Literature Review of Ethical Concerns in the Use of Disruptive Technologies in Government 3.0

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Abstract— **'Government 3.0' as the new paradigm brings in new disruptive technologies in the digitization process of the public sector. The massive use of Artificial Intelligence, Machine Learning, Big Data Analytics, Internet of Things and other technologies in public service provisioning that have a potential to significantly influence the life of a large number of citizens demands for a thorough investigation of the ethical concerns. Along a literature review, this paper investigates the ethical issues associated with the implementation of disruptive technologies in the public sector. In the first part of the paper, ten categories of ethical concerns in e-government are identified. Subsequently, these ten categories guide a more detailed review of 74 articles dealing with specific ethical concerns in relation to the implementation of Artificial Intelligence and Big Data in e-government. The literature review revealed important similarities and differences in ethical issues relating to the two technologies.**

Keywords-ethics, government 3.0, e-government, disruptive technologies.

I.   INTRODUCTION

The discussion of ethics should be an integral part of e-government research, in particular when new disruptive technologies are to be deployed. Often however, ethical considerations are relegated to the "Discussion" or "Future research" sections of the papers. This paper therefore studies existing literature on ethics in e-government. Furthermore, ethical implications of the introduction of new disruptive technologies in e-government are identified.

Ethics has been defined as "*the art of living well*" by Aristotle (cited in [1]) and has been one of the most discussed philosophical concept ever since [2]. Treviño et al. define ethical behavior as "*doing the right thing, showing concern for people and treating people right, being open and communicative, and demonstrating morality in one's personal life*" [3, pp. 131–132]. Ethics in government refers to ethical behavior and to the approach of organizing the processes and rules of governance in a way that shows concern for citizens, is transparent and accountable (cf. good governance principles [4]).

Discussion of ethics in e-government lies on the intersection of the areas of the ethics in government and the Information and Communication Technologies (ICT) ethics. In his paper of 1986, Anderson identified four major ethical issues in ICT: privacy, accuracy, property and accessibility

[5]. More than thirty years later these issues are even more important and contentious than at the dawn of the Internet era, for several reasons (particularly in regards to e-government): firstly, the relationship between the government and a citizen is unequal one: citizen is dependent and vulnerable [6]; secondly, ICTs have an effect on public values, and their transformative potential should be also viewed in this dimension [7][8]; thirdly, the landscape of the public sphere is different from the private sphere as the ultimate aims of the organizations involved are very different [9].

This paper studies the subject of ethical implementation of e-government and the ethical introduction and use of the ICTs in public sphere, while we do not discuss questions of ethical decision-making by individual officials in government. The research is a part of the Erasmus+ Gov 3.0 project (https://www.gov30.eu), which aims to establish Government 3.0 as a research domain. The project team defines Government 3.0 as follows:

Government 3.0 refers to the use of new disruptive ICTs (such as blockchain, big data and artificial intelligence technologies), in combination with established ICTs (such as distributed technologies for data storage and service delivery) and taking advantage of the wisdom of crowd (crowd/citizen-sourcing and value co-creation), towards data-driven and evidence-based decision and policy making. [10, p.2]

The Gov 3.0 project identifies and describes new technologies, trends and concepts associated with the Government 3.0 paradigm. Some of these technologies are termed "disruptive" as they are likely to have significant impact on how e-government will be shaped in the future. Along the project, the authors conducted several workshops discussing the Government 3.0 concept and the use of disruptive technologies in public spheres. Ethical issues were one of the most discussed topics along these workshops. Yet despite ethics being one of the biggest concerns of academics along the implementation of new technologies, no systematic review of literature on ethics in e-government has been found. In this paper, we therefore investigate ethics in the implementation of the most significant disruptive technologies, namely Artificial Intelligence (AI) and Big Data.

The structure of the paper is as follows: Section II presents the research methodology of the paper and outlines the research questions, Section III presents results of the literature review of the ethical considerations in e-government,

identifying main ethical themes in the research. In Section IV, we present the results of the literature review of the ethical issues concerning AI and Big Data use in Government 3.0. Section V discusses the results of the literature review and concludes with an outlook on future research on ethics in e-government and by reflecting the limitations of the paper.

II. METHODOLOGY

The aim of the paper is to scope the understanding of ethics in e-government and spotting the needs for ethical considerations in Government 3.0, specifically with new disruptive technologies and technological trends. The paper is descriptive and based on a systematic literature review.

Three research questions guide this research:

1. What are the main ethical considerations within the e-government domain?

2. What ethical issues can be identified concerning the implementations of AI and Big Data within e-government?

3. What are the research needs concerning ethical issues of disruptive technologies in e-government?

Following Kitchenham and Charters [11], the articles were collected from the four databases: SpringerLink (http://link.springer.com/), IEEE Xplore (http://ieeexplore.ieee.org/Xplore/), ACM (http://dl.acm.org/) and DGRL (V. 14, only for the first stage). The search was carried out in autumn 2018. Search was restricted to the title and abstract of the papers and was with the search string: "ethics AND ('digital government' OR 'e-government')". This allowed identifying main ethical considerations and themes in e-government, presented in Section III. Reviewing the results of the searches ensured that chosen papers focus on ethical issues, i.e., papers that did not include ethical issues as a main or at least a secondary topic, were not published in a peer-reviewed journal or conference proceeding or were not accessible in full-text were excluded (exclusion criteria).

For the second stage, literature on ethical issues of the specific technologies was searched and reviewed. The search strings "AI | Artificial Intelligence | Big Data AND ('ethical issues' OR 'ethics')" were used, resulting initially in 645 references. After the exclusion criteria were applied, 74 papers were left (27 AI, 47 Big Data papers). First exclusion was made after examining metadata of the articles, while the second exclusion was based on full-text scans of the articles. Out of the remaining papers, we extracted ethical issues applicable to the use of these technologies in e-government.

To analyze ethics aspects specifically related to the disruptive technologies, we used the concept-centric approach suggested by Webster and Watson [12]. For example, the list of broad ethical themes resulting from the first review cycle of ethics was used to codifying the presence or absence of the theme in each paper on ethics in AI and Big Data. The results of this literature review are described in Section IV.

III. ETHICS IN E-GOVERNMENT

Literature review identified 22 articles focusing on ethics in e-government. Table I lists the ten ethical considerations in e-government along with the literature. Subsequently, we summarize the main aspects of these ethical considerations.

TABLE I. ETHICAL CONSIDERATIONS IN E-GOVERNMENT

Ethical considerations in e-government	Articles reviewed
Inclusivity	[6], [7], [9], [13]–[18]
Privacy	[6], [16], [17], [19]–[25]
Data use	[6], [21], [24], [26]
Quality/ Accuracy of information	[9], [23], [25]
Transparency	[7]
Accountability	[19], [27]
Information ownership	[20], [23]
Trust	[6], [7], [9], [19], [23], [28]
Alignment of values	[13], [17], [23], [29], [30]
Cost	[6], [16], [25]

Inclusivity refers to the concern about the inability of some groups of citizens to make use of the digital government services. It is discussed in the context of the digital divide either within a society or between countries. Most common factors causing digital divide are disparity in access to technology, wealth, education or age-related differences [14]. Inclusivity is a significant concern as in some cases e-government services are replacing the traditional ways to interact with the government, so citizens who are unable to use the new services are put in significant disadvantage.

Privacy is the concern about the unauthorized or inappropriate use of individual information by the government or other actors. Privacy is the most discussed ICT-related ethical issue, especially after the advent of social media and large-scale personal data collection [31].

Data use refers to the concern about inappropriate use of collected data. This includes for example the aggregation of data from different sources to infer new information or to de-anonymize individual citizens. This is not a new issue [32], however with the increase of the amount of data about any particular person, cross-referencing different databases has become a significant concern, threatening citizens' privacy.

Concerns on *quality and accuracy of information* relate to the imperfect digitalization of certain data in the transition to digital services. Data errors or incomplete information in databases may result in additional costs for a citizen [25].

Transparency is a concern that certain processes in e-government may become black boxes, impossible to understand by individual citizens. Lack of transparency may lead to the inequality of treatment, when certain decisions are made using invisible decision processes based on data only available to the system [24].

Accountability is related to transparency and concerns the responsibility of government toward an individual citizen in case of problems with or misuse of the digital government system. Accountability is necessary to improve citizen trust in e-government [33].

Information ownership is about the possibility of the digital government system's user to change or restrict access to one's own information. It also concerns the re-use of certain information from the e-government systems by the third parties [34][35].

Trust is a general consideration of the effect that the automatization (and associated de-humanization) of the government services may have on an individual citizen. It also encompasses the issues of government control and surveillance [7][31].

Alignment of values refers to the mismatch between the values of the government and the citizens. Sometimes motivation of the government to introduce digital services (e.g. cutting costs, improving efficiency) may not be aligned with the interests of the citizens, who value accountability and inclusivity of the services [6][16]. This concern is connected to the inclusivity and trust concerns. The discussion of values in this context also touches on the differences of attitudes to the free speech versus security dilemma [17][36] and the difference between values across countries, i.e., imposing western values in the developing countries [13].

Cost consideration refers not only to the financial cost of implementing and running the digital government services but also trade-offs for the citizens, associated with the implementation of e-government services: ensuring inclusive access to government services may increase the workload for the civil servants and thus the cost of public services [6].

IV. ETHICAL ISSUES IN GOVERNMENT 3.0

The second stage of the literature review identifies specific ethical issues related to the new disruptive technologies AI and Big Data in e-government. The issues are categorized along the 10 ethical considerations identified in Section III.

A. Artificial Intelligence

The use of AI in government is expected to increase as well as the significance of its effects on issues with moral component [37][38]. Literature distinguishes between 'Artificial Intelligence' (AI) and 'Artificial General Intelligence', A(G)I. "AI in e-government" refers to the use of elements of artificial intelligence to facilitate some of the services and processes, while A(G)I relates to autonomous decision-making and AI-supported robots in the society in future [39]. While the latter has implication for government as well [37], it is not part of our current investigations, as we focus on current implementations of AI in e-government.

TABLE II. ETHICAL CONSIDERATIONS OF AI IN E-GOVERNMENT

Ethical consideration in e-government	Supporting literature
Inclusivity	[40]–[45]
Privacy	[45]–[49]
Quality/ Accuracy of information	[46]
Transparency	[37], [47]
Accountability	[37], [45], [47]–[52]
Information ownership	[53]
Trust	[37], [40], [47], [54], [55]
Alignment of values	[37], [42], [44]–[48], [53], [55]–[60]
Cost	[41], [42], [48], [61], [62]

Of the literature reviewed, 27 papers (Table II) are dealing with ethical issues in the application of AI. Most common categories of the ethical concerns mentioned are values (14), accountability (9), privacy (8), inclusivity (6) and cost (6). In most of the cases, the issues relate to the AI-assisted Big Data use for decision making (both autonomous by AI or AI-assisted). The most common ethical issues in each category are described below.

1) Major issues

Accountability: The concerns of this category relate to the automated decision-making by AI systems. Who is responsible or liable for AI making a bad decision (ethically, legally or otherwise)? This is a significant concern in private sector (especially relating to the autonomous vehicles), but also a huge issue in government, where decisions can have implications on a very large scale [52]. Thus the question of liability should not be only discussed when implementing the decision-making systems but also be explicitly addressed in laws [50][51].

Value alignment: while the decisions made by the autonomous AI systems should be ideally based on hard data, there is a concern that such decisions might not be objective [48]. What values should be programmed into the AI making complex data-based decisions is an open question [50][59]. For simple decisions, rules may be straightforward. For some other, choosing between two sub-optimal options may amount to the value judgment [55]. Ensuring transparency and providing sufficient discussions of such algorithms may help address such concerns [55][56].

Privacy: Ethical concerns include using AI for surveillance [45], for profiling [46] and the leakage of personal data (especially in sensitive settings like healthcare) [48][49]).

Inclusivity: AI may also increase inequality between those who control AI and other people [44][45]. The effect of AI on the society needs to be studied to ensure inclusive realization with respect to human rights [40][42][43].

Cost: AI can be a costly endeavor, especially in regard to indirect costs: the increase of automation and move towards automated decision-making is forecast to lead to a profound shift in the structure of the labor market [42][48][61]. Brandy argues that changes may affect public services twofold: directly, when some public officials will lose their jobs as services will be automated; and indirectly, when the increase in unemployment will lead to the increasing pressure on the public sector [62].

2) Minor issues

Transparency: AI systems need to be able to "explain" why a certain decision has been made [37].

Trust: There is an issue of trust towards autonomous or AI-assisted decisions [40][55], especially in sensitive settings like healthcare [54].

B. Big Data

Big Data already plays an important role in many domains, for example: disaster management [63], healthcare [64][65], food security [66], law enforcement [67] and smart cities [68]. In some cases, Big Data is used for automated decision making, sometimes in conjunction with AI [69].

Ethics and ethical issues emerged as one of the important topics in the Big Data literature review by Lu and Liu [70] appearing in 97 of the collected sources. Other major topics included healthcare applications of Big Data and privacy (which was the fourth most prominent topic related to Big Data overall, trailing only behind technology-related keywords).

The review identified 47 papers dealing with ethical issues in Big Data as shown in Table III. Most named ethical concerns are privacy (40), data ownership (10), data accuracy (9), values (9), data use (6) and inclusivity (6). The descriptions of these ethical concerns along Big Data use in e-government follow below.

TABLE III. ETHICAL CONSIDERATIONS OF BIG DATA IN E-GOVERNMENT

Ethical consideration in e-government	Supporting literature
Inclusivity	[67], [69], [71]–[74]
Privacy	[34], [48], [65], [67], [71]–[106]
Data use	[77], [79], [86], [90], [107], [108]
Quality/ Accuracy of information	[65], [77], [95]–[97], [99], [100], [102], [109]
Transparency	[74], [81], [110]
Accountability	[48], [74], [75], [110]
Information ownership	[34], [48], [69], [71], [78], [85], [97], [98], [106], [111]
Trust	[95], [105]
Alignment of values	[34], [48], [77], [81], [91], [94], [102], [107], [109]
Cost	[48], [65], [95], [98], [103]

1) Major issues:

Privacy: The main concern about Big Data is the ever-increasing amount of personal information collected [34][82], often without the subjects being aware of that collection [90]. Even with de-personalised information there is a significant concern about the cross-reference of data between different datasets to identify the anonymised individuals [76][80][112]. Given large amounts of information collected and the improvements in Big Data Analytics and Machine Learning technologies, it is very difficult to guarantee full anonymity of data [78][96]. In the government context, this concern is connected to the worry about the surveillance state, when government "knows everything" [88][104]. The benefits of the use of Big Data for security and surveillance needs to be balanced against personal freedom and privacy, otherwise it may lead to significant erosion of trust towards government [100][101].

Data ownership: Organisations involved in data collection (e.g. social media companies [113]) may accumulate very large amounts of personal data. While the data may include identifiable and potentially sensitive information, it does not actually belong to the person: often individuals do not even know what kind of information is collected about them [90][106]. Ethical concerns regard making use of personal data by organisations for their own benefit (or even for the benefit of society), without explicit consent from individuals [48][85].

Data accuracy: in e-government contexts, the collected data can be used for decision making or provision of personalised e-government services. Inaccurate or incomplete data can lead to erroneous or biased decisions [95][100][102]. These issues are more significant in the public sector, as citizens cannot always opt-out of a service and potential harm from incorrect data can be larger [109].

Data use: data misuse is a concern about the use of citizen data for purposes other than ones, for which an explicit consent has been given [86][90][108] or a legal ground exists. However, in a dynamically evolving field of e-government it may not be easy to predict every possible scenario, in which the data might be used. A balance should be found for ethical use of data, which would still allow creating innovative public services [79][107].

Alignment of values: similar to the issues discussed in AI, the use of Big Data may lead to the conflict between the values of the government and citizens: between individual and public good [81][94]. It is also necessary to consider the implications of the decisions based on the biased Big Data for the societal stability [48][102].

2) Minor issues

Inclusivity: there is a certain risk of the discrimination based on the dataset used. This can lead to stigmatisation [72], wrong identification in criminal cases [67] and increasing digital divide [71].

Transparency and accountability: in public sector it is important to indicate when and how the data is collected and for what purposes is it used [74][92], while the algorithm creators need to be accountable for their product [48][110].

Trust: improper management of data may lead to the issues with citizen trust towards government. Data management becomes an important concern for the agencies dealing with Big Data, requiring skills and effort [95][105].

Costs: there are cost issues related to the storage and processing of Big Data. By definition Big Data requires significant resources that need to be diverted from elsewhere. Implementing Big Data-based decision making systems, it is necessary to assess the possible trade-offs [48][65][98].

V. DISCUSSION AND CONCLUSIONS

Deploying disruptive technologies in public services brings new ethical challenges that need to be addressed by the researchers and practitioners of e-government. From the literature research, we extracted ten ethical considerations that should be carefully reflected along each project aiming at deploying disruptive technologies in e-government. Ensuring that the implementation of new services properly addresses the inclusivity, privacy, data use, data accuracy, accountability, ownership, trust, alignment of values and cost concerns will help to move towards more responsible design and implementation of the new Government 3.0 paradigm.

This research provides a description of ethical issues in AI and Big Data along the ten ethical considerations. Ethical concerns in the use of AI relate mostly to the accountability of autonomous decision-makers (who is accountable for AI making wrong decision?) and value alignment (what will be the basis for AI decisions?). Privacy and inclusivity are other important issues.

In Big Data, the main concern is privacy: what data should be collected and for what purposes? Information ownership and consent are important ethical issues as well. There is a significant worry about the improper use of Big Data for

surveillance, there is an apparent need for ethical discussion regarding the limits of data collection and balancing the benefits of Big Data with its drawbacks.

Finally, the need for legal frameworks and regulation of the use of disruptive technologies arises in both, AI and Big Data ethical discussions [37][51][85][95].

Kidder [114] argues that ethical responsibilities increase with the increase of potential harm resulting from an unethical decision. Both AI and Big Data offer significant benefits for public sector, at the same time having considerable potential for misuse. With the widespread use of ICTs by the governments and digital transformation of governance processes, main ethical concerns shift from the individual decision-making by government officials to the discussion of ethical implementation and management of ICTs and tools in public sector.

Therefore, further research is needed to provide adequate frameworks along the introduction of disruptive technologies in e-government, which help to provide answers to the ethical considerations described in Sections III and IV guiding researchers and practitioners in the assessment of ethics. Further empirical and theoretical research is necessary to address the issues arising from the implementation of disruptive technologies and provide a basis for drafting legal framework regulating these technologies.

Future research should also assess ethics in the implementation of other disruptive technologies identified as a part of the Government 3.0 paradigm [115] (e.g., Augmented and Virtual Reality (see [116] for a discussion of ethical challenges), Internet of Things, Blockchain, etc.).

Limitations of the research conducted in this paper may be imposed by the methodology chosen: some relevant papers dealing with ethical issues may have been excluded if they had no "ethics/ ethical issues" in their title or abstract. Likewise, there are some papers that might not be in any of the databases used for the literature review, but still contain valuable information. A more extensive literature review is needed to overcome these limitations. Despite these limitations, we are confident that the literature review presented here is representative enough to provide valuable insights in the ethical issues in e-government and provide useful outline of the future research directions.

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REFERENCES

[1] E. M. Hartman, "Socratic questions and aristotelian answers: A virtue-based approach to business ethics," *J. Bus. Ethics*, vol. 78, no. 3, pp. 313–328, 2008.

[2] D. Guttmann, *Ethics in social work: A context of caring*. Routledge, 2013.

[3] L. K. Treviño, L. P. Hartman, and M. Brown, "Moral Person and Moral Manager: How Executives Develop a Reputation for Ethical Leadership," *Calif. Manage. Rev.*, vol. 42, no. 4, pp. 128–142, 2000.

[4] OECD, OCDE, "The OECD principles of corporate governance," *Contaduria y Adm.*, no. 216, pp. 183–194, 2004.

[5] R. O. Mason, "Four Ethical Issues of the Information Age," *MIS Q.*, vol. 10, no. 1, pp. 5–12, 1986.

[6] J. B. Berger, "Coercive E-Government Policy Imposing Harm: The Need for a Responsible E-Government Ethics," *Proc. 49th Hawaii Int. Conf. Syst. Sci.*, pp. 2830–2839, 2016.

[7] F. Bannister and R. Connolly, "ICT, public values and transformative government: A framework and programme for research," *Gov. Inf. Q.*, vol. 31, no. 1, pp. 119–128, 2014.

[8] L. Royakkers, J. Timmer, L. Kool, and R. van Est, "Societal and ethical issues of digitization," *Ethics Inf. Technol.*, vol. 20, no. 2, pp. 127–142, 2018.

[9] H. Mullen and D. S. Horner, "Ethical Problems for e-Government: An Evaluative Framework," *Electron. J. e-Government*, vol. 2, no. 3, pp. 187–196, 2004.

[10] G. V. Pereira et al., "Scientific foundations training and entrepreneurship activities in the domain of ICT-enabled governance," in *Proc. 19th Annu. Int. Conf. dg.o '18*, pp. 1–2.

[11] B. Kitchenham and S. Charters, "Guidelines for performing Systematic Literature reviews in Software Engineering Version 2.3.," EBSE, UK, 2007.

[12] J. Webster and R. T. Watson, "Analyzing the past to prepare for the future," *MIS Q.*, pp. xiii–xxiii, 2002.

[13] S. Basu, "Digital Divide, Digital Ethics, and E-government," in *ICTs in Developing Countries*, London: Palgrave Macmillan UK, 2016, pp. 161–169.

[14] E. Mordini *et al.*, "Senior citizens and the ethics of e-inclusion," *Ethics Inf. Technol.*, vol. 11(3), pp. 203–220, 2009.

[15] E. Easton-Calabria and W. L. Allen, "Developing ethical approaches to data and civil society: from availability to accessibility," *Innovation*, vol. 28(1), pp. 52–62, 2015.

[16] B. N. Fairweather and S. Rogerson, "Towards morally defensible e-government interactions with citizens," *J. Inf., Commun. Ethics Soc.*, vol. 4(4), pp. 173–180, 2006.

[17] N. Kapucu, "Ethics of Digital Government," in *Encyclopedia of Digital Government*, A.-V. Anttiroiko and M. Malkia, Eds. IGI Global, 2007, pp. 745–748.

[18] J. W. Weiss, G. J. Gulati, D. J. Yates, and L. E. Yates, "Mobile broadband affordability and the global digital divide - An information ethics perspective," *Proc. HICSS*, vol. 2015–March, pp. 2177–2186, 2015.

[19] J. Lodge, "The dark side of the moon: Accountability, ethics and new biometrics," in *Second generation biometrics: The ethical, legal and social context*, Springer, 2012, pp. 305–328.

[20] R. Heersmink, J. van den Hoven, N. J. van Eck, and J. den van Berg, "Bibliometric mapping of computer and information ethics," *Ethics Inf. Technol.*, vol. 13(3), pp. 241–249, 2011.

[21] R. Domanski, E. Estevez, E. Styrin, M. Alfano, and T. M. Harrison, "Toward an ethics of digital government," *Proc. 19th Annu. Int. Conf. dg.o '18*, pp. 1–4, 2018.

[22] I. Büschel, R. Mehdi, A. Cammilleri, Y. Marzouki, and B. Elger, "Protecting Human Health and Security in Digital Europe: How to Deal with the 'Privacy Paradox'?," *Sci. Eng. Ethics*, vol. 20(3), pp. 639–658, 2014.

[23] G. Kaisara and S. Pather, "Relevance of Ethics in e-Government: An Analysis of Developments in the WWW era," in *Proceedings of the 6th International Conference on E-Government*, 2010, pp. 45–53.

[24] P. Henman, "E-Government, Targeting and Data Profiling," *J. E-Government*, vol. 2, no. 1, pp. 79–98, Dec. 2005.

[25] R. E. Anderson, "Ethics and Digital Government," in *Digital*

Government: Principles and Best Practices, 2004.

[26] D. Goroff, J. Polonetsky, and O. Tene, "Privacy Protective Research: Facilitating Ethically Responsible Access to Administrative Data," *Ann. Am. Acad. Pol. Soc. Sci.*, vol. 675(1), pp. 46–66, 2018.

[27] P. Henman, "E-Government, Targeting and Data Profiling," *J. E-Government*, vol. 2(1), pp. 79–98, Dec. 2005.

[28] G. Sharma, X. Bao, and L. Peng, "Public Participation and Ethical Issues on E-governance: A Study Perspective in Nepal," *Electron. J. e-Government*, vol.12(1), pp. 82–96, 2014.

[29] E. Wihlborg, H. Larsson, and K. Hedström, "'The computer says no!' - A case study on automated decision-making in public authorities," *Proc. HICSS*, vol. 2016–March, pp. 2903–2912, 2016.

[30] A. V. Roman, "Framing the Questions of E-Government Ethics: An Organizational Perspective," *Am. Rev. Public Adm.*, vol. 45(2), pp. 216–236, 2015.

[31] F. Belanger and J. S. Hiller, "A framework for e-government: Privacy implications," *Bus. Process Manag. J.*, vol. 12(1 SPEC. ISS.), pp. 48–60, 2006.

[32] R. O. Mason, "Four Ethical Issues of the Information Age," *MIS Q.*, vol. 10(1), pp. 5–12, 1986.

[33] E. W. Welch, C. C. Hinnant, and M. J. Moon, "Linking citizen satisfaction with e-government and trust in government," *Journal of Public Administration Research and Theory*, pp. 371–391. 2005.

[34] L. Voronova and N. Kazantsev, "The Ethics of Big Data: Analytical Survey," in *2015 IEEE 17th Conf. on Business Informatics*, 2015, pp. 57–63.

[35] R. Heersmink, J. van den Hoven, N. J. van Eck, and J. den van Berg, "Bibliometric mapping of computer and information ethics," *Ethics Inf. Technol.*, pp. 241–249, 2011.

[36] G. A. Sandy, "Mandatory ISP filtering for a clean feed to australian internet subscribers," *15th Am. Conf. Inf. Syst. 2009, AMCIS 2009*, vol. 10, pp. 6951–6958, 2009.

[37] A. Dameski, "A Comprehensive Ethical Framework for AI Entities: Foundations," in *Artificial General Intelligence*, M. Iklé, A. Franz, R. Rzepka, and B. Goertzel, Eds. 2018, pp. 42–51.

[38] A. Smith and J. Anderson, "Digital Life in 2025: AI, Robotics and the Future of Jobs," *Pew Res. Cent.*, 6. 2014.

[39] M. Anderson and S. L. Anderson, "Machine ethics," *IEEE Intelligent Systems*, 2006.

[40] M. Brundage, "Artificial Intelligence and Responsible Innovation," in *Fundamental Issues of Artificial Intelligence*, Cham: Springer International Publishing, 2016, pp. 543–554.

[41] F. Kile, "Artificial intelligence and society: a furtive transformation," *AI Soc.*, vol. 28(1), pp. 107–115, 2013.

[42] W. Zhao, "Research on Social Responsibility of Artificial Intelligence Based on ISO 26000," 2019, pp. 130–137.

[43] P. Boddington, "Some Characteristic Pitfalls in Considering the Ethics of AI, and what to do about them," 2017, pp. 85–97.

[44] M. Drev, "Work Task Automation and Artificial Intelligence: Implications for the Role of Government," in *At His Crossroad*, Cham: Springer, 2019, pp. 35–41.

[45] T. Meek, H. Barham, N. Beltaif, A. Kaadoor, and T. Akhter, "Managing the ethical and risk implications of rapid advances in artificial intelligence: A literature review," in *2016 PICMET*, 2016, pp. 682–693.

[46] K. Y. Lee, H. Y. Kwon, and J. I. Lim, "Legal Consideration on the Use of Artificial Intelligence Technology and Self-regulation in Financial Sector: Focused on Robo-Advisors,"

2018, pp. 323–335.

[47] K. Shahriari and M. Shahriari, "IEEE standard review — Ethically aligned design: A vision for prioritizing human wellbeing with artificial intelligence and autonomous systems," in *2017 IEEE Canada IHTC*, 2017, pp. 197–201.

[48] B. C. Stahl and D. Wright, "Ethics and Privacy in AI and Big Data: Implementing Responsible Research and Innovation," *IEEE Secur. Priv.*, vol. 16(3), pp. 26–33, 2018.

[49] K. Miller, "Can We Program Ethics into AI? [Reflections]," *IEEE Technol. Soc. Mag.*, vol. 36(2), pp. 29–30, 2017.

[50] A. Etzioni and O. Etzioni, "AI assisted ethics," *Ethics Inf. Technol.*, vol. 18(2), pp. 149–156, 2016.

[51] R. Rault and D. Trentesaux, "Artificial Intelligence, Autonomous Systems and Robotics: Legal Innovations," 2018, pp. 1–9.

[52] Y.-J. Lee and J.-Y. Park, "Identification of future signal based on the quantitative and qualitative text mining: a case study on ethical issues in artificial intelligence," *Qual. Quant.*, vol. 52(2), pp. 653–667, 2018.

[53] D. Helbing *et al.*, "Will Democracy Survive Big Data and Artificial Intelligence?," in *Towards Digital Enlightenment*, Cham: Springer International Publishing, 2019, pp. 73–98.

[54] J. Danaher, "Toward an Ethics of AI Assistants: an Initial Framework," *Philos. Technol.*, vol. 31(4_, pp. 629–653, 2018.

[55] V. Vakkuri and P. Abrahamsson, "The Key Concepts of Ethics of Artificial Intelligence," in *2018 IEEE ICE/ITMC*, 2018, pp. 1–6.

[56] E. Yudkowsky, "Complex Value Systems in Friendly AI," 2011, pp. 388–393.

[57] J. M. Kizza, "New Frontiers for Computer Ethics: Artificial Intelligence, Virtualization, and Cyberspace," 2016, pp. 207–225.

[58] S. D. Baum, "Social choice ethics in artificial intelligence," *AI Soc.*, pp. 1-12, 2017.

[59] A. Giubilini and J. Savulescu, "The Artificial Moral Advisor. The 'Ideal Observer' Meets Artificial Intelligence," *Philos. Technol.*, vol. 31(2), pp. 169–188, 2018.

[60] S. A. Sora, "Artificial intelligence in a value based management system," *Int. J. Value-Based Manag.*, vol. 1(1), pp. 27–33, Feb. 1988.

[61] G. Su, "Unemployment in the AI Age," *AI Matters*, vol. 3(4), pp. 35–43, Feb. 2018.

[62] J. Bandy, "Automation moderation," *AI Matters*, vol. 3(4), pp. 59–62, Feb. 2018.

[63] S. Akter and S. F. Wamba, "Big data and disaster management: a systematic review and agenda for future research," *Annals of Operations Research*, pp.1–21, 2017.

[64] L. Yin, D. Fassi, H. Cheng, H. Han, and S. He, "Health Co-Creation in Social Innovation: Design Service for Health-Empowered Society in China," *Des. J.*, vol. 20(sup1), pp. S2293–S2303, 2017.

[65] A. Stylianou and M. A. Talias, "Big data in healthcare: a discussion on the big challenges," *Health Technol.*, vol. 7(1), pp. 97–107, Mar. 2017.

[66] B. Evans, "Using Big Data to Achieve Food Security," in *Big Data Challenges*, London: Palgrave, 2016, pp. 127–135.

[67] M. Phillips, E. S. Dove, and B. M. Knoppers, "Criminal Prohibition of Wrongful Re-identification: Legal Solution or Minefield for Big Data?," *J. Bioeth. Inq.*, vol. 14(4), pp. 527–539, Dec. 2017.

[68] M. Batty, "Big data, smart cities and city planning," *Dialogues Hum. Geogr.*, vol. 3(13), pp. 274-279, 2013.

[69] S. Monteith and T. Glenn, "Automated Decision-Making and Big Data: Concerns for People With Mental Illness," *Curr. Psychiatry Rep.*, vol. 18(112), p. 1-12, Dec. 2016.

[70] L. Y. Y. Lu and J. S. Liu, "The Major Research Themes of Big Data Literature: From 2001 to 2016," in *2016 IEEE CIT*, 2016, pp. 586–590.

[71] C. F. Breidbach, M. Davern, G. Shanks, and I. Asadi-Someh, "On the Ethical Implications of Big Data in Service Systems," 2019, pp. 661–674.

[72] H. Mamiya, A. Shaban-Nejad, and D. L. Buckeridge, "Online Public Health Intelligence: Ethical Considerations at the Big Data Era," 2017, pp. 129–148.

[73] L. Kammourieh *et al.*, "Group Privacy in the Age of Big Data," in *Group Privacy*, Cham: Springer, 2017, pp. 37–66.

[74] M. Cuquet, A. Fensel, and L. Bigagli, "A European research roadmap for optimizing societal impact of big data on environment and energy efficiency," in *2017 GIoTS*, 2017, pp. 1–6.

[75] A. Zwitter, "The Network Effect on Ethics in the Big Data Age," in *Big Data Challenges*, London: Palgrave, 2016, pp. 23–34.

[76] P. A. Chow-White, M. MacAulay, A. Charters, and P. Chow, "From the bench to the bedside in the big data age: ethics and practices of consent and privacy for clinical genomics and personalized medicine," *Ethics Inf. Technol.*, vol. 17(3), pp. 189–200, Sep. 2015.

[77] J. S. Saltz, "A Framework to Explore Ethical Issues When Using Big Data Analytics on the Future Networked Internet of Things," in *FNSS 2018,* 2018, pp. 49–60.

[78] A. Richterich, "Using Transactional Big Data for Epidemiological Surveillance: Google Flu Trends and Ethical Implications of 'Infodemiology,'" in *The Ethics of Biomedical Big Data,* Cham: Springer, 2016, pp. 41–72.

[79] G. O. Schaefer, M. K. Labude, and H. U. Nasir, "Big Data: Ethical Considerations," in *The Palgrave Handbook of Philosophy and Public Policy*, Springer, 2018, pp. 593–607.

[80] J. N. Gathegi, "Clouding Big Data: Information Privacy Considerations," in *IMCW2018,* 2014, pp. 64–69.

[81] C. Garattini, J. Raffle, D. N. Aisyah, F. Sartain, and Z. Kozlakidis, "Big Data Analytics, Infectious Diseases and Associated Ethical Impacts," *Philos. Technol.*, Aug., pp. 1–17, 2017.

[82] J.-L. Monino, "Data Value, Big Data Analytics, and Decision-Making," *J. Knowl. Econ.*, pp.1–12, Aug. 2016.

[83] D. Nunan and M. Di Domenico, "Big Data: A Normal Accident Waiting to Happen?," *J. Bus. Ethics*, vol. 145(3), pp. 481–491, Oct. 2017.

[84] J. Collmann, K. T. FitzGerald, S. Wu, J. Kupersmith, and S. A. Matei, "Data Management Plans, Institutional Review Boards, and the Ethical Management of Big Data About Human Subjects," in *Ethical Reasoning in Big Data*, Cham: Springer, 2016, pp. 141–184.

[85] K. Pormeister, "The GDPR and Big Data: Leading the Way for Big Genetic Data?," in *Annual Privacy Forum,* 2017, pp. 3–18.

[86] N. Dorasamy and N. Pomazalová, "Social Impact and Social Media Analysis Relating to Big Data," in *Data Science and Big Data Computing*, Cham: Springer, 2016, pp. 293–313.

[87] M. Steinmann *et al.*, "Embedding Privacy and Ethical Values in Big Data Technology," in *Transparency in Social Media*, Cham: Springer, 2015, pp. 277–301.

[88] H. Hijmans, "Internet and Loss of Control in an Era of Big Data and Mass Surveillance," 2016, pp. 77–123.

[89] A. Narayanan, J. Huey, and E. W. Felten, "A Precautionary Approach to Big Data Privacy," 2016, pp. 357–385.

[90] B. van der Sloot, "Is the Human Rights Framework Still Fit for the Big Data Era? A Discussion of the ECtHR's Case Law on Privacy Violations Arising from Surveillance Activities," 2016, pp. 411–436.

[91] B. Mittelstadt, "From Individual to Group Privacy in Big Data Analytics," *Philos. Technol.*, vol. 30(4), pp. 475–494, 2017.

[92] M. Andrejevic, "Surveillance in the Big Data Era," in *PICT*, Dordrecht: Springer, 2014, pp. 55–69.

[93] Y. Wang, "Big Opportunities and Big Concerns of Big Data in Education," *TechTrends*, vol. 60(4), pp. 381–384, Jul. 2016.

[94] M. Fuller, "Some Practical and Ethical Challenges Posed by Big Data," 2016, pp. 119–127.

[95] D. Helbing, "Societal, Economic, Ethical and Legal Challenges of the Digital Revolution: From Big Data to Deep Learning, Artificial Intelligence, and Manipulative Technologies," in *Towards Digital Enlightenment*, Springer, 2019, pp. 47–72.

[96] X. Zhang and S. Xiang, "Data Quality, Analytics, and Privacy in Big Data," 2015, pp. 393–418.

[97] V. Morabito, "Big Data and Analytics for Government Innovation," in *Big Data and Analytics*, 2015, pp. 23–45.

[98] L. Taylor and C. Richter, "Big Data and Urban Governance," in *Geographies of Urban Governance*, Cham: Springer, 2015, pp. 175–191.

[99] Aqeel-ur-Rehman, I. U. Khan, and S. ur Rehman, "A Review on Big Data Security and Privacy in Healthcare Applications," in *Big Data Management*, Cham: Springer, 2017, pp. 71–89.

[100] I. Stanier, "Enhancing Intelligence-Led Policing: Law Enforcement's Big Data Revolution," in *Big Data Challenges*, London: Palgrave, 2016, pp. 97–113.

[101] A. Gerdes, "Big Data—Fighting Organized Crime Threats While Preserving Privacy," in *Using Open Data to Detect Organized Crime Threats*, Cham: Springer International Publishing, 2017, pp. 103–117.

[102] R. Kitchin, "The real-time city? Big data and smart urbanism," *GeoJournal*, vol. 79(1), pp. 1–14, Feb. 2014.

[103] I. Olaronke and O. Oluwaseun, "Big data in healthcare: Prospects, challenges and resolutions," in *2016 FTC*, 2016, pp. 1152–1157.

[104] J. Richards, "Needles in Haystacks: Law, Capability, Ethics, and Proportionality in Big Data Intelligence-Gathering," in *Big Data Challenges*, London: Palgrave, 2016, pp. 73–84.

[105] M. Mulqueen, "Sustainable Innovation: Placing Ethics at the Core of Security in a Big Data Age," in *Big Data Challenges*, London: Palgrave, 2016, pp. 61–71.

[106] M. Alemany Oliver and J.-S. Vayre, "Big data and the future of knowledge production in marketing research: Ethics, digital traces, and abductive reasoning," *J. Mark. Anal.*, vol. 3(1), pp. 5–13, Mar. 2015.

[107] P. Prinsloo and S. Slade, "Big Data, Higher Education and Learning Analytics: Beyond Justice, Towards an Ethics of Care," in *Big Data and Learning Analytics in Higher Education*, Cham: Springer, 2017, pp. 109–124.

[108] R. Finn and A. Donovan, "Big Data, Drone Data: Privacy and Ethical Impacts of the Intersection Between Big Data and Civil Drone Deployments," 2016, pp. 47–67.

[109] W. J. Radermacher, "Official statistics in the era of big data opportunities and threats," *Int. J. Data Sci. Anal.*, vol. 6(3), pp. 225–231, Nov. 2018.

[110] M. Whitman, C. Hsiang, and K. Roark, "Potential for

participatory big data ethics and algorithm design," in *Proceedings of the 15th PDC '18*, 2018, pp. 1–6.

[111] M. Sax, "Big data: Finders keepers, losers weepers?," *Ethics Inf. Technol.*, vol. 18(1), pp. 25–31, Mar. 2016.

[112] V. Narayanan, P. N. Howard, B. Kollanyi, and M. Elswah, "Russian Involvement and Junk News during Brexit," 2017.

[113] L. Sax, S. Gilmartin, and A. Bryant, "Assessing response rates and nonresponse bias in web and paper surveys," *Res. High. Educ.*, vol. 44(4), pp. 409–432, 2003.

[114] R. M. Kidder, "Ethics: A matter of survival," *Futurist*, vol. 26(2), p. 10, 1992.

[115] Z. Lachana, C. Alexopoulos, E. Loukis, and Y. Charalabidis, "Identifying the Different Generations of Egovernment: an Analysis Framework," in *The 12th MCIS 2018*, 2018, pp. 1–13.

[116] C. Botella, A. Garcia-Palacios, R. M. Baños, and S. Quero, "Cybertherapy: Advantages, limitations, and ethical issues," *PsychNology J.*, 2009.