

Artificial Intelligence in the public sector: opportunities and challenges*

SUMMARY: 1. Introduction. - 2. Public bodies and artificial intelligence: new opportunities by data-driven regulation. - 2.1. From data to granular knowledge. - 2.2. New ways of delivering public services. - 3. Automated decision-making: challenges for administrative law principle. - 3.1. A brief overview on the functioning of Artificial intelligence. - 3.2. GDPR protection: a “human-on-the-loop” meaning. - 4. Conclusion.

1. Nowadays, the most important challenge that public administration has to deal with is the management of a large amount of data.

At the beginning of the ‘90’s, the process of digitalization has started, hence public administration begun to collect manually data related to administrative documents and procedures. The amount of data was insignificant, because of the traditional tools used to collect data and the shortage of digital resources⁶⁰⁶; but the trend changed when fast development of cloud computing and information and communication technologies (ICT) made it easier to generate, storage and analyse data.

It is true that public bodies are changing under legislative efforts, such as, firstly, Digital Administration Code (*d.lgs.* 82/2005) in order to digitalise own processes and organizations, in line with administrative principles.

The digitalization process provide a «logical data»⁶⁰⁷ structure instead of a «logical documents» one, with the consequence that artificial intelligence’s outcomes as well as data derive from digital sources (*i.e.* database interconnected, public platform) should be introduced in the procedure under the public bodies’ control.

The shifting to logical data paradigm makes the phase of managing and collecting data crucial for the legality of proceeding. Therefore, artificial intelligence’s outcomes could be considered «legally relevant»⁶⁰⁸ as long as they are generated under a legal framework.

Consequently, one of the main revolution that public bodies have been living is the shifting from digitalization to datafication⁶⁰⁹ that is an approach that considers that all elements could be quantified and analysed. This phenomenon is due to information technologies available at lower cost and their ubiquity throughout society.

606 * Paper reviewed and updated, presented during the Seminar on “*Big Data and Public Law: New Challenges beyond Data Protection*”, Gargnano sul Garda, 15-17 October 2018.

On the contrary, nowadays documents are born digital and data can be collected immediately.

607 See E. MENICETTI, *Accessibilità e tutela della riservatezza*, in B. PONTI (a cura di), *Il regime dei dati pubblici. Esperienze europee e ordinamento nazionale*, Santarcangelo di Romagna, 2008, pp. 181 ss.

608 The article 1, *comma* 1, *lett.* p) of Digital Administration Code (*d.lgs.* 82/2005) considers «informatic document all document in which there is the digital representation of acts, facts and data legally relevant».

609 V. MAYER-SCHONBERGER AND K. CUKIER, *Big data. Una rivoluzione che trasformerà il nostro modo di vivere e già minaccia la nostra libertà*, Garzanti, Milano, 2013, pp. 103 ss. created the term *datafication* and give some examples of ubiquity of ICT and the possibility of quantify everything, such as location, relations, own self, words, and so on.

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Due to advanced ICT tools, public and private actors collect and analyse an impressive quantity of data.⁶¹⁰ Related to public sector, this revolution influence policy and rulemaking process because predictive analytics on ICT's outcome could facilitate the merging of scattered data and the establishing of unexpected correlations.

Internet of things throughout the city, social networks, digital procedures, e-mails and so on are just some of the instruments, which public bodies and people use every day to produce and capture a significant amount of data.

Everywhere there are data, thus the ability of collecting and analysing them is crucial «to do more, better, faster and more cheaply»⁶¹¹: public bodies have to understand this improvement urgently and to govern it, both in order to re-think how public services could be delivered and to preserve administrative principles into administrative proceedings.

It is clear that this huge amount of data poses both opportunities and challenges to the administrative law system, which scholars have to face⁶¹².

On the one hand, big data and artificial intelligence create new opportunities to understand reality in a deep way, thanks to specific tools (such as Internet of Things, predictive analysis and datasets) and new ways of working (*i.e.* interoperability and sharing between public bodies) and new ways of government (*i.e.* data driven regulation).

On the other hand, however, they pose some questions, related to administrative principles, especially to due process, rule of law and accountability.

In this way, General Data Protection Regulation 2016/679 (GDPR) represents the first attempt to unify the fundamental right of data protection and, at the same time, the free circulation of data in a safe and trustworthy digital society. In particular, one of the main purpose of GDPR is to protect rights and freedoms of people as a whole and not only the ones of data subjects.

For this reason, scholars may appreciate both the public aim of this act and the attempt of regulating the rise of artificial intelligence in the public sector to protect rights and freedoms.⁶¹³ Starting from these characteristics, this contribution would offer some insights in order to re-think and to adapt traditional legal categories and principles, *i.e.* due process, to this new phenomenon.⁶¹⁴

GDPR tries to highlight the central role of guide-principles, such as accountability and transparency and, at the same time, it provides for specific rights to recipients. It pays attention to

610 Public bodies collect a large amount of data during own activities, called administrative data; indeed private sector collect data, namely, from e-commerce, payment transaction, trade agreements and so on.

611 In this way, M. MACIEJEWSKY, *To do more, better, faster and more cheaply: using big data in public administration*, in *International Review of Administrative Sciences*, 83, 2017, pp. 120-135.

612 It is a matter of fact that the big data phenomenon has been studied under several point of views, such as technological, urban policy and protect of privacy ones, while only recently legal scholars have started to study it.

613 F. PIZZETTI, *La protezione dei dati personali e la sfida dell'Intelligenza Artificiale*, in F. PIZZETTI (a cura di), *Intelligenza artificiale, protezione dei dati personali e regolazione*, Torino, 2018, pp. 164 ss. The Author argues, «to the heart of GDPR there are people with their rights and freedoms», p. 165.

614 O. POLLICINO, *Tutela dei diritti fondamentali nell'era digitale e contest valoriale: una indagine transatlantica*, in *Rivista di diritto dei media*, 2, 2018, suggests that changes of digital area push scholars and judges towards two ways. They could choose to transfer *sic et simpliciter* traditional legal categories into digital scenario or they could choose to re-think and adapt them to new scenario. This choice is hardly influenced by cultural framework (resistance to or openness to the innovation).

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these aspects with the aim of significantly enhancing people's trust about the use of new methodologies in the public decision-making, such as big data analytics, internet of things and artificial intelligence, with the final purpose of protecting people affected by.

Artificial intelligence uses as main raw material a huge amount of data (also known as big data), with the consequence that accessibility and correctness of data are a pre-condition to guarantee a good administration principle and to protect rights and freedoms. GDPR focuses on these elements in order to be both a normative framework to avoid pervasive as well as unreasonable public control and a tool for improving a sound data circulation.

Scholars must urgently assess what are the consequences of the administrative decision-making process in the machine-learning era. In particular, attention should be paid to two issues: data quality and compatibility between artificial intelligence and well-established administrative principles.

Consequently, the quality of data, collected and used for decision-making process, is one of the main challenges that public administration has to deal with.

Strictly connected to the first one, the second challenge is about the consideration of legal compatibility of automated individual decision making with principles of administrative law. Scholars should have the ability to re-address this new kind of activities into the legal framework, using renewed and adapted old traditional categories to the concerns connected to the machine-learning era⁶¹⁵.

However, artificial intelligence could strengthen regulatory public administrations to make them smarter or able to develop data-driven regulation, so that they permit to turn good administration principles into reality. Hence, scholars may be optimistic about artificial intelligence used by public administrations, but, for doing that, the re-thinking of traditional guarantees must be a priority.

Article 22nd GDPR expresses that data subject have the right not to be subject to a decision based solely on automated processing, which produces legal effects concerning him/her or similarly significantly affects him/her. Nevertheless, GDPR permits automated processing even if there are some legal guarantees, such as the right to obtain human intervention, the right to be heard and the right to contest the decision.

In a literal interpretation, GDPR offers some tools to allow public administrations to use artificial intelligence legally, namely in a way that permits them to be transparent and to act reasoning in order to preserve due process principle. In particular, scholars could individualize ways to standardize rights and procedure to concrete them, to well-defining *ex ante* duties on civil servants, artificial intelligence and programmers and to make the functioning of artificial intelligence transparent.

In order to enhance public accountability and transparency, algorithmic impact assessments may be introduced in the public-sector procedures to correct bias and to augment protection (for example, discrimination could be prevented).

615 About the inadequacy of old categories to the digital era, see L. FLORIDI, *Soft Ethics and the Governance of the Digital*, in *Philosophy & Technology*, 31, I, pp. 1-8 available at <https://link.springer.com/article/10.1007%2Fs13347-018-0303-9>.

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To sum up, in the second chapter of the article I try to highlight how artificial intelligence redefines the way of delivering public services; in particular the rise of evidence-based methods could change administrative decision-making process (*i.e.* data driven regulation) and, more generally, boundaries of public function.⁶¹⁶

In the third chapter, I pay attention to challenges, which public bodies deal with, relating to the introduction of artificial intelligence in an adjudicatory proceeding. The main challenge is about automated decision-making, consequently I suggest a “human- on-the-loop” interpretation of article 22nd GDPR in order to preserve administrative principle and to avoid discriminations. Moreover, I prompt an extensive interpretation of good administration principle in order to preserve accountability.

Scholars should reflect about these opportunities and challenges both to overcome oppositions against the introduction of artificial intelligence in the public sector and to shape a new cultural framework based on renewed and adapted legal categories to the new digital context in order to guarantee procedural and jurisdictional rights and freedoms’ protection.

2. A big amount of data is useful to public administration for at least two reasons: both the better government of the city and the completeness of inquiry activities during the administrative procedure.

My focus will be just about the first point on data collected for issuing administrative decisions: this new kind of regulation calls data-driven regulation.

In the ICT era, data science and big data allow public administrations to analyse, store and process a large amounts of collected data in order to take administrative decisions, plans, strategies and actions better fit to citizens’ needs⁶¹⁷. It is important to underline that «the usefulness of big data is followed by multiple levels of operational steps, such as acquisition, information extraction and cleaning, data integration, modelling and analysis, and interpretation and deployment».⁶¹⁸

The main revolution of this age is the possibility for public administrations to collect a large amount of personal data on citizens and daily commuters or tourists, known as administrative data⁶¹⁹ as well as urban data on city infrastructures and utilities (such as traffic, public transports

616 It is particularly interesting the study of G. CARULLO, *Gestione, fruizione e diffusione dei dati dell’amministrazione digitale e funzione amministrativa*, Torino, 2018 in which he highlights how ICT could change the way of public bodies’ working and the relationship with citizens. Especially, under the ICT push, participatory rights, transparency, regulation and public service delivering, as I try to explain below in chapter 2.2. Another point of view is also offered by S. CIVITARESE MATTEUCCI, L. TORCHIA (a cura di), *La tecnificazione dell’amministrazione*, in D. SORACE, L. FERRARA, S. CIVITARESE MATTEUCCI, L. TORCHIA (a cura di), *A 150 anni dall’unificazione amministrativa italiana. La tecnificazione*, IV, Firenze, 2017 in which the relation between digitalization, public administration and citizenship is deeply analyzed.

617 About the possibility to re-design the delivery of services, see F. MALOMO and V. SENA, *Data intelligence for local government? Assessing the benefits and barriers to use of big data in the public sector*, in *Policy and Internet*, 9, 1, 2017, pp. 7-27.

618 S. K. PAL, S. K. MEHER, A. SKOWRON, *Data science, big data and granular mining*, editorial in *Pattern Recognition Letters* 67, 2015, pp. 109–112.

619 Administrative data derive from the operation of administrative systems, as information collected for the purposes of registration, transaction and record keeping. Frequently, administrative data derived from a wide range of administrative systems such as those in education, healthcare, taxation, housing or vehicle licensing as well as registers of births, deaths, marriage and so on. See R. CONNELLY, C. J. PLAYFORD, V. GAYLE AND C. DIBBEN, *The role of*

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routes, number of services access). It represents a unique opportunity to inform policy and regulation for governing the growing problems of unsustainable urban expansions, inequality and insecurity and other governance problems. In this way, the employment of data science, big data, Internet of things, algorithms and predictive analytics are useful to enhance efficiency of their services and decision-making.⁶²⁰

2.1. Throughout the centuries, public bodies collected data about cities and their citizens in a very large datasets based on relatively limited samples, in a specific time and space, with the restricted number of variables. They have been defined as small data, which are referred to data captured with questionnaire surveys, case studies, city audits, interviews and focus groups as well as national censuses⁶²¹, and government records. Limited and out of time are characteristics of small data because of inadequate tools for capturing and analysing them and, consequently, scholars and researchers undertook to limit the collecting of data⁶²².

Something changed when statistics demonstrated that casualty makes samples better⁶²³ and when new powerful information and communication technologies have been developing and employed: the data revolution era begins.⁶²⁴ In fact, not only the possibility to collect and store data, but also the possibility to interconnect⁶²⁵ and mash data gathered by different institutions represent

administrative data in the big data revolution in social science research, in *Social Science Research*, 59, 2016, particularly p. 3.

620 Firstly, Michael Abramowicz, an American economist, argued that predictive analysis is useful in the market regulation, because it is possible to predict more effectively the outcome on cost-benefit, see M. ABRAMOWICZ, *Information Markets, Administrative Decision-making, and Predictive Cost-Benefit Analysis*, in *University of Chicago Law Review*, 71, 2004. See also J. MITTS, *Predictive regulation*, June 27, 2014, available at SSRN: <https://ssrn.com/abstract=2411816> or <http://dx.doi.org/10.2139/ssrn.2411816>, who considers predictive analysis to better individualize regulatory priorities.

621 For example, Catholic churches developed databases on birth and death of people or their marriage; municipalities used tools for processing census information.

622 Some authors consider it as an artificial line due to the inadequacy of tools; see V. MAYER-SCHONBERGER AND K. CUKIER, *Big data. Una rivoluzione che transformer il nostro modo di vivere e già minaccia la nostra libertà*, Garzanti, Milano, 2013, pp. 34 ss.

623 This assumption is considered important to shift from causation rules to correlations one, that is the Big data's method of research.

624 A new paradigm arises, from one in which it was important to manage and control a little amount of data to another in which it is important to manage and collect as data as possible; see M. FALCONE, *Le potenzialità conoscitive dei dati amministrativi nell'era della "rivoluzione dei dati": il caso delle politiche di eradicazione dell'epatite C*, in *Istituzioni del federalismo*, 2, 2017, p. 426.

625 At the beginning of 90's when the digitalization of Italian public administration was at dawn, A. MASUCCI, *L'atto amministrativo informatico. Primi lineamenti di una ricostruzione*, Napoli, 1993, p. 67 wrote that the rationality parameter, which informs administrative proceedings, impose «the necessity of connecting different public bodies in order to share data storage everywhere». See also, G. CARULLO, *Big Data e Pubblica Amministrazione nell'era delle banche dati interconnesse*, in *Concorrenza e mercato*, 23, 2015.

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one of the main revolution⁶²⁶ for public bodies in the digital era that allows public bodies to have a granular⁶²⁷ and deeper knowledge about society.

Data refers to «units or morsels of information that as a whole form the bedrock of modern policy decisions by government and nongovernment authorities», so data is the «starting point for what we know»⁶²⁸, especially if data represents almost all pieces of information available.⁶²⁹

Informational and communicational technologies provide «a deeper, more holistic and robust analysis»⁶³⁰ because of the indexical objects, which are embedded into almost all urban and environmental spaces as well as able to communicate and share data among each other, in order to obtain new derived data.

For example, throughout the city there are a network of cameras and transponders for capturing data, which feed back to a central control hub, where analysts could monitor the flow of traffic and could modify traffic light sequences and speed limits as well as automatically punish traffic violations.⁶³¹

Basically, public and private actors create a citywide instrumented system that unify together data streams from different agencies related to different public services into an hub service centre.⁶³² Here, these data are visualized and monitored by analysts' process, which could aggregate data over time and huge volumes of administrative data. After these operations, these correlations appear on a virtual operations platform that enables city officials to have significant information on different flows throughout the city.

In this context, data science, big data and other technologies have an important role in the enhancing of public powers because they facilitate both the collection of data, and the interconnection among several public administration databases⁶³³ and they allow public bodies to convert scattered data into valuable knowledge. Therefore, «governments are central to both

626 Just at the beginning of the 2000's, some scholars considered that telematics was a good opportunity for public administrations to innovate and became transparent and more efficient them and to make simpler relationship between public bodies and citizens. See P. MERCATALI, *Informatica applicata alla pubblica amministrazione*, Simone, 2003.

627 As an example of some doctrine, R. KITCHIN, *The real-time city? Big data and smart urbanism*, in *Geo Journal*, 79, 2014, p. 2; S. ALLWINKLE AND P. CRUICKSHANK, *Creating smarter cities: an overview*, in *Journal of Urban Technology*, 18, 2011, p. 2; S. K. PAL, S. K. MEHER, A. SKOWRON, *Data science, big data and granular mining*, in *Journal Pattern Recognition Letters*, 67, 2015, p. 110, in which they consider how granular mining permits to understand society meticulously.

628 S. RANCHORDAS AND A. KLOP, *Data-driven regulation and governance in smart cities*, in *Handbook on Data Science and Law*, A. BERLEE, V. MAK, E. TJONG TJIN TAI, Edward Elgar, 2018, p. 8.

629 Some case studies conducted by ALBERT LASZLO-BARABASI permit to understand how a complex system works: it is possible thanks to a huge amount of data collected and analysed useful to highlight something new and previously unknowable.

630 R. KITCHIN, *The real-time city? Big data and smart urbanism*, in *Geo Journal*, Springer, Dordrecht, 79, 2014, p. 7.

631 Many other examples are possible: smart tickets could trace passenger travel; transponders could measure vehicle flow or empty spaces in a car park; SEE R. KITCHIN, *The real-time city? Big data and smart urbanism*, cit.; R. KITCHIN, T. P. LAURIAULT AND G. MCARDLE, *Knowing and governing cities through urban indicators, city benchmarking and real-time dashboards*, in *Regional Studies, Regional Science*, 2015.

632 One of the main specialized examples in Italy is Consorzio per il Sistema Informativo – CSI, which makes big data analysis in Piedmont.

633 This activity is technically called massive data integration.

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creating and managing knowledge»⁶³⁴ because they do not just produce knowledge, but also manage it, especially with the aim of «serving the public interest».⁶³⁵

On the one hand, it is clear that ICT offer the possibility to see an objectively measured, well defined as well as a real-time analysis of everyday life, infrastructures and needs, consequently public bodies could use these significant information and try to regulate the services of the city and to offer public services more focus-oriented.

On the other hand, predictive analytics permit to establish new correlations between pieces of information: this method of knowledge overturns the traditional way, based on causation rules.

Thanks to Big data analytics, public bodies have the ability to find useful correlations within datasets «without understanding causation»⁶³⁶; nonetheless, it is important that users have in mind that there is «the risk of finding spurious correlations».⁶³⁷ Anyway, with improved statistical and computational methods and the possibility of linking different datasets could begin a new process of creating knowledge. In particular, the big data revolutions is based on patterns, which come from linkage and connections about pieces of data, which the ordinary human assessment could not understand.⁶³⁸

It is also useful to highlight that these data offer knowable and governable systems, which show a rational, mechanical, linear and hierarchical ways of being.⁶³⁹ This knowledge is useful for public bodies in order to act effectively and efficiently. In fact, they could see «the world as it actually is through descriptive statistics and visual representations»⁶⁴⁰. The use of indicator,

634 C. FREDRIKSSON, F. MUBARAK, M. TUOHIMAA AND M. ZHAN, *Big data in the public sector: a systematic literature review*, Scandinavian Journal of Public Administration, 21, III, 2017, p. 47.

635 H. MAUREEN, *The value and challenges of public sector information*, in *Cosmopolitan Civil Societies: an interdisciplinary approach*, 5, III, 2013, p. 81.

636 J. SHAW, *Why big data is a big deal*, in Harvard Magazine, 116, IV, 2014, p. 33. H. EKBIA, M. MATTIOLI, I. KOUPER, G. ARAVE, A. GHAZINEJAD, T. BOWMAN, V. RATANDEEP SURI, A. TSOU, S. WEINGART, C. R. SUGIMOTO, *Big data, bigger dilemmas: a critical review*, in *Journal of the association for information science and technology*, 66, VIII, 2015, p. 1529 ss. pay attention to the historical evolution about the epistemological paradigm and they argue that «the distinction between causal relation and correlation is at the center of current debates.....a debate that has been going on for decades,..between the advocates of data-driven science and those of theory-driven science». Also J. COWLS AND R. SCHROEDER, *Causation, correlation and Big Data in social science research*, in *Policy & Internet*, 7, IV, 2015, pp. 447 ss. show debate about methodological change, from causation paradigm to correlation one and the consequence about social science research.

637 J. SHAW, *cit.*, p. 34.

638 In addition, M. FALCONE argues that big data analytics are deeply changing the way in which public bodies know; see M. FALCONE, *Le potenzialità conoscitive dei dati amministrativi nell'era della "rivoluzione dei dati"*, *cit.*, pp. 423 ss. An interesting point of view is offered by H. EKBIA, M. MATTIOLI, I. KOUPER, G. ARAVE, A. GHAZINEJAD, T. BOWMAN, V. RATANDEEP SURI, A. TSOU, S. WEINGART, C. R. SUGIMOTO, *Big data, bigger dilemmas: a critical review*, *cit.*, p. 1527; in this article they consider that, in a cognition-oriented perspective, the limited capacity of the human mind to make sense of large amounts of data requires «mediation through trans-disciplinary work, technological infrastructure, statistical analyses, and visualization techniques to enhance interpretability».

639 Study on network science, system complex and self-organization principle of system complex show that «our action are led by rules, schemes and mechanisms», consequently there are reproducibility and predictive ability as in hard science, A. LASLO-BARABASI, *Lampi. La trama nascosta che guida la nostra vita*, Torino, 2011, p. 13; see also R. CAVALLO PERIN, *Beyond the municipality: the city, its rights and its rites*, in *Italian Journal of Public Law*, 2, 2013, pp. 307-315.

640 F. ASTLEITHNER AND A. HAMEDINGER, *The analysis of sustainability indicators as socially constructed policy instruments: benefits and challenges of "interactive research"*, in *Local Environment*, 8, VI, 2003, pp. 627-640.

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benchmarking and dashboard, as well as big data analysis and internet of things permit to capture the external reality in a fully and representative way.

Some authors⁶⁴¹ consider data as value-free and objective tools of knowing the city, based on the assumption that data are independent of ideas and contexts. In this sense, data are simply able to reflect the truth without subjective interpretation.

Indeed other authors⁶⁴² are critical because of the assumption that data do not exist independently of the ideas and of instruments used to generate process and analyse them. In fact, data «is the product of choices and constraints, shaped by a system of thought, technical know-how, public and political opinion, ethical considerations, the regulatory environment and funding and resourcing... framed and used contextually to try and achieve certain aims and goals»⁶⁴³.

This latter interpretation is partially true and it is a relevant challenge that public bodies deal with. In chapter 3, I develop this idea because I am critical about algorithmic functioning in relation with legal categories and principles.

Anyway, the outcome knowledge represents the substance of data-driven regulation and thanks to this, public bodies could issue administrative decisions, plans, strategies and actions for better managing infrastructures, for allocating urban resources and for nudging citizen, tourist and daily commuters in order to govern the city in an efficient way.

Consequently, it seems proper to consider that the delivering of public services are changing deeply, from a traditional way to an innovative one.

2.2. In the Italian administrative system, the delivering of public services is based on authoritative and unilateral decision, as a result of the application of rational rules.

In fact, the Italian Constitution establishes at the article 41 that public or private actors must deliver public services according to the law that orders plans and controls, which actors must operate to reach social objectives.

It seems interesting to analyse how big data, artificial intelligence and predictive tools could transform the way of planning and controlling public services.

First, it appears that the law is not the only way to better individualize citizens' needs and, secondly, it seems partly outdated to consider that only the law, as stated by the Constitutional Court⁶⁴⁴, individualizes social purposes.

641 D. ROSENBERG, *Data before the fact*, in L. GITELMAN, *Raw data is an oxymoron*, Cambridge, MIT press, 2013, pp. 15-40.

642 T. P. LAURIALT, *Data infrastructures and geographical imaginations: Mapping data access discourses in Canada*, Phd thesis, Carleton University, Ottawa, 2012, available at https://curve.carleton.ca/system/files/etd/7eb756c8-3ceb-4929-8220-3b20cf3242cb/etd_pdf/79f3425e913cc42aba9aa2b9094a9a53/laurialt-datainfrastructuresandgeographicalimagination.pdf; G. BOWKER AND L. STAR, *Sorting things out: classification and its consequences*, Cambridge, MA: MIT press, 1999; R. KITCHIN AND M. DODGE, *Code/Space: software and everyday life*, Cambridge, MA, MIT press, 2011; R. KITCHIN, *The data revolution: Big data, open data, data infrastructures and their consequences*, Sage, London, 2014; D. RIBES AND S.J. JACKSON, *Data bite man: the work of sustaining long-term study*, in L. GITELMAN, *Raw data is an oxymoron*, Cambridge, MIT press, 2013, pp. 15-40.

643 R. KITCHIN, *The real-time city? Big data and smart urbanism*, cit., p. 9.

644 The reference is to judgement n. 29/1957, in which the Italian Constitutional Court established that social purposes were individualize by «general and social needs, determined by the law».

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These assumptions are overcome by the fact that citizens' needs are individualized with sensors networks⁶⁴⁵ (such as cameras, light monitors, proximity sensors), cloud computing and digital platforms.

As mentioned above, with big data analytics public bodies could analyse behaviour of public services' users in real-time, predict their needs and respond to potential crisis in a very short-term.

It is noteworthy to consider that the use of predictive tools, artificial intelligence and big data allow public bodies to overcome traditional procedures of law making based on «anecdote or intuition or clientelist politics or periodic/partial evidence»⁶⁴⁶ and «paternalism»⁶⁴⁷.

Hence, these tools permit to shift «from fact-free policy to rational and evidence-based rules»⁶⁴⁸; in particular, some case-studies⁶⁴⁹ demonstrate that informational technology architecture, predictive analytics algorithm and data governance «define a mechanism for transforming from a reactive mode of operation based on gut instincts to a proactive mode of operation based on mathematical models»⁶⁵⁰.

A proactive approach is based on tools, which are able primarily to identify indicators and to collect insights (*i.e.* data); secondly, to integrate, unify and analyse data from different sources in order to develop a predictive, flexible model useful for giving relevant information. The result

645 This expression refers to very small sensors or actuators embedded or placed on different structures to measure specific predefined outputs, such as movement and speed of traffic jam, levels of light, temperature and air pollution.

646 R. KITCHIN, *The real-time city? Big data and smart urbanism*, cit., p. 7.

647 F. DI PORTO AND N. RANGONE, *Cognitive-based regulation: new challenges for regulators?*, in *Federalismi. Rivista di dirittopubblicoitagliano, comunitario e comparato*, 20, 2013, p. 7, in which Authors argue that nowadays public bodies and other regulators could overcome the lack of knowledge about real people, consequently traditional regulatory strategies based on paternalistic objectives seem to be enriched with crucial information in order to be more focus-oriented.

648 S. RANCHORDAS AND A. KLOP, *Data-driven regulation and governance in smart cities*, cit., p. 12. About the rising of evidence-based law making, see R. VAN GESTEL AND J. DE POORTER, *Putting evidence-based law making to the test: judicial review of legislative rationality*, in *The theory and practice of legislation*, 4, 2016, pp. 155-185. Authors analyse how this kind of law making process is rising with the consequence of shifting from codification of existing customs to modification of human behaviour. In particular, the article's core is how courts could judge about legislation and regulation based on evidence fact and scientific researches. It might consider that subsidiarity and proportionality play an important role to conduct procedural review. Proportionality as external or internal limits to the use of big data insights as well as cognitive ones in regulation. Proportionality must lead public bodies' choices with or without artificial intelligence; but, especially, in public sector the use of ICT should be less intrusive as possible because of the leading of public interest. For wider examination see R. ANGELINI, *Intelligenza artificiale e governance. Alcune riflessioni di sistema*, in F. PIZZETTI (a cura di), *Intelligenza artificiale, protezione dei dati personali e regolazione*, Torino, 2018, pp. 298 ss.

In other fields of knowledge, such as economics, scholars pay attention to the overcoming of paradigm of rational choice in favour of cognitive-based one. This shifting is important because of the unprecedented attention to real people, their behaviours and habits in order to analyse people's decision-making mechanism. This awareness allows public bodies (and other regulators in general) to make «better formulation of rules and the provision of more adequate responses to the public interest they are intended to satisfy», see F. DI PORTO AND N. RANGONE, *Cognitive-based regulation: new challenges for regulators?*, cit., p. 3

649 An example of case study is conducted by an IBM RESEARCH TEAM on property vacancy problem in Syracuse city, NY in 2011, as a result of IBM's Smarter Cities Challenge project (www.smartercitieschallenge.org).

650 S. APPEL ET AL., *Predictive analytics can facilitate proactive property vacancy in Technological forecasting and social change*, 89, 2014, p. 172.

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represents the «core information that can be used to make policy decisions, understand gaps and monitor the status of actions and their impact on achieving the desired outcomes».⁶⁵¹

Some literature show that the activity of planning public services is shifting from a predetermined and authoritative activity to a predictive and proactive one: in this way, policy development is based on a comprehensive view of the city and it allows public bodies to act more focus-oriented and to reshape local services. In the digital age, nodality is one of the four properties⁶⁵² that public bodies should have for pursuing effective objectives: that is, public bodies should put themselves «in the middle of an information»⁶⁵³ because of their «social centrality and visibility»⁶⁵⁴. Thanks to their own strategic position as nodal receivers public bodies could receive and give information in order to better govern.⁶⁵⁵

Public bodies could have some benefits from this way of knowing needs, because they could issue regulatory acts efficiently, forecast risks and prevent restrictions on competition⁶⁵⁶: they could use information as object as well as tools of regulation.

Evidence-based method is based on deeply knowledge of trends and on *ex ante* perspective, hence on knowledge available at the time of regulation: evidence-based law-making process is not new, but it is growing thanks to indicators suites, which capture real-time data and represent them on dashboard graphs, which provide detailed information about city performance. Nowadays, this kind of process has been pushed by powerful technologies⁶⁵⁷ and «the desire to reform the public sector management of city services to make them more efficient, effective, transparent and value for money, combined with citizen and funder demands»⁶⁵⁸.

3. In the public sector, the use of big data analysis, predictive analysis, internet of things and so on, creates some concerns.

651 S. APPEL ET AL., *Predictive analytics can facilitate proactive property vacancy*, cit., p. 167.

652 C. HOOD AND H. MARGETTS in *The tools of government in the digital age*, Palgrave, 2007 individualize four properties useful for a government in the digital era: nodality, authority, treasure and organization. Governments should be in the middle of information and have a legal or official power, as well as money or anything which could be freely exchanged and people with specific skills.

653 C. HOOD AND H. MARGETTS, cit., p. 5.

654 C. HOOD AND H. MARGETTS, cit., p. 8.

655 In the network science discipline nodality is crucial property. In fact, every complex system (social, biological, technological, trade, energy and so on) have a structure based on central node and link that connect each other. There are some huge node, called hub, which gather many nodes; consequently, hub becomes important for the stability of the system, see A. LASLO-BARABASI, *Network science*, Cambridge University Press, 2016, pp. 247 ss.

656 F. DI PORTO, *L'informazione come "oggetto" e come "strumento" di regolazione (il caso dei mercati energetici al dettaglio)*, in *Riv. Trim. dir. Pubbl.*, 4, 2011, pp. 975 ss., in which Author argues that information plays an important role for regulators in the information and communication technologies era. Author examines the role of information in the retail energy market and she takes into account the development of nudging and reflexive governance as two new ways of government.

657 It is necessary to underline that since the early 1990's some indicators (single and composite) have been used to capture details of city, but only with potential computational and mining process, data are very useful for public bodies.

658 R. KITCHIN, T. P. LAURIAULT AND G. MCARDLE, *Knowing and governing cities through urban indicators, city benchmarking and real-time dashboards*, in *Regional Studies, Regional Science*, 2, I, 2015, p. 8.

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The first reason is that public bodies and the government have always been considered «of the people, by the people».⁶⁵⁹ Connecting to this idea, information and communication technologies should be subordinated to humans.

The second reason regards the respect of rule of law and the achievement of public interest. Undoubtedly, public bodies benefit from the use of technological tools, but, as the public interest requires, they must respect administrative principles.

Many concerns about artificial intelligence rise from their ubiquity⁶⁶⁰, their uncertainty about legitimacy and their hiddenness and opacity of functioning, based on algorithms⁶⁶¹.

Some studies⁶⁶² demonstrate that algorithmic perception changes relating to the nature of decision-maker as well as tasks, which they do. In particular, if artificial intelligence does mechanical tasks, people perceive them as equally fair and trustworthy because of their efficiency and objectivity; indeed, if artificial intelligence does human tasks, people perceive them as less fair and trustworthy because of their lack of intuition and their dehumanization.

Moreover, the use of artificial intelligence in the public sector poses some questions about legitimacy⁶⁶³ because «algorithms structure and constrain the ways in which humans act»⁶⁶⁴; on one hand, legitimacy could exist in an instrumental way that is the better goals are gained, more legitimate they are. On the other hand, procedure could legitimate tools if they allow recipients to participate and contribute to decision-making.

The classification above permits to argue that in our administrative system we should prefer a mixed approach, in which public bodies preserve procedural rights as well as tools' efficiency, as I examine below in chapter 3.2.

In addition to these concerns, another one rises related to artificial intelligences' opacity. These tools rely on predictive or descriptive algorithmic processes that allow public bodies to discover useful patterns and outcomes as well as to take decisions. Concerns rise to unknowable and unpredictable data-mining proceedings not based on rationales and factors understandable by humans. This complexity of algorithmic proceeding creates some problems to the due process

659 C. COGLIANESE AND D. LEHR, *Regulating by robot: administrative decision-making in the machine-learning era*, Institute for law and economics, University of Pennsylvania Law School, research paper, 8, 2017, pp. 1152 ss.; they report a phrase of Abraham Lincoln's speech at Gettysburg Address on 19th of November 1863 available at http://rnc.library.cornell.edu/gettysburg/good_cause/transcript.htm.

660 In this article, I do not argue about concerns on surveillance and privacy issues.

661 Here, I adopt the algorithm definition elaborated by T. GILLESPIE, *The relevance of algorithms*, in *Media technologies: Essays on communication, materiality, and society*, T. GILLESPIE, P. J. BOCZKOWSKI and K. A. FOOT (eds.), Cambridge Mass., MIT Press, 2014, pp. 167; also N. DIAKOPOULOS, *Algorithmic Accountability*, in *Digital Journalism*, 3, III, 2015, 400.

662 M. K. LEE, *Understanding perception of algorithmic decisions: fairness, trust and emotion in response to algorithmic management*, in *Big data and society*, 2018, pp. 1-16; M.K. LEE AND S. BAYKAL, *Algorithmic mediation in group decisions: fairness perceptions of algorithmically mediated vs discussion-based social division*, in *CSCW '17 Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing*, pp.1035-1048.

663 As J. DANAHER argue, legitimacy is the property that coercive public decision-making processes must possess if they are to rightfully exercise the requisite authority over our lives; about the regulation of human behaviour by algorithms, see L. LESSIG, *Code: And other Laws of Cyberspace*, Basic Books, New York, 1999.

664 J. DANAHER, *The threat of algocracy: reality, resistance and accommodation*, in *Philosophy technology*, Springer, 2016, p. 3 .

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principle because it should be preferable that decision-making procedures are rationally comprehensible to those who are affected by them⁶⁶⁵.

Two solutions could be suggested in order to preserve due process principle in automated-decision making: to enhance participatory rights according to article 22nd of GDPR and to re-think good administration principle, applicable *ex ante*.

3.1. Artificial intelligence and algorithms are useful tools for making public bodies' operational activities faster and more efficient.

As mentioned above, artificial intelligence works with the use of machine learning techniques, which are able to learn on their own, starting from training and testing data. In particular, algorithms in machine learning change in response to their output and «automatically improve with experience».⁶⁶⁶

Basically, all data collected in ways mentioned above, are used by developers to programme machine learning tools. Consequently, these data are previously divided in testing and training data⁶⁶⁷, then machine learning techniques use them in an unknowable way.

This property is called “black box”⁶⁶⁸ and create some ethical and legal concerns that scholars have to face for preserving rights and freedoms as well as administrative law principles.

Especially, some concerns arise when artificial intelligence is used in an automated decision-making.

Machine learning techniques base on profiling activities, consequently, it is likely the risk of unjustly stereotyping individuals for their ethnicity, lifestyle or residence. Hence, the surveillance on data quality without discrimination biases is important duty on public bodies in order to preserve due process principles, and good administration.

In fact, algorithmic bias could contribute to the risk of stereotyping, especially if biases exist in the «data used to train deep learning systems»⁶⁶⁹. For example, public bodies could deliver, or

665 In this sense, also P. SAVONA, *Administrative decision-making after the Big data revolution*, in www.federalismi.it, 19, 2018. Similar problems could arise in criminal proceeding law, as evidenced by S. QUATTROCOLO and U. PAGALLO, *Fair trial and the Equality of arms in an algorithmic society*, in *Global Law. Legal answers for concrete challenges*, M. L. LABATE MANTOVANINI PADUA LIMA and J. GARCEZ GHIRARDI (eds.), 2018, pp. 261-274; S. QUATTROCOLO, *Equità del processo penale e automated evidence alla luce della Convenzione Europea dei Diritti dell'Uomo*, in *Revista Italo-Espanola de Derecho Procesal*, 2, 2018, reperibile al sito <http://www.rivitsproc.eu/es/articulos/equita-del-proceso-penal-e-automated-evidence-alla-luce-della-convenzione-europea-dei-diritti-delluomo/>.

666 T. MITCHELL, *Machine learning*, Indian edition, 1997, p. XV.

667 Supervised machine learning is based on each data labels with its correct reference so that the algorithm knows when it is making errors. Unsupervised learning uses unlabeled data, so that performance criteria being optimized are not measures of error rates, because the truth is not known, but measures of similarity between digits determined by the algorithm to be the same. See C. COGLIANESE AND D. LEHR, *Regulating by robot: administrative decision-making in the machine-learning era*, Institute for law and economics, University of Pennsylvania Law School, research paper, 8, 2017, pp. 1158 ss.

668 F. PASQUALE, *The black box society. The secret algorithms that control money and information*, Harvard University Press, 2015, p. 3 in which the Author highlights that it is a useful metaphor that represents «a system whose workings are mysterious; we can observe its inputs and outputs, but we cannot tell how one becomes the other».

669 GOVERNMENT OFFICE FOR SCIENCE, *Artificial intelligence: opportunities and implications for the future of decision making*, 2016, p. 14.

not, some public services or other benefits because of historical data on individuals, that could be discriminatory and reflect, consciously or unconsciously, biases.

3.2. In order to avoid discrimination on public decisions, article 22nd of General Data Protection Regulation 2016/679 (GDPR) provides for some rights to recipients⁶⁷⁰ and it bans all decisions that are adopted solely on automated processing, because of concerns mentioned above.

This article should require that public bodies must fully respect rights, such as to give specific information to data subjects, to guarantee the right to obtain human intervention, to express one's own point of view, to give a full reason giving and the possibility to challenge the decision.

In my view, this article provides a human-on-the-loop⁶⁷¹ perspective, that is, artificial intelligence could work autonomously, but the human oversight and override are guaranteed. In this case, civil servants could decide whether follow or not artificial intelligence's outcome⁶⁷².

In the digital era, new duties for public bodies rise⁶⁷³: on the one hand, they should control how developers produce algorithms. Indeed, algorithms are value-laden⁶⁷⁴ and, in spite of their efficiency, they could reproduce discrimination biases.⁶⁷⁵ For these reasons, public bodies should extend own control *ex ante*, especially during the programming phase.

In order to preserve good administration and impartiality, public bodies have to control how programmers and engineers programme algorithms as well as have to give specific duties to them⁶⁷⁶; for example, public bodies could cooperate with engineers to provide guidelines on legal framework and technological measures for compliance (*i.e.* legal by design).

I argue that the difference between private and public sector must be preserved: artificial intelligence, which is programmed for public bodies activities will be very different in scope and in way in which rights are protected.⁶⁷⁷ Public bodies could provide compliance rules and principles to programmers in order to build artificial intelligence in line with administrative principles.

670 For a critical perspective about right to explanation (articles 13-15), see S. WACHTER, B. MITTELSTADT, L. FLORIDI, *Why a right to explanation of automated decision-making does not exist in the General Data Protection Regulation*, in *International Data Privacy Law*, 7, II, 2017, pp. 76-99, available at: <https://academic.oup.com/idpl/article/7/2/76/3860948>

671 The European Parliament resolution of 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics (2015/2103INL) relating to robotic weapon's debate suggests three kind of human engagement: *human-in-the-loop*, in which robotics could act only under human commands; *human-on-the-loop* explained above and *human-out-of-the-loop*, in which robots could act autonomously without any human controls. This Resolution is available at

<http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P8-TA-2017-0051+0+DOC+XML+V0//EN>.

672 Recently, Italian Administrative Courts have promoted the idea that artificial intelligence should be used as tools, see *Tar Lazio, sez. III bis*, 4 April 2017, n. 4195; *Tar Puglia, Bari, sez. I*, 27 June 2016, nn. 806 and 807.

673 See E. CARLONI, *Tendenze recenti e nuovi principi della digitalizzazione pubblica*, in *Giornale di Diritto Amministrativo*, 2, 2015, p. 4.

674 K. E. MARTIN, *Ethical implications and accountability of algorithms*, in *Journal of business ethics*, May 2018, p. 2. The author conceptualize that «algorithms create moral consequences, reinforce or undercut ethical principles, and enable or diminish stakeholder rights and dignity».

675 About this concern and its consequence, see R. BINNS, *Algorithmic accountability and public reason*, in *Philos. Technol.*, 2017, available at <https://link.springer.com/article/10.1007/s13347-017-0263-5>.

676 In the same sense, see G. PESCE, *Digital first. Amministrazione digitale: genesi, sviluppi, prospettive*, Napoli, 2018, p. 235.

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Building technical legal standards could be a first step to allow public bodies or judiciary courts to optimize external oversight. Therefore, it is valuable that the internal and external oversight can be developed together, in order to guarantee, «the former provides all the relevant information to the latter to evaluate the adopted decision».⁶⁷⁸ Therefore, this proposal might empower rights of article 22nd GDPR, whose efficacy could be at risk without added technical legal standards.

The extension of good administration principle to the preliminary phase of artificial intelligence programming responds to the necessity to «balance the loss in comprehension and participation against the potential gains in outcomes and procedural fairness»⁶⁷⁹. At the same time, also impartiality could be respected: algorithmic construction is a «translation process»⁶⁸⁰ so automated systems could replicate discrimination biases of humans.

Consequently, public bodies should prepare an impact assessment⁶⁸¹ to verify whether artificial intelligence works legally, as well as fairly. It could be a useful way to verify *ex post* the reasonableness and proportionality of administrative act. In addition to this proposal, public bodies could promote the use of distributed ledger technology (blockchain) in order to track every stage of algorithmic functioning.⁶⁸²

On the one hand, public bodies must control the programming of artificial intelligence⁶⁸³, in order to preserve the good administration and impartiality principle. On the other hand, public bodies have to guarantee rights to participation and opposition, according to article 22nd GDPR. In this way, artificial intelligence could be used without concerns and they could be integrated in the existing constitutional and administrative system.

4. Public power and the content of some principles are changing. The use of ICT in public sector transforms the public power because of new tools, which allow public bodies to do something more. For example, the use of ICT throughout the city permits local government to reallocate financial resources in an efficiently way, more respectful of people's needs: as mentioned above, evidence-based government leads the planning of public services, indeed of traditional and authoritative way.

677 GOVERNMENT OFFICE FOR SCIENCE, *Artificial intelligence: opportunities and implications for the future of decision making*, 2016, p. 14 is really clear about the necessity of defining *ex ante* public benefit.

678 A. ROIG, *Safeguards for the right not to be subject to a decision based solely on automated processing (article 22 GDPR)*, in *European Journal of Law and Technology*, 8, III, 2017, p. 9.

679 J. DANAHER, *The threat of algocracy: reality, resistance and accommodation*, cit., p. 13

680 R. KITCHIN, *Thinking critically about researching algorithms*, in *Information, Communication & Society*, 20, 2017, p. 22.

681 See some guidelines *Algorithmic impact assessments: a practical framework for public agency accountability*, by D. REISMAN, J. SCHULTZ, K. CRAWFORD, M. WHITTAKER, April 2018, available at <https://ainowinstitute.org/aiareport2018.pdf>. In which authors give rules for public bodies in order to use artificial intelligence legally as possible.

682 GOVERNMENT OFFICE FOR SCIENCE, *Artificial intelligence: opportunities and implications for the future of decision making*, 2016, p.16.

683 F. PIZZETTI, *La protezione dei dati personali e la sfida dell'Intelligenza Artificiale*, in F. PIZZETTI (a cura di), *Intelligenza artificiale, protezione dei dati personali e regolazione*, Torino, 2018, pp. 124 ss. Author argues that many rights are involved, such as right not to be discriminated, right to self-determination, consequently public bodies control that programmers respect ethic principles.

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At the same time, the use of ICT in the administrative proceedings, such as the adjudicatory one, could rise some concerns about the safeguards of due process principle. In fact, the article 22nd GDPR provides some rights to recipients affected by automated decision-making, but they could be ineffective alone. For these reasons, in the ICT era, principles that lead public administration activity could be re-thought.

In particular, I suggest that public bodies could anticipate good administration and impartiality principle at the preliminary stage of artificial intelligence programming. Therefore, they could preserve legality in the functioning because of their own technical standardization. Thanks to this effort, not only recipients could understand how artificial intelligence works, but also judicial review could judge consciously.

At the same time, public bodies could prepare an impact assessment about the functioning of artificial intelligence, in order to verify *ex post* whether these tools could be used legally. It should be important that scholars identify some guarantees in order to correctly introduce artificial intelligences' outcome in the proceedings and to rethink categories of public purposes, suitability and proportionality of decisions.

Scholars have to lead the transformation of public administration in a deep and wide perspective, in accord to suggestion of legislators and Italian Digital Agency. In fact, at national level, Code of Digital Administration is the main source of law, which allow public bodies to make transition toward data revolution. For example, datasets are considered of national interest⁶⁸⁴, some crucial national registers⁶⁸⁵ are unified at national level and Italian Digital Agency conducts many efforts⁶⁸⁶, in order to standardize⁶⁸⁷ and rationalise informational public heritage.

These legislative tools could support public bodies to correctly deal with challenges and opportunities provided with information and communication technologies and give opportunities to scholars to comprehend the evolution of administrative law in the digital era.

ISABELLA ALBERTI

684 *D.lgs* december 30th 2010, n. 235 modified article 60th of Code of Digital Administration in order to make datasets of national interest wider.

685 National Registry of the Resident Population (*Anagrafe Nazionale della Popolazione Residente – ANPR*), National Registry of territorial data (*Repertorio Nazionale dei dati territoriali*), National Database of Public Procurement (*Banca Dati Nazionale dei Contratti Pubblici - BDNCP*)

686 For example it tries to make standardize and interoperable public datacenter; it gives some guidelines such as *Libro Bianco sull'Intelligenza Artificiale al servizio del Cittadino*. France makes a similar attempt with Report *Donner un sens à l'intelligence artificielle. Pour unestratégienationale et européenne*, 2018.

687 Nowadays, informatics coordination principle from article 117, 2nd paragraph, letter r) seems to prevail on the public administration autonomy principle, see F. CARDARELLI, *Amministrazione digitale, trasparenza e principio di legalità*, in *Diritto dell'Informazione e dell'Informatica*, 2, 2015, paragraph 4 in which he describes the legal and case law framework about this principle. See also, A. G. OROFINO, *L'esternazione informatica degli atti amministrativi*, in S. CIVITARESE MATTEUCCI, L. TORCHIA (a cura di), *La tecnificazione dell'amministrazione*, in D. SORACE, L. FERRARA, S. CIVITARESE MATTEUCCI, L. TORCHIA (a cura di), *A 150 anni dall'unificazione amministrativa italiana. La tecnificazione*, IV, Firenze, 2017, p. 195.