trading between digital economies and communities via crypto-currencies, and block chain organisation. Social coding occurs at this fundamental level of economics – which is a core part of the knowledge "turn" that Lyotard suggests – where game and game theory work on probability, prediction, and also behaviourism. This report's interest in trading, currencies, probability theory, fluctuations, networked infrastructures, and education models (including the proposition for a Quantum Literacy [6.2]) thus highlights for any consideration of the algorithmic condition, the active and dynamic nature of epistemologies as well as ontologies, and the kinds of ethical coding engaged by that condition.

The EoC report describes how new, emergent forms of knowledge generation in the period 1980–2020 require novel registers to address what we propose to call the algorithmic human condition. Ours is a period during which algorithms have enabled the use of data in both prescriptive terms (using algorithmic calculations to confirm previous knowledge categories) and in generative ways (where algorithmic calculations are exploratory, and open ended). This use of algorithms has been productive of different forms of knowledge, and "data" is now understood in terms of code that can be made to produce different things, and which has neither a positive, nor a negative nor anf definitive (intrinsic) 'meaning.' Code is code (and not number, character, letter or amino-acid) insofar as its relation to what it encrypts is entirely arbitrary. Following this, the report asks, if knowledge models are formed of and contribute to a reality that involves actions reasoned in terms of by algorithmic calculations, then what is the status of ethics in coding algorithmic conditions? This question targets that what we describe as *the algorithmic condition* is being both generated by, and generative of technic models (by data-technology-human apparatuses) rather than humanistic ideologies.

1.3
KNOWLEDGE: ETHICS CODING

In addition to Lyotard's attention to the technical, the modal production of knowledge, and the requirement for education to be responsive to such significant societal change, the EoC research considers the algorithmic condition through the lens of Arendt's notion of the *vita activa* in her book *The Human Condition* (1958). In this text, Arendt set out what the framework for a twentieth-century ethics could be, set in the post European World War II context mid-twentieth-century, booming cybernetics society and the development of information infrastructures (variously described in the work of Bell, 1973; Galison, 1994; McLuhan, 1964; Kline, 2015; Rid, 2016; Rindzeviciute, 2016; Siskin, 2016; Wiener, 1961). Arendt's proposal for "The Human Condition" (1958) begins with a consideration of the novel technology of this era, most notably the Sputnik 1 satellite, which was the world's first artificial satellite, launched by the Soviet Union into an elliptical low-earth orbit on 4 October 1957. Arendt uses this perspective to re-think the human condition as being unbound, face to face to nothing anymore, now that we can watch the world from a point of view in outer space.

Arendt's *Human Conditio*n narrates the shift in technologically-given perspective towards pluralist societies, especially that in terms of a two-fold process of individual expropriation on the one hand and the accumulation of social wealth on the other. Arendt's reference and her subsequent discussion asks for a reimagining of the political realm that were adequate to these developments – in this pluralist technological world perspective – as actioned by people. Arendt's *vita activa* further describes how actions are temporally bound and contingent in each case and, for each collective, also bound to their contemporaneous technological forms.

Arendt's framework questions how we might redesign the topology of contemporary experience, one which is given perspective through its technological communications platforms – what we describe today as ICT, the IoT, and also as Universal Quantum Computing models (see 6.1). Across the member states of the European Union, this technological topology is mapped via policy statements on the IoT, algorithms, data (in terms of security, health, governance issues), and in the infrastructural histories behind the use of algorithmic process organisation throughout Europe (seen, for example, in the development of the common market for coal and steel in Europe in the 1950s). The topology of code today comes in "algorithmic formality": a play between "temporalized" and contingent symbolic systems that afford data to be recognised according to certain formal patterns.

TWO

ALGORITHMS

2.1
THE ALGORITHMIC CONDITION

Algorithms are used in all sorts of calculations and predictions. They are used in code encryption or breaking, data sorting, data management, information sorting, organisation, and analysis. With the huge data sets generated through the computing power of the twentieth century, nearly all infrastructural and organizational structures are being reset on a novel basis, that of algorithmic control. This triggers a kind of frenzy: the more kinds of problems that can be treated in this way, the more novel applications pop up to extend the scope of algorithmic control, planning, and generation of scenarios.

The algorithmic control of coding information is employed across a broad area of human-oriented organisational activities, including transport systems, food production, processing, and distribution, health, education, finance, the media industries, and security. In addition to organisational procedural systems, algorithms are employed to process huge demographic data sets, which can be used, bought and sold as data sets in the market place. As identified by diverse scholars – from the analysis of the operation of Hindu-Arabic numerals by the Baghdad-based ninth-century scholar Abdullah Muhammad bin Musa al-Khwarizmi (Crossley & Henry, 1990: 104), to the twentieth-century culture and media scholar Wendy Hui Kyong Chun (2011) – the manipulation of codes and symbols of information by an algorithm engage in "code logos". This refers to the way in which an algorithm operates according to how it is conditioned: "code as source, code as true representation of action, indeed, code as conflated with, and substituting for, action" (Chun, 2011: 19).

In referring to the algorithmic condition, we infer the ways in which algorithms of all kinds play together and condition our environments and communities (cf. Amoore, 2009; Amoore & Piotukh, 2015), and the material intra-actions within those environments (we refer to "intra-actions" not "inter-actions" here, signalling the algorithmic agency of the code at work, following Barad, 2007: 141). The actions of social; vernacular life are themselves information, which collated,constitute and allow to detect (encrypt and decipher) patterns in recorded data.

2.2
ALGORITHMIC MODALITIES, AND THE BEHAVIOUR OF MATHEMATICAL MODELS

In terms of ICT, the term algorithm refers to the encoding of computerised procedures, which can be subsequently used to extract data sets from anything. Amoore and Raley note that: "Algorithms increasingly have the capacity to analyse across different forms of data (images, text, video, audio) and across cloud-based spatial locations of data" (2017: 6). Since the mass computerisation of societies from the 1980s, the shift to a social environment – where the digitisation of communications enabled new modes of algorithmic conditions – has radically altered communities, produced new community forms, both actualised and virtual, and new behaviours (cf. Dobnikar et al., 2011; Finn, 2017; Floridi, 2015; Parisi, 2013; Simon 2015). What does it mean when the *algos* (a market traders term used in mainstream media for automating trading to generate profits at a frequency impossible to a human trader, thereby ruling out the human (emotional) impact on trading activities; it became popular in the media when the comments by the French President Hollande with regard to the concept of hard Brexit caused the British sterling currency to plunge in value 6% in 2 minutes in October 2016) acts upon the matter of information that has been put into action by the political field, affecting both the field and the information in ways unforeseen by the society that invented the algorithm? What does this kind of algorithmic behaviour do to the data sets that it rearranges?

Algorithms put data into a coded state of performance, relative to mathematical models. For example, any regulation of the digital market occurs at the level of code and algorithm, with regard to sets rules based on pricing, quantity, timing, and other mathematical models. This is what has produced, and continues to produce, the material conditions made by market transactions that determine the forms and types of social, political, and cultural systems that direct, and are reflective of life today. Algorithms provide the set of instructions used to plan, control and predict outcomes in unstable environments, and with regard to problems that would classically count as too complex and unsolvable ("wicked", Churchman, 1967). Algorithms are described theoretically in terms of how they can be understood as a recipe for achieving x; with the mathematical models put to work by algorithms, this x's own and ongoing active behaviour can be taken into account of the performed calculation, as for example with the algorithms that organise data in social media, or the algorithms that organise data for transport safety. Algorithmic performance, and the mathematical models behind it, forever "approximate" their referent. But this approximation is not one in epistemological terms only, concerning a relation of representation. And neither is it one in ontological terms only, where an object would acquire indefinite "depth" or "withdrawal" (as object-oriented philosophers like to call it). It is performative approximation that produces what it will have referred to (when studied retrospectively). Prospectively, however, this indefiniteness is where the algorithmic condition and the human condition encounter one another: even when we have the set of instructions, there are multiple "unstable" factors that contribute to the possible dynamic outcomes that form and characterise x. These unstable factors and processual dynamics represent what the report identifies as the algorithmic modalities that affect a model, its behaviour and its outcomes, leading to a range of forms of data use and manipulation (see Poser, 2013 on modalities; Rouvroy & Berns, 2013 on data governmentality).

THREE

DATA

3.1 DATA

Algorithmic infrastructures are creating a different kind of condition for using data, as Daniel Bell (1973) suggested.

Data protection principles, formalised in the 1995 EU Data Protection Directive, and the 2016 EU General Data Protection Regulation (GDPR) seek to address some of the issues raised by the use of algorithms, and generated by different forms of algorithmic behaviours, but discussion of these conditions are so far limited when it comes to the facilitation of an ethical climate.

In particular, as even mundane data might be mined, stored, and then transformed into collaborative filtering algorithms (and others, as computing capacity expands and novel algorithms can be written), into new data sets about individuals that may be unexpected or have potential to harm them, the data gathered about individuals becomes more distant from the data applied to them (e.g. through decision-making), placing existing legal frameworks under strain.

One of the most important aspects of the algorithmic turn and the focus on data-driven decisions is the proliferation of pre-emption (rather than regulation), trying to predict patterns and behaviours based on standardised algorithmic models. This is what the Belgian juridical scholar Antoinette Rouvroy calls "data behaviourism", which provides a "new way of producing knowledge about future preferences attitudes, behaviours or events without considering the subject's psychological motivations, speeches or narratives, but rather relying on data" (Rouvroy, 2012: 1).

What is new here is that this kind of data behaviourism does not simply produce subjects, since data does not consider subjects as "flesh and blood persons" – as concrete agents, driven by deep and complex wishes and feelings – but rather this type of behaviourism bypasses consciousness and reflexivity, and operates on the mode of alerts and reflexes. In other words: the algorithmic condition affects potentialities rather than actual persons and behaviours (as described by Edwards and Veale, 2017), yet at the same time, the condition influences human cultures. Hence, in considering *the algorithmic condition*, the inference is that we have moved from the Spinozist ethical question of "What a body can do" to a predictive code question of "What does the algorithm do to bodies?". As the algorithm exerts a power over bodies that it directs, this constitutes a politics; entering the domain of ethics, and the question of Artificial Intelligence [AI]. Machine learning is tethered not only to the available databanks, but also to the contingencies written into the algorithm, experienced by the machine (in its glitches and power surges and infections, etc.), and ethical biases are cached within the patterns of data upon which algorithms are trained.

At its core, data behaviourism is producing the same power structures from the past (for example, see Noble, 2018), and degrees of bias, but this time providing the legitimacy to solidify power relations that may have earlier been questioned and rigorously scrutinised. Describing this data state, Rouvroy suggests:

> We are no longer dealing with things, since there are no longer any things, there are no longer resilient objects: there are only networks of data evolving in real time and that aggregate from time to time as profile, patterns and so on. But raw data seem to be speaking by themselves. We no longer distinguish what used to come under the sign or the signal and the thing. What is lost with this entanglement is the possibility of critique.
> (Rouvroy in Rouvroy & Stiegler, 2016: 7)

Bias is a difficult word to translate across disciplines, as it is used with many meanings. Statisticians see bias as something that allows data to exhibit patterns, whereas social scientists of many flavours consider bias in the sense of emergent patterns which are undesirable, and can spring from a multitude of areas. Additionally, a range of computer science researchers have been involved in creating approaches to 'de-bias' algorithmic systems.[1] These define fairness, often in terms of protected characteristics in the law and ways in which to integrate or mitigate them, for example during the training or refining of machine learning systems. Yet these systems assume that organisations have access to the sensitive data they need to mitigate these issues, such as race, sexuality or religion — which they often do not — as well as a definite classification of these in their grey zones, which could always be otherwise (Binns et al., 2017). Furthermore, issues of fairness stretch beyond protected characteristics into the *justification* of actions being taken, and it is thus possible to make a system that is perceived as unfair, even if equality law is strictly obeyed.Bias can be introduced in a number of ways, for example:

- Data might represent historical patterns – such as entrenched racism or sexism – which we do not wish to replicate. As a result, it might hold a mirror up to the world, when a mirror is not what we want a decision-system to be based upon. (see also discussion in Rouvroy & Berns, 2013)
- Zipf's law of minimal effort, whereby only a minority of users online generate content. Peter Lunenfeld (2011) has characterised this as a "secret war between downloading and uploading", consumption and creation. This is essentially captured by the idea that one is not "sampling at random" from an entire "population" of data, and that even where the measurement of a phenomenon is agreed upon, data concerning it might not be measured or captured evenly.
- Algorithms may engender their own data bias, through the "presentation bias" of results to generate "clicks", ratings or comments. Placing items in search results higher up the page is shown in studies to be "the most important factor used in determining the quality of the result, not the actual content displayed in the top-10 snippets" (Bar-Ilan et al., 2009).
- "Filter bubbles" are based upon a paradox whereby no algorithm can recommend something new that you may like, if it does not use data from other people (Pariser 2011), which at scale can produce a herding effect. Analogously, a recent study in the J*ournal of the Royal Society Interface* showed that sheepdogs think algorithmically, and that algorithms make good sheepdogs (Strömbom et al., 2014). The study described an algorithm derived from sheepdog/herd behaviours in which a single individual, through the introduction of predatory pressure inducing flocking, which in turn make herds more easily "driven", is capable of influencing the group behaviour of a massive and unwilling crowd.

1 See www.fatml.org.

3.2 DATA SOVEREIGNTY

"Data sovereignty" is a term that tries to resolve such conflicts with regard to geopolitical issues – which law applies to data depending on where it is stored. It is a question of where and how data is hosted. Servers and providers used to be geopolitically localisable, however, this principle no longer applies in relation to cloud hosting. Technologies like blockchain offer new concepts of data sovereignty. Amoore and Raley (2017: 3) draw attention to how "the embodied actions of algorithms [...] extend cognition, agency and responsibility beyond the conventional sites of the human, the state and sovereignty."

In the German language, the term data sovereignty is also linked to a discussion called "*informationelle Selbstbestimmung*", which has been an (ongoing) discussion since the 1970s dealing with issues around privacy, and which in the context of modern data processing, the protection of the individual against unlimited collection, storage, use and disclosure of his/her personal data is encompassed by the general personal rights of the German constitution. In terms of international law, data sovereignty is often related to who owns the data – that is, in terms of nation states – due to geopolitical location (Vaile et al. 2013). However, this principle is in conflict with cloud computing (distributed storage). Homi Bhabha's (2017) treatment of spectral, vernacular sovereignty in relation to memory (collective identity) is relevant here, as a means by which to uncover the philosophical problem implied by this notion of data sovereignty.

FOUR

CODING

4.1
CODE DEFINITIONS

The term "code" is being interpreted in several ways. The etymological roots of the term "code" are Latin – codex – meaning a tree trunk or block of wood from which sheaves/sheets of papyrus, or paper books were made. Code also comes from an explicit and systematical writing down of laws, with reference to Hamurabi and Justinian law. By the late sixteenth century codexes referred to collections of statues / laws, and specific codexes are still referred to; e.g. *The Codex Alimentarius* (Food Code). With regard to algorithms, code is often referred to in terms of systems of symbols used for information control and programming. "Code" can also be used as a term to describe conversions, and the writing of messages and instructions. "Code" in this sense refers to particular media of communication (as in Morse code), but also to protocols and rules for communication. In computer programming, to "code" (in certain languages) refers to the formulation of instructions, the running of protocols, and the setting up of algorithms to perform work. "Code" also refers to pre-specific language or economy of symbols that, like an alphabet (lexicality, grammar, syntax) rather than like systems of symbols (axioms and elements) that can represent other things indexically, and thus hide things, or enable access to things, as in cryptography through encryption keys and codes.

It is in these senses that we investigated the term in relation to the consideration of the algorithmic today; code that preserves the "materiality" of the thing to which it refers (as in the materiality of the book), yet also is symbolic; and inclusive of the implications of quantum technologies and mechanics, where specific coding enables, governs, or directs societal and social operations.

From an analytical point of view, it is significant that code produces "systems of symbols" (rather than a symbolical system) – precisely because of this, a structural approach and a systematic approach are not mutually exclusive: they are the two sides on one coin, and their interplay is generative on either side. This difference between "system" and "structure" is a problem that lies at the very core of all approaches that endeavour to formulate a "general linguistics" – at least since Ferdinand de Saussure (1857–1913). Taking into account its "materiality", code can deal with this problem because it does not try to "solve" it, but rather provides for a comparative and comparatistic practice of how it can be "resolved" – in the sense of how we speak of a mixed substance being "resolved" in chemistry.

In ICT code is taken to refer, not only to the formulation of a set of instructions (codes in general) for data in a computer programme or genetic information, but also as inferring the material and discursive data (social codes) that are used across all communication and media forms (Stocker & Schöpf, 2003: 15), all of which contribute to generic knowledge codes (educational canons, rules of law) that subsequently contribute to the forms and governance of communities. The work of the pillars named in the Juncker Commission on the Digital Single Market provide the contextualising framework for the codes produced in the European ICT environment in, and through, which the EU's nations must work together, in terms of the law and its ethical applications.[2] The conception of "Europe" itself shifts under this condition, as much as it does under the ethical shifts identified by Arendt (cf. Balibar, 2015; Gasché, 2008; Hoskyns, 1996; Tselentis et.al., 2010).

In its consideration of the different forms of coding, as a working hypothesis the EoC assumes that, if we are communicating not only numerically (counting) but also in units (measurements) of data through specific sets of algorithmic instructions that organise procedures, then that algorithmic condition is altering knowledge forms, their ontologies, and epistemic and classificatory fields via the formality of informatics generated, and the fields of possibilities enabled. Such enabling is selective, it is empowerment as well as disempowerment. The implications of machine learning can be generative of forms of "moralism" that are different to the ethical considerations of technology, and are not helpful for engaging an economical ethics of resources, work, and governance. However, machine learning can also contribute to the generation of "local" morals or simply idiosyncratic "manners of conduct". Such local morals may embody newly acquired experiences that do not in themselves lay any claim to any formal status, or to be of *general* validity. "Moralisms" only arise when local customs claim generalised validity. Thus, an "ethics of coding" does not seek to contradict the accreditation of local morals; rather, it is an ethics precisely in that it can embrace non-generalisable situatedness by making their particular kind of encoding translatable, and hence compatible, with the encodings of other local morals.

The coding of concepts happens twofold, and in parallel, at both an ideological and informatic level. In terms of the symbolic and historical levels, these are maintained and driven by two things: the recorded expression of codes (by specific laws, cultures and communities that are generationally and politically contingent), and the valuation of its actions. Within algorithmically governed areas of society, concepts are not coded at these socio-political levels (albeit that through data behaviourism coding for the future is entangled with power structures from the past), but by informatic, modal operations. It is this latter focus that deserves attention in its own right, and that is of specific interest for us when looking at the three fields that we consider subordinate to what we call Ethics of Coding in the Algorithmic Condition: Social Coding, Ethical Coding, Educational Coding.

2 https://ec.europa.eu/commission/priorities/digital-single-market_en

4.2
SOCIAL CODING

In consideration of social coding, we ask: What are the areas of social governance in which such a Code Logos may be evidenced – in terms of the design of infrastructures for communications; the direction of funding for communications (and for whom)? How do contemporary social coding forms contribute to forms of knowledge about society? What are the models and conditions that enable the forms that societies take, given their particular algorithmic conditions, as well as their larger, environmental algorithmic condition? Finally, we ask: what are the shared understandings of ethics generated by these conditions?

Forms of social coding capture the informatics of the algorithms at work. For example, Chun (2011) refers to the notion of a "code logos", which urges us to think about what the frameworks of normative coding are that are enacted today by digital technologies that enable coding to occur. Social coding is used across, and is implicit in, the design of a range of ICT platforms, including network architectures that regulate the control of security identity data, digital social platforms, and collective awareness platforms, defining the biopolitical terms of heredity, genetic codes, gendered codes (see Van der Tuin, 2015), class coding, ethnicity coding, ideological coding, theological coding, and economic coding – all of which define rights of access as well as support states of sovereignty. In the context of the algorithmic condition, the notion of "data sovereignty" within the legal framework of the "European Union" is representative of the shift in codification of social knowledge forms.

In *The Coming of Post-Industrial Society: A Venture in Social Forecasting* (1973) Daniel Bell argues that the most important shift for society is the "codification of theoretical knowledge". Linking Bell's conception of social coding to Susanne Langer's concern with "The New Key" in philosophy (as just one of many such examples), we can see that even as early as the 1940s, the change in social epistemic structure brought by knowledge shifts has many ramifications for societies:

> Here, suddenly, it becomes apparent that the age of science has begotten a new philosophical issue, inestimably more profound than its original empiricism: for in all quietness, along purely rational lines, mathematics has developed just as brilliantly and vitally as any experimental technique, and, step by step, has kept abreast of discovery and observation; and all at once, the edifice of human knowledge stands before us, not as a vast collection of sense reports, but as a structure of *facts that are symbols* and l*aws that are their meanings*. A new philosophical theme has been set forth to a coming age: an epistemological theme, the comprehension of science. The power of symbolism is its cue, as the finality of sense-data was the cue of a former epoch.
> (Langer, [1942] 2009: 16 original emphasis).

The formulation of the algorithmic condition as a state contributes to changes in cultural epistemologies concerning issues of data (such as how we understand what forms of computation, time, memory, archiving, and storage might be), communications, and the notion of "history" itself. As commentators including Bernard Stiegler, Donna Haraway, and Félix Guattari note, a "lack of consistency" (the "contingency" of any "foundational" point) is one of the traits of the technological systems, machines, and subjects produced in, and by, post-industrial capitalism (cf. Guattari, 1995: 48; Haraway, 1997: 121; Stiegler, 1998: 177). With this modal mode of operation come new expressions, and new ways of articulating the conditions of the present. In the chapter "Locked In: The Algorithmic Basis of Sociality" in her book *The Culture of Connectivity: A Critical History of Social Media* Dutch media scholar José van Dijck notes:

> Connectivity quickly evolved into a valuable resource as engineers found ways to code information into algorithms that helped brand a particular form of online sociality and make it profitable in online markets – serving a global market of social networking and user-generated content.
> (Van Dijck, 2013: 4)

Van Dijck's focus and language details the use of social media platforms and how they engage algorithms to service the market place. By attempting to critique in traditionally modern and postmodern keys, we can only project power relations from the past, the present and into the future onto the ICT platforms, whereas we know that both they and their workings are determined *yet at the same time not exhausted by* such power relations.

Summary Points on Social Coding

To speak of an ethics of "something" indicates a possessiveness; the idea that there is a realm already defined (such as the uses of big data by commercial companies such as Google, which may be said to purchase the data, or use the data made available to them in the marketplace). As we engage with some of the nuances of (context contingent) social coding, those prefigured areas are readily identifiable. As Lyotard demonstrated, the concept of knowledge has changed. However, we might look to critical models of "social physics" or sociology to consider further the collapse of knowledge models. For example, as French philosopher Auguste Comte's three-stage positivism (see Scharff, 2012) identifies in the third stage (industrialism) how we no longer look for causes, origins, etc., rather there is nothing to be learnt anymore (learning is characteristic for the second stage; the spiritual/metaphysical one). In the third stage we only concern ourselves with the laws of what is known, and this idea is in conflict with both coding and programming.

4.3 ETHICAL CODING

We have looked at "ethical coding" through the lense of what it means to be "citizens" in the algorithmic condition (Bühlmann, 2018). To ask (and think) what it means to be citizens in a digital world infers a capacity to act responsibly. Yet with regard to whom, and within which domain? In considering what coding ethically – and an "ethics of coding" – entails, we endeavour to maintain an open mind, by attending instead to modes of exchange, translation, and transference. Hence the consideration (for ICT, the IoT, technology design), of a new role of "economy" to address judiciary laws through coding (Ayache, 2010, 2017).

When we begin to explore algorithmic conditions that give rise to *ethical coding*, we note that the language used to express this condition shifts between a consideration of attention to the differences between the object and/or concept produced, and the material, technological platform generating it. Here we have to address the conflation of the product(s) of algorithmic infrastructures – the technical objects (data sets; digital infrastructures) – with their conceptual etymology and "promise".

"It is injustice, not justice, which brings us into normative politics" (Bhabha, 2017 citing Avishai Margalit 142). Homi Bhabha takes Margalit's observation as his point of departure for what he refers to as spectral sovereignty – where the concept of a "nation state" continues, even after its form has been altered, changed, or perhaps even destroyed (for example, the "nation states" of the indigenous peoples of Palestine or Kashmir). Following Bhabha, Bruce Robbins and Paulo Lemos Horta argue:

The nation state persists in spectral or compromised form, [as an] absolutely contemporary, part of any properly cosmopolitan aspiration in the digital era … [introducing into] identity a primordial indefiniteness – one might say, a refusal to be pinned down by the question, 'Where are you from?' For Bhabha, this indefiniteness parallels the role of dignity in the discourse of human rights: it is the proper basis for a cosmopolitan ethics. (Robbins & Horta, 2017: 13)

Judith Butler (2004) also refers to the concept of "spectral sovereignty" in relation to the discussion of precarious life, questions of power, ethics, violence and mourning – which Mary Lou Rasmussen and Valerie Harwood (2009) apply in relation to issues of contemporary governmentality and the nation state's approach to "identity".

If we can be civic citizens of this digital world, how then might we be lawful within this digital world? What is its relation to jurisprudence, and to law? Must we be ethical in a novel way because laws are being mechanised (Niggli, 2014)? What does an ethics for coding consist of? How to lead (as Arendt puts it in *The Human Condition*) an active and a free life? (see Birmingham, 2006) Within algorithmic conditions we ask, *what is digital citizenship*?

4.4 EDUCATIONAL CODING

"Educational coding" in the context of this report is concerned with schooling (conventionally understood) and with educational institutions. It also seeks to examine the kinds of education, schooling or literacy that are required to engage with the algorithmic condition, across a wide range of institutions. Commitments to teaching digital literacy, coding, and even algorithmic literacy have, thus far, failed to engage sufficiently with the algorithmic condition. The literacy required to address this condition extends beyond simple programmatic interventions or skills-based approaches that seek to develop competence in becoming more adept users of technology or even a better understanding of how big data works. Coding literacy does not involve simply introducing Science, Technology, Engineering and Mathematics [STEM] students, designers, engineers and computer scientists to arts, humanities and social sciences curricula, or doing the converse for students in across the science, technology, engineering, and either art and mathematics, or applied mathematics [STEAM].

An extensive literature documents and examine the risks posed by algorithms – not only in terms of coding (for bias and discrimination) – but also in terms of their application and interpretation, whilst noting how algorithms can alert us to our own biases (Kitchin & Dodge, 2011). The opaqueness of pervasive machine learning algorithms requires additional ethical considerations and safeguards. However, as Alison Powell articulated in her evidence to the UK's Science and Technology Committee consultation on automated decision making, transparency alone is not enough to make algorithms accountable (Powell, 2017). For example, traditional notions of transparency do apply to neural networks that distribute intelligent decision-making across linked nodes, in which the decision-making process cannot be unpicked (cf. Burrell, 2016; Kroll, 2017). Furthermore Paul B. de Laat (2010, 2017) observes that transparency is complicated by the fact that underlying data sets cannot be made freely available due to privacy constraints machine learning models may promote "gaming of the system", thus a solution or salience would appear to lie in the use of intermediate parties involved in their application.

As algorithms interface with datasets, the literature highlights the dangers of creating feedback loops that further target and exclude marginalised populations. As a consequence, understanding big data means understanding the construction of "evidence" and the responses to such "evidence", in a manner that remains vigilant and critical, and that does not see such outputs as definitively authoritative. Yet, we can also make algorithms and big data our objects of study through a variety of lenses and, in the pedagogical context, a "science of relations".

However, the critical leverage derived from exposing the limitations of contemporary algorithmic culture and its practices can – important as this is – promote fear and impede opportunities to see the benefits that can arise from these practices. In the context of education, a good deal of contemporary discourse surrounding technology involves creating preventative and awareness-raising interventions, targeting vulnerability, safeguarding, cyber-bullying, and privacy. In this respect, programmes and responses follow the model of public health interventions rather than developing educational responses to the contemporary questions arising from algorithmic culture and questions of algorithmic governance.

Making something an object of study is part of this process of schooling – the "suspension" that allows for a non-instrumental engagement with whatever is on the table. In education, something is put on the table to allow us to gather around it (cf. O'Donnell, 2012, 2014). Masschelein and Simons (2009) take up this Arendtian metaphor in order to show the importance of mediators – the object, the matter at hand, the world – in the educational endeavour, and the process of suspension required in order to study it and detach it from its use value. This offers a promising way of thinking about education more broadly, in the sense that it invites a range of bodies, such as research centres, industries, and other organisations, including public sector bodies, to introduce "educational moments" that are uncoupled from the demands of production or consensus. As part of an ethics of coding, this would cultivate and promote practices of listening, enquiring, singularising, and studying.

Bernard Stiegler's (2012) re-appropriation of the concept of the "*pharmakon*" invites both vigilance and generosity when responding to practices and this ethic in the educational context, and his attentiveness to the co-imbrication of the human/artefact coalition and the co-genesis of humanity and technology allows for other, more complex stories to be told. For Stiegler, we become human through our processes of mediation – *techne* is part of becoming human (see also Vlieghe, 2013). It is not a matter of being for or against technology per se, but rather, of thinking about education and the "grammar" and the "objective" of schooling itself.

FIVE

ETHICS AND MANNERS OF CONDUCT

5.1
ETHICS

The evaluation of the ethics of data use, and or the ethical ecology of decision support systems that engage with data, happens across a number of situations within any given algorithmic environment, or condition. Edwards and Veale (2017) describes forms of evaluation of algorithms, in relation to public sector practitioners of machine learning, whilst Guy Abel (2010) notes a similar process in relation to international migration and population behaviour and change. Additionally, as national debates in, for instance, the Netherlands (Kool, Timmer & Van Est, 2015) and France (CNIL, 2016) reveal, there are multiple positions on what actually constitutes an "ethics" of behaviour.

The very notion of marking "change" per se, as a registration point, first of all makes a presumption of something "new", and second, presumes the possibility of marking its correspondences, predicting its intentionality – significant and insignificant – and what Poser describes as "physical and causal necessity" (2013). The action of singling out a specific instance (for example, asking which ICT or IoT project has answered its brief in the most appropriate way) involves quantitative measurements that assess meaning through its "critical mass number of normalized instances" (Bühlmann & Hovestadt, 2013: 14), such as we see in the statistical measurement of the sales of objects through informatics algorithms. When dealing with social change, the measurement of the mass and the marginal engages qualitative judgments (Schwab, 2016), and a marking out of differences that can lead to moralistic pronouncements, which is fundamentally different to an ethics that seeks to insert and implement a community-actioned, political ethic (Arendt, 1958).[3]

Ethics can be defined, using a term from Thomas Gieryn (1983), as "boundary work". Ethics comes from the Greek term *ethos*, meaning "habitual character and disposition" in plural, "manners", and refers to a person's, community's, or institution's activities and conduct. In contrast, "moral" comes from the Latin term *moralis*, referring to the proper behaviour of a person in a particular community or culture. Given the comparative and integrative vector of ethics (that seeks to abstract from particular morals and make them compatible) we speak of an Ethics of Coding in the Algorithmic Condition in order to address the level of society (not communities), for which we regard as constitutive pluralist and also arbitrary ways of institutionalizing morals (see Benveniste, 1969; Lambert, 2001).

There are many aspects to consider with the use of these two terms. One that seems important to us is that, with regard to coding, ethics has less to do with something "being well understood" and "finding a common ground", and the comfort that goes along with this desire,

3 E.g. MIT's work on a "moral machine" for IOT/ automated vehicles makes value judgements with broad criteria. http://moralmachine.mit.edu/

than with affirming the necessity of not being entirely comfortable, as individuals, in (public) situations: such forms of uncomfortability ask for what we call "forms of conduct" – those forms can be encoded and deciphered in various manners. Hence there is room for "play" with regard to forms of conduct. In that sense, codes of conduct provide "lenses" through which to look at formalised concepts that are taken as norms and standards.

When codes of conducts are instituted, they are typically rendered in terms that claim a general validity as standards, norms, etc. Such processes of generalisation are, of course, different in the case of standards from those of norms. The distinctions with which we work involve the following: A standard can *constitute* a system (as in IT standards), whereas a norm is *derived from* an established system, or from a projective, ideal system. These distinctions are important, because in ICT we have networks that are inadequately addressed when regarded as systems. Systems is a term in logics (elements and axioms), whilst networks is a term in logistics (particles, nodes, and distributions). This distinction has important implications for how we reason, assess, and evaluate systems and networks.

"Codes of conduct", as we understand them, open up interrogative, critical spaces with regard to behaviours – either those that are prescribed normatively, or those perceived as self-evident or "natural", as habits, customs and traditions. Codes of conduct thus involve bearing with the discomfort that stems from "coding" such behaviour to constitute and fit for public domains where one's own custom is just one of many possible forms of behaving. We call "coding a habit" the moment of opening up a gap of arbitration, of which we need to be conscious and which must be given a form in order to "stay with the trouble" (Haraway, 2008). This is the condition of possibility for translating between different behaviours without imposing an inflexible hierarchy.

The paradigmatic shifts across societies due to the algorithmic conditions that now organise life thus require more than just velocity and form predictive tools with which to measure and critique normative modes of "quantitative standardization" (Bühlmann & Hovestadt, 2013: 14-15), in order, not only to account for shifts in organisation theory, but also to have ethical procedures incorporated into all decision support systems that engage with data.[4] Thus, a key question for an ethics in – and of – the DSM environment (for e-health, population, migration, security, communications, education, and research) is: How can we develop, use, and evaluate decision support systems that engage with data? The question that arises is: *How does one become a digital citizen with a clear commitment to ethics?*

4 For example, all of the current initiatives in establishing the codes of conduct related to the DSM, such as the electronic communications code https://ec.europa.eu/digital-single-market/en/news/proposed-directive-establishing-european-electronic-communications-code

5.2
DOING ETHICS

Mirko Tobias Schäfer (2017) notes that the Data Ethics Decision Aid (DEDA, developed by Aline Franzke and Schäfer 2017) enables new ICT and new technology project groups to think through the stages of their creation, design, or plan, in terms of the whole assemblage and use of data sets generated by that assemblage; allowing the project designer to ask who manages, and who is responsible if things go wrong. Who will produce documentation of ethical issues, and make decision-making processes transparent and public, and how and where will this take place? How does the project / object develop accountability so that a governing body is able to explain what they do with the data, and who has access to it? Schafer notes that such questions add a new layer of deliberation within democratic societies.

Schafer develops a data ethics decision aid to assist with such questions. It follows a flowchart of steps to guide the designer of new data products (hardware and software) (see Appendix A).

> The steps involve consideration of the following elements: > 1. Algorithms > 2. Source > 3. Anonymity > 4. Visualisation > 5. Access > 6. Open Access and Re-use of Data > 7. Responsibility > 8. Transparency and accountability > 9. Privacy > 10. Bias > 11. Informed consent

These topics provide the categories (and not the classification) for quality standards and the process of certification. The distinction between categories and classes here is crucial: categories establish the structure of orders of belonging, it is in that sense that they are relative to criteria. Classes, on the other hand, are relative to criteria in how they administrate such orders of belonging (and thus they presuppose the structure of such orders as given unproblematically). Certification in this context is understood in a technical manner; that is as an exchange of trust, and not as a document of "proof" (such as in the passing all check list points with a certain percentage). In the algorithmic condition we note that trust is an ethical arrangement that is different from the concept of proof. There are different lineages for ethics-ready certifications, where a user pays in order to attain a certain degree of "competency". However, use of the DEDA is not, we suggest, to be taken as a certification mark. Rather, it should be used in conjunction with a code of conduct in order to generate an explicit ethics with regard to a particular code of conduct, specific to the community of the user.

5.3
EOC –ETHICS BASED ON CODES OF CONDUCT FOR DIGITAL CITIZENSHIP

Following the Data Ethics Decision Aid (DEDA) model of an ethics process for thinking about the design of new technologies, we propose an ethics based on codes of conduct (rather than an "ethics tool") as a framework to be considered alongside the DEDA. This ethics interrogates critically particular codes of conducts by taking as its guiding points the following for consideration of users of the DEDA.

Such treatment of Codes of Conduct asks for consideration of:

1. Knowledge sovereignty of the thing/condition/concept (knowledge as a shared and public domain that is not "owned" by anyone),
2. Local processes of certification (productive of an ethics in a particular domain, eg; architecture, or automotive industries);
3. Legal basis for certification of the thing/condition/concept (an ethics that registers a "maturity" with legal capacity, enabling certification/ technology readiness).

Each category requires different levels, generating an explicit form for "codes of conduct" for digital citizenship within specific communities of practice – for example, in engineering, architecture, health, education, or security. Such a process causes us to reflect on a new notion of the public, one relative to standards and practices in applied cryptography (e.g. the generalized usage of block chain technology and crypto-currencies beyond the field of banking properly, to re-organize institutions and corporations at large). This is especially important because in our view it provides a novel domain for policy writing, that concerns the self-governing of the "communities of witnesses" that replace former administrative hierarchies when organizations and institutions are being re-thought in terms of block chain technology. The claimed "absolute transparency" of these communities of witness raises novel challenges for policy writing to respond to, and it posits the possibility for policy writing to find a way out of its own modernist bias (protocols of political correctness and tick-box forms as demonstration of proof do not, per se, instigate a more ethical behaviour – it may even trigger the opposite).

It should be noted that there are two main philosophical traditions of how to think of "law" (in the European, but also in other contexts). The United Kingdom follows the common-law tradition (as does the United States), whilst most European countries follow the civil law tradition. This creates confusion, not only at the level of international law, but also for the law of nations (*Völkerrecht*), as it applies to UNESCO, public international law, and European law. These are all different "levels of abstraction" with regard to the "force of law" that come into effect with regard to diverse situations. Inevitably, there are many conflicts between them, some of them lurking in the religious cultural roots (Catholicism and Reformation). The understanding of "sovereignty" (in the context of data sovereignty, and as we suggest: knowledge sovereignty) crucially depends upon these different traditions in the philosophy and history of law: the sovereign in common law is not the same as that in civil law. Homi K. Bhabha (2017) addresses this (at least implicitly) when he speaks of “spectral sovereignty (ghosts of national sovereigns that work on theological and affective energy), “vernacular cosmopolitans” and “cosmopolitan memories”.

In other words, an ethics of coding consists of the identification of the formal terms for codes of conduct for digital citizenship within specific communities of users – to be set by that community. In consideration of codes of conduct and the use of the Data Ethics Decision Aid to generate a code of conduct based ethics for a specific system or object, Intellectual Property [IP] cannot play a fundamental role anymore.

SIX

QUANTUM ~ LITERACY

6.1
QUANTUM

What are the implications for generating an ethics of coding for algorithms, applicable across different social, educational, and philosophical applications (see Bühlmann et al., 2015), within the field of information as we understand it today – namely as data (Hui, 2017: 235) – a field in which the possibilities afforded by quantum physics instigated a huge categorical shift in physics itself, as well as in metaphysical articulations? (Deutsch, 1985)

The term "quantum" is derived from the Latin and in the general sense refers to the relation between quantity (counting, "one") and magnitudes (measurements, "units") (see work by German mathematician Emmy Noether on the role of magnitudes [cf. Weyl, 1981]). After the work of scientists in the twentieth century, including Niels Bohr, Albert Einstein, Max Plank, Werner Heisenberg, Erwin Schrödinger, John Bell, Richard Feynman, David Deutch, and others (Lévy-Leblond, 1976; Whitaker, 2012), a shift from classical towards quantum thinking inserted an understanding of the fields of relationality into empirical and philosophical analysis, thus re-configuring the conception of epistemologies as well as, more recently, that of ontologies (see the trends towards Data Ontologies and Semantic Web), in all disciplines. Quantum-generated epistemologies are articulated by thinkers such as Karen Barad (2007) and Arkady Plotnitsky (1994, 2006, 2009); and evidenced in popular culture, where disturbing questions of the question of algorithmic reality, AI, human, and non-human agency are explored, such as in episodes of the television series *Black Mirror* (Charlie Brooker, 2011-2018). In the algorithmic condition, reference to quantum refers to the rendering of appearances that cause all quanta phenomena visible and material (photons move in particles and waves: light, literally, is "material"(particle view) as well as "immaterial" (wave view) (see Feynman, 2014; Colman, 2017) – in both technical, and spectral senses. Within this condition, how the quantum processing of data will effect the categories of time, space, light (as energy and mass), and all of the framing discourses of life, approximating such issues as nature, culture, aesthetics, technology, politics, science, philosophy, gender, ethnicity, theology, health, food production, communication, and information remains to be observed. It is important to note that in this physical term of "quantum", all electronics based computers (as opposed to analog computers, which work on the level of electric control only by operating with tubes directly, without an intermediary of code-based arbitrage) are already to be regarded as "quantum computers", in that they involve the same mathematics (complex analysis rather than real analysis) as applied in quantum physics (see Brillouin, 1969). The rather recent hype with regards to a kind of "Quantum Computers" that are said to introduce an entirely new generation of computing involves a different paradigm of "logical computability": it proposes to go from the Universal Turing Computing paradigm to one called "Universal Quantum Computing" (e.g. IBM's marketing language). The promise this makes concerns the dealings with the so-called Halting or Decision Problem in the Turing Computing Paradigm, and is not primarily a question of physics, but one of logics and metaphysics. (This is something we will investigate in detail in our continuing work after this report).

6.2
QUANTUM LITERACY [QL]

As quantum conditions become knowledge generators in what we call the Algorithmic Condition, new syntaxes, semantics, and grammars with regard to digital informatics are required with which to express and articulate this era's socio-material reality, and the formalization of the codes of conduct it is enabling/instituting. We argue that we are currently living in a novel era of sophistics, for which a quantum literacy is required in order to articulate the algorithmic condition (see Bühlmann, Colman & Van der Tuin, 2017). Our emphasis on a literacy (rather than a logics) means to express that a literacy empowers one to make sound arguments as well as to lie with arguments, to compose poetry as well as prose and reflective accounts. The reason at work in sophistics is not "pure" but "cunning" and "witty". The political and philosophical conditions of accountability and responsibility in the novel Algorithmic Condition are yet to be engendered (if they are not to institute an orthodox form of governance). As Lévy-Leblond, J.-M. argues:

> It is quite clear that in the actual practice of physics, no one can be content with the use of the sheer mathematical formalism, even though this formalism is a necessary and fundamental constituent of the considered theoretical domain. A metalanguage is necessary as well, so that the names given to the mathematical objects and formal concepts of the theory enable its statements to fit in the general discourse. The choice of the terminology thus is a very delicate affair, with deep epistemological implications. If adequate, it may greatly help the understandability of the crucial points as it may hinder it in the contrary case.
> (Lévy-Leblond, 1976: 171)

SEVEN

THE ALGORITHMIC CONDITION: CONCLUSIONS AND RECOMMENDATIONS

7.1 ALGORITHMIC CONDITIONS – SUMMARY OBSERVATIONS

This report draws attention to the question of ethics in relation to ICT issues in Europe; the role of education in addressing the change in knowledge generation, its conditions of production and exchange in this society; and the need to develop new forms of literacy that are responsive to this condition. The algorithmic condition can be characterised in a number of ways:

- Algorithmic conditions arise from economic infrastructures that direct knowledge;
- Algorithmic conditions arise from calculations can be used for analysis that can be exploratory, or for compliance (as in corroboration of data sets);
- Algorithmic conditions give rise to social coding, and the language used to express this condition shifts between a consideration of code in terms of control and governance, as well as a consideration of code as generative and open;
- Algorithmic conditions can be understood as informatic codes (not as pre-determined symbols) that are generative of novel forms, things, and concepts, and taken as material-semiotic indicators. They are used to govern the domains of information flows, including security, privacy, communication, transport, distribution, big data, machine learning, and algorithmic reason;
- Algorithmic conditions are generative of a particular ethics concerning codes and formula; cryptocurrencies, digital citizenship, the acquisition of privacy, architecture, and the speed of thought;
- Algorithmic conditions are used as ethical matter – expressed as positional, economic, social, political measurement and governance "tools". However, the rationality of these tools cannot decide the ethicality of the matter at stake – it can only resolve it, in a quasi-chemical manner that produces novel aggregations and constellations in the symbolical fabric of "ethical matter";
- Further, the question of "ethics" itself is inevitably a question of "force" as it is implemented by the ethos of its technological platform (Hodge, 2017). Additionally, the tag of "ethics" can be used as a carrier for the potentially unethical (Powell & Nemorin, 2017); used merely for compliance – 'tick-box'- requirements.

7.2 ETHICAL CODING

When working with an algorithmic environment (e.g. the DSM) in the generation of information economies by platforms such as Google and Twitter, the issues of agency and governmentality in relation to the condition of the community are raised. However, the ethics of the algorithmic condition is determined by the practices and habits of digital (world) citizens within local communities. The actions of the algorithm are frequently hidden by its systems embedded within infrastructures of communication and distribution of datamining and warehousing, code, and in the political, financial, and economic applications of that data as code in a range of applications, including security, secrecy, legal, educational, and commercial uses. However, education of the ways in which the condition operates and is generated – and with what potential outcomes – can enable an ethical environment that is not concerned with the commerce of weaponising, or controlling, but with more sustainable engagements with life.

As Arendt (1958) argues, the actions of people are what determine and create the political fabric of a collective community. Membership of this community is contingent upon the terms of responsibility created through actions of living. Change, as Arendt describes it, is propelled in some instances by technological change. This kind of change can be articulated as relational change – that is, it occurs as a result of political and or ecological crises (such as we see in the after-effects on communities post-war, post-famine, or post-state of emergency). However, when examining the variations of ethics of coding that occur, we see that change is more readily understood as a resulting from a change in the ethos of a community and also from the contingencies of locally situated algorithmic conditions. With the implementations of a computerised society, a new community of users is enabled, and new forms and different uses of ICT emerge, shaping the nebulous algorithmic conditions of the era of 1980–2020.

Ethical coding in ICT platforms engages multi-levels of standardisation, that are adjusted according to fluctuations in social coding (as caused by events; natural or man-made disasters; accidents; cultural and political changes that affect societies; innovations in technology; changes in knowledge produced through ICT that affect research across all areas of life; healthcare; security; governance; business; and citizenship).

We conclude that in order to address these issues ethically, we need to approach them from a transversal/operational point of view rather than by simply gathering situational knowledge of how the concrete consequences of such multi-level standardisation can be documented today. To address "the algorithmic condition" with regard to ICT platforms only would be a reductive action when our interest is in a corresponding ethics; we need to take into account also these platform's derivative "non-spaces", such as the darknet, etc. Hence, the issue of "standardisation" must be addressed before and relative to their different backgrounds: epistemology and ontology, economy, political theory, and law.

7.3 RECOMMENDATIONS

1. When developing, using, and evaluating decision support systems that engage with data, it is recommended that the Data Ethics Decision Aid (DEDA) is used in order to generate an ethics based upon Codes of Conduct. This ethics should be detailed as part of a support system's specifications, and can be noted at the technology-ready point of development of new systems.
2. The need for the development of a quantum literacy that is able to be expressive and to articulate the various domains that pertain to the algorithmic condition.

EoC GLOSSOMATICS

ALGORITHM: A set of instructions that organises a particular procedure (a formalised task) into steps that can be mechanically performed. Algorithms are used to control and stabilise actions in unstable environments.

ANALOG COMPUTING: Early computers that worked on the level of electric control with vacuum tubes, without an intermediary mediation by code (electronics) and the arbitrage that goes along with electronics. We oppose analog computing to quantum computing (see below).

CIPHER: The spelling-out of nothing (form Arabic *sifr* for "empty, nothing, naught") into a set, or an alphabet of "elements" such that any of the formulations in the code-terms of a cipher can cancel each other out. (See Rottmann, 1987; Barad, 2012; Bühlmann, 2018b).

ICT ALGORITHM: The encoding of computerised procedures into a set of steps; used to find data in the control of process or the provision of relevant information.

INDEXES diverse "manners" ("rationalisations" [pl., hence "manners"]) of how computerised procedures can be discretised and dissolved into combinatorial clouds of possible sequentiality. They are "probabilisers"; tools used to prepare data such that it can be identified according to different relevancy measures, and sorted and treated variously. They are applied widely, from generic data compression algorithms such as .jpg and gif, to specific contexts for the mining of big data, as in image recognition software or, more generally, pattern detecting applications.

CODE: Systems of symbols used for information control and programming. It is significant that code is a "language", or "an economy" of symbols, not a symbolical system. Because of this, a structural approach (symbols, algebra, groups) and a systematic approach (forms and elements, axiomatic) are not mutually exclusive with regard to code. This exclusiveness between "system" and "structure" is a problem that lies at the very core in all approaches that try to formulate a "general linguistics", at least since Saussure. Taking into account the "materiality" of code can deal with this problem because it does not try to "solve" it, but rather provides a comparative method for how it can be "resolved" – in the same sense that we speak of a mixed substance being "resolved" in chemistry. Technically, a particular code always has a double make-up: it is always relative to a logarithmic base (decimal, binary, hexagonal, a particular alphabet etc.) and it is governed by a particular set of rules (grammars, syntaxes). The logarithmic base steps in the place where in axiomatics where in axiomatics is the place of common notions (elements); it indexes their place logistically, according to a vicarious order of substitute positioning.

DATA: refers to measurements of quantified information. All data is relative to how it has been recorded. In popular language, data often refers to the information used by particular markets; it often tends to be naturalized uncritically, by conflating it with code as the 'nature' of the algorithm.

DATA SOVEREIGNTY: Digital data subject to the laws of the country in which it is stored in server farms. As a legal paradigm, it comes into crisis with cloud computing and its geographically distributed manner of storage.

DEDA: Data ethics decision aid, https://dataschool.nl/deda/?lang=en

DIGITAL CITIZENSHIP: Citizenship that relates to belonging to communities of users that have attained a degree of digital competence (see https://ec.europa.eu/jrc/en/digcomp/digital-competence-framework), but with the added steps of striving for a societal ethics based on a great number of different codes of conduct.

ELECTRICS/ELECTRONICS: When the field of electronics was invented in the 1880ies, electrical devices had already been around for at least 100 years (e.g. Volta's electric batteries, or Samuel Morse's electric telegraph). The difference lies in how devices manipulate electricity to do their work. Electrical devices take the energy of electric current and transform it in simple ways into some other form of energy – most likely light, heat, or motion. Electronic devices do much more. Instead of just converting electrical energy into heat, light, or motion, electronic devices are designed to manipulate the electrical current itself to coax it into doing interesting and useful things. The very first electronic device invented in 1883 by Thomas Edison manipulated the electric current passing through a light bulb in a way that let Edison create a device that could monitor the voltage being provided to an electrical circuit and automatically increase or decrease the voltage if it became too low or too high.

ETHICS: We understand ethics as "boundary work" that manifests in contracts that organise protocols for actions. Ethics comes from the Greek term ethos, meaning "habitual character and disposition" in plural, "manners", and refers to a person's, community's, or institution's activities and conduct. When habits are culturally sanctioned into customs, they become constitutive for morals. Problematizing such processes of sanctioning as processes of institutionalization, there is a comparative and integrative vector of ethics (that seeks to abstract from particular morals and make them compatible) that is capable to address the level of *society* (not communities).

INFORMATICS: from *information* and the suffix *-ics*, for all that pertains to it. The science of knowing how to "read" and "write" amidst the circuit of information, as manners of processing data for storage and retrieval.

IGNORANCE, AND ITS COST: To plead ignorance in actions is not an acceptable argument (Arendt, 1963, 1978, 2003). To be ignorant is not innocent. "I did not mean to do that" does not solve the problem that something is done – cf. Les rencontres philosophique de lÚNESCO: *Qu est-ce qu on ne sait pas?* (Serres, Ricoeur, Blanchot, etc.)

MACHINE: The universal Turing machine (UTM).

MATHEMATICAL MODEL: A schematisation tool that informs the set-up of algorithms. A model always reduces the complexity of a situation in a definite and particular way. Different models of the same situation do not contradict each other from a quantum literacy perspective, but provide for different "resolutions" in the material-code sense elaborated above (> CODE). As such, models lend themselves as a tool to come up with manners of schematisation and formatting. They can be characterised in their different capacities and capabilities, and they can be compared and profiled with regard to each other. While different models may all be valid, they are not equally well suited for being applied to a particular problem. (Models play as central a role in quantum literacy, as arguments do in linguistic literacy).

MODAL: A measure of a proposition, law, predication, or knowledge model. A modal is a qualifier for the quantitative measurement of contingency and necessity stated by systems of propositions, laws, predications, or a particular knowledge model.

MORAL: "Moral" comes from the Latin term moralis, referring to the proper behaviour of a person in a particular community or culture. They embody contingent customs and traditions.

NORM: A norm is *derived from* an established system, or from a projective, ideal system. It claims validity in a generally committing, "necessary" sense.

QUANTUM: A unit (quantity) of mass (energy and information) relational to its interactions with other units of mass (energy and information). A quantum unit (quantity) measures "undecided" energy as "pre-specific mass" (materiality neither reducible to classical forces, nor to any one homogenous generic force in particular, like heat). It is a unit that measures probability amplitudes (waves of possibilities that propagate across resolutions), and hence a unit of measurement that is not absolute but conditioned, yet variously so (in this variation it differs from the Kantian notion of transcendentality). Quantum measurement provides for a semiotic-material practice of measurement that is performative in a social sense (interpretative, enactive, continuous) and that can be theorised individually (hence biased), yet in an objective and anonymous sense (formal, distinct, "polite"). In this latter respect, the performativity of quantum measurement is unlike other forms of social performativity such as rituals – forms that can be theorised only on a level of collective and culturally specific, shared customs, rather than individually, anonymously, or formally.

QUANTUM COMPUTING: We maintain that digital computing is quantum computing, in that it makes the shift from electrics to electronics. The digital code is code on a binary logarithmic base, this alone is the main difference to a decimal coding system for example (which takes ten as its logarithmic base) or any other coding system. The binary base is more abstract then the others in that it can express the terms of any other coding system in its base. This abstraction is similar to that between different number domains: while all natural numbers can be expressed as rational numbers, and while all rational and irrational can be expressed as real numbers, the reverse does not apply. Electronics that works with binary code involves not only real analysis (as analog computers do) but complex analysis. This makes such computers quantum computers. The same reasoning explains also for the multiplication of digital communication channels that all "surf" one and the same analog communication channel (a certain frequency). The frequency serves as the physical "substrate" or "carrier" for an indefinitely great number of multiple digital channels.

QUANTUM LITERACY: Literacy for expressing heterogeneous quanta conditions. Literacy in expressing, articulating, estimating, cultivating and hence understanding quanta conditions in their semiotic-material heterogeneity. Quantum literacy is literacy in formality and their symbolic conditions, rather than in one particular form or format and its set of characters (as when "literate" is classically referred to mastering an alphabet, or a theory of numbers, or a theory of forms).

STANDARD: A standard can *constitute* a system (as in IT standards), on arbitrary grounds. In this, it is unlike a norm which is derived from an established system or convention.

THE PRICE OF INFORMATION: To turn data into information means to strip this data of much of the possibilities/contingencies it embodies (as data). Hence, information comes at a cost – it destroys virtual conditions of possibility for the coexistence of differences (Brillouin, 2004: 303).

TURING MACHINE: A Turing Machine is a mathematical model of computation which manipulates symbols mechanically on a strip of tape according to a table of rules. (Turing, 1936, 1938).

UNIVERSAL TURING MACHINE: The universal Turing machine (UTM) can simulate an arbitrary Turing machine on arbitrary input. The challenge is in how the mechanical demonstration mode at work in a Turing Machine can be accommodated in one homogenous (gravitated) universal dynamics. This is not directly a question of physics, it touches upon the role of abstract mathematics with regard to empirical physics, and hence touches upon the problems of how to think about the Laws of Nature. The challenge that quantum physics poses to classical (Newtonian) physics is that it relativizes the latter's central and integrative role of classical dynamics over pre-classical mechanics; quantum physics introduces, before all else, a novel mechanics that is itself analytical/algebraic. The philosophical challenges this novel paradigm for physics poses is how to relate quantum mechanics to the algebraic conception of natural laws as Laws of Conservation (Noether, 1918; Kosmann-Schwarzbach, 2011).

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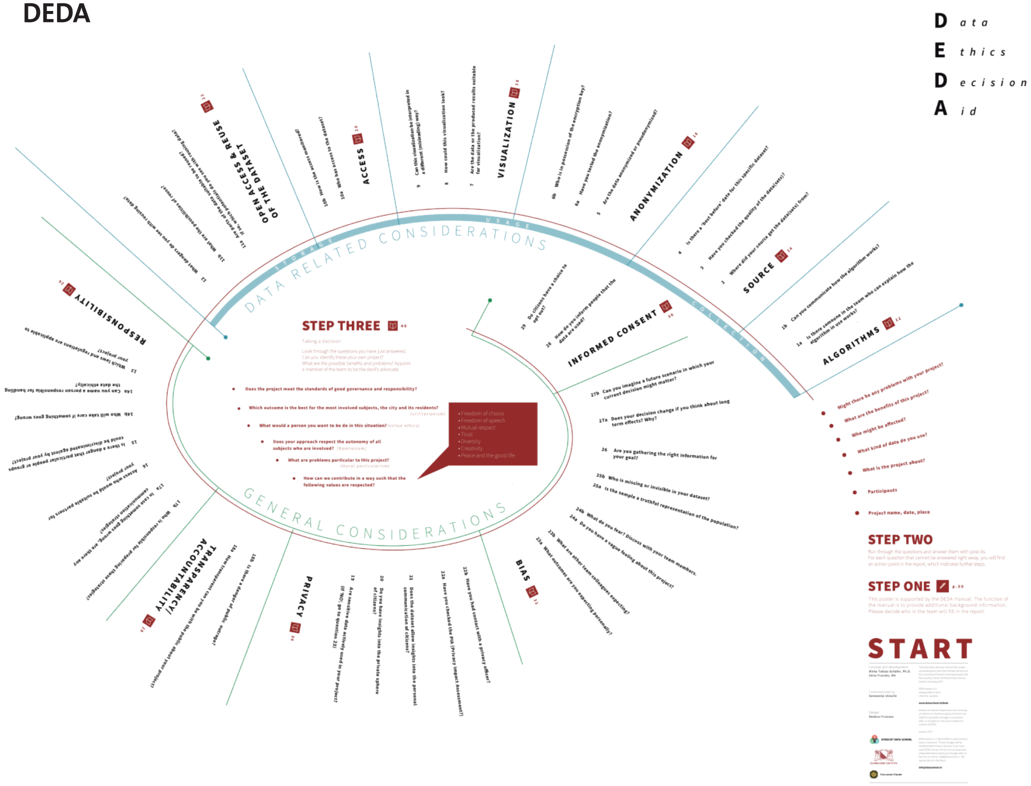
APPENDIX A

DEDA



Source: https://www.uu.nl/en/news/utrecht-data-school-develops-data-ethics-decision-aid

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