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Public Administration Complexity and Its Implications on Theory, Research and Practice

Złożoność administracji publicznej a jej konsekwencje w zakresie teorii, badań i praktyki

ABSTRACT

Public administration is in itself a very complex human endeavour and deals with a complex environment, as manifested in the various actors included and wicked issues that have to be dealt with. Starting from the concept of complexity, the paper applies this concept to public administration and analyse the implications of public administration complexity on research and practice. The concept of complexity constitutes an important element of classical public administration theories such as systems theory and organisation theory, as well as a vital part of modern theoretical (e.g. network theory) and practical/doctrinal approaches to public administration such as the various concepts connected with the overarching and sometimes elusive concept of "governance" (e.g. good governance, multi-level governance, etc.). The article is structured around the main dimensions of public administration complexity, which are built on the basis of different complexity sources that have implications on public administration theory and research.

Keywords: public administration; administrative science; complexity; complexity theory

INTRODUCTION

The main theme of this paper is complexity and its influence on public administration research and theory. Public administration is in itself a very complex human endeavour and at the same time operates in a complex environment and deals with highly complex public problems.

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There are several aspects of complexity which are important for modern public administration. For purposes of clarity, let us address the external and internal complexity of public administration.[1] On the one hand, public administration operates in a highly complex environment. This dimension of complexity could be labelled external complexity, which emanates from physical, social, and other aspects of the public administration environment. As clearly stated by J. Pierre and B.G. Peters, "the societies that governments seek to govern are extremely complex, and have become even more complex. Rather than ceding control to that complex and often incoherent society, (…) we are (…) attempting to find ways to understand how governance can occur through the interplay of social and governmental action. There is, in this view, a clear role to be played by the state in steering the society, but that steering is always in the context of complexity and always in the context of bounded rationality and experimentation".[2]

On the other hand, public administration is in itself very complex. There are several elements of this complexity that could be labelled building blocks of the internal complexity of public administration. This complexity is directed towards internal processes, methods, and skills; issues connected with human resources management; various organisational arrangements within public administration and the size of public administration, as well as individual administrative organisations; organisational culture; values, norms, and interests in public administration, etc.

In this paper, public administration complexity is approached from the complexity theory perspective. Complexity theory has gained influence among public administration scholars and has become an important and influential theoretical framework that can serve as a framework to better understand the many issues faced by modern-day public administration, both internally and externally.

The article elaborates the concept of complexity and its connection with different theoretical and doctrinal approaches to public administration. It is followed by a more detailed exploration of the various dimensions of public administration complexity, particularly its "internal dimensions". It then goes on to address the implications of public administration complexity on the research and theory of public administration, using the analytical framework of complexity theory. The final part presents conclusions.

[1] These two dimensions of complexity can also be found in C. Bason, *Leading Public Design: Discovering Human-Centred Governance*, Bristol 2017.

[2] J. Pierre, B.G. Peters, *Governing Complex Societies: Trajectories and Scenarios*, Basingstoke 2005, p. 2.

EVOLUTION OF COMPLEXITY THEORY

Complexity theory was primarily developed in the natural and technical sciences but it gradually found its way into the social sciences as well. Roots of complexity theory may be found in the natural sciences, especially physics. Gradually, in the process of a "paradigm shift" (T.S. Kuhn), complexity took on the position of a new paradigm that was different from the previous understanding of the physical world and the laws that govern its causes. That previous understanding of events was mainly linear, with accompanying reductionist methods that served as explanation tools of reality, which was perceived as orderly, structured, predictable, and governed by firm and clear laws (the logic of cause and effect). Later understanding of events brings non-linearity to the stage and concepts such as dynamism, complexity, and the like, which, among other things, required adaptability, unpredictability and persistence.[3] From the natural sciences, complexity found its way and was received in the social sciences, and the change of thinking from a linear to a non-linear understanding of reality has found its place in various disciplines of the social sciences, including sociology, economics, politics, international relations, administrative science and others.

Complexity theory is not a single theory; rather, it is a collection of various theoretical approaches with a somewhat common denominator. That common denominator is the emphasis on various aspects of complexity. The literature that deals with complexity is rich and diversified, spanning many fields and disciplines. It also builds upon theories and concepts previously known and applied in the natural and social sciences such as general systems theory, cybernetics and autopoiesis,[4] chaos theory, cooperation, complex adaptive systems, dissipative structures, increasing returns, path-dependence and others.[5]

Contemporary complexity theory has been described as the "third wave of social systems theory".[6] This third wave builds on the earlier many works of researchers across various disciplines. It is stated that the first wave "of social systems theory is Parsons's structural functionalism, the second wave is derived from the general systems theory of the 1960s through the 1980s, and the third wave is based on

[3] R.R. Geyer, *Globalization, Europeanization, Complexity, and the Future of Scandinavian Exceptionalism*, "Governance" 2003, vol. 16(4), pp. 565–567.

[4] "Complexity builds on and enriches systems theory by articulating additional characteristics of complex systems and by emphasising their inter-relationship and interdependence" (E. Mitleton-Kelly, *Ten Principles of Complexity & Enabling Infrastructures*, [in:] *Complex Systems and Evolutionary Perspectives on Organisations: The Application of Complexity Theory to Organisations*, ed. E. Mitleton-Kelly, Amsterdam 2003, p. 25).

[5] *Ibidem*.

[6] R.K. Sawyer, *Social Emergence: Societies as Complex Systems*, Cambridge 2005.

the complex dynamical systems theory developed in the 1990s".[7] All three waves are scientifically rich and quite diverse. R.K. Sawyer provides a clear overview of the development of every wave.[8] The first wave was extensively developed by the work of T. Parsons and also hugely influenced by the growing popularity of cybernetics (N. Wiener and cybernetics;[9] W.A. Ross's law of requisite variety[10]). This initial phase concentrated on stability and change in complex systems. The second wave builds on several theoretical concepts, spanning various disciplines. Influential authors in this phase are mostly natural scientists from the Santa Fe Institute in California (S. Kauffman, M. Gell-Mann, and others),[11] but also other authors and researchers such as L. von Bertalanffy and his 1968 book *General Systems Theory*, J.G. Millers' *Living Systems* (1978), as well as the concept of *autopoiesis* (developed in biology by H. Maturana and F. Varela) and the seminal work of N. Luhmann who "developed one of the best-known second-wave social systems theories".[12] Theory of chaos also belongs to this phase of development of complexity theory. This phase emphasised dynamics and change and added several concepts to complexity theory, such as self-organisation and self-maintaining of systems, non-linearity, concepts of dissipative structure (I. Prigogine) and open systems, which emphasised the interaction of the system with its environment.

The concept of a complex adaptive system (CAS)[13] or complex evolving system[14] is the focal point of contemporary complexity theory. A complex adaptive

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[7] *Ibidem*, p. 10.

[8] *Ibidem*, p. 2.

[9] N. Wiener published his *Cybernetics or Control and Communication in the Animal and the Machine* as early as 1948 and that was the first public use of the term "cybernetics" to refer to self-regulating mechanisms. However, in various social science disciplines it seems essential to become acquainted with his book published in 1950, titled *The Human Use of Human Beings: Cybernetics and Society*, which is "a popularization of Cybernetics (omitting the forbidding mathematics), though with a special emphasis on the description of the human and the social" (S.J. Heims, *Introduction*, [in] N. Wiener, *The Human Use of Human Beings: Cybernetics and Society*, London 1989, p. 17). "In response to a certain demand for me to make its ideas acceptable to the lay public, I published the first edition of *The Human Use of Human Beings* in 1950" (N. Wiener, *The Human Use of Human Beings…*, p. 15).

[10] R.W. Ashby's book *An Introduction to Cybernetics* was first published in 1956 and, as stated by the author in the preface, it overlaps only slightly with his book "*Design for a Brain* (…), so that the two books are almost independent. They are, however, intimately related, and are best treated as complementary; each will help to illuminate the other" (*ibidem*, p. 5).

[11] There are several research institutions devoted specifically to complexity science. The Santa Fe Institute in California, USA, is one (https://www.santafe.edu), and another is the New England Complex System Institute in Cambridge, Massachusetts, USA (https://necsi.edu).

[12] R.K. Sawyer, *op. cit.*, p. 14.

[13] J.N. Rosenau, *Many Damn Things Simultaneously: Complexity Theory and World Affairs*, [in:] *Complexity, Global Politics, and National Security*, eds. D.S. Alberts, T.J. Czerwinski, Washington 1997.

[14] E. Mitleton-Kelly, *op. cit*.

system "is distinguished by a set of interrelated parts, each one of which is potentially capable of being an autonomous agent that, through acting autonomously, can impact on the others, and all of which either engage in patterned behaviour as they sustain day-to-day routines or break with the routines when new challenges require new responses and new patterns".[15] J.N. Rosenau describes several characteristics of such a complex adaptive system.[16] Firstly, the CAS has the capacity of self-organisation. The elements or parts of a CAS configure themselves into a structured "orderly whole" in which the CAS acquires new attributes ("emergent properties").[17] Secondly, in the process of self-organisation, a CAS adapts to internal and external pressures, which results in the fact that systems "co-evolve with [their] environment". However, "the co-evolution of systems and their environments is not a straight-line progression. As systems and their environments become ever more complex, feedback loops proliferate and nonlinear dynamics intensify, with the result that it is not necessarily evident how any system evolves from one stage to another".[18] Thirdly, complex systems are exposed to the influence of small, and at first sight insignificant, events that can – in the long run – cause huge and serious outcomes. This phenomenon of the power of small events is well known as the "butterfly effect" (E.N. Lorentz).[19] However, it has to be noted that *argumentum a contrario*, a huge initial step (or action) does not have to produce

[15] J.N. Rosenau, *Change, Complexity, and Governance in a Globalizing Public Space*, [in:] *Debating Governance: Authority, Steering, and Democracy*, ed. J. Pierre, Oxford 2000, p. 181.

[16] Idem, *Many Damn Things Simultaneously…*, pp. 36–38.

[17] Emergence of new attributes of the CAS is an important element of the third wave complexity theory. Sawyer (*op. cit.*, p. 3) states that "relatively simple higher-level order 'emerges' from relatively complex lower-level processes". Furthermore, "emerging at the global system level are patterns, structures, or properties that are difficult to explain in terms of the system's components and their interactions" (*ibidem*, p. 4).

[18] J.N. Rosenau, *Many Damn Things Simultaneously…*, p. 37.

[19] Edward Norton Lorenz (1917–2008), primarily educated as a mathematician but turned weather forecaster/meteorologist, is the founder of the theory of chaos. "The advent of chaos theory constitutes one of the great scientific revolutions of the 20th century. It has influenced the course of all scientific and many engineering disciplines and has even begun to affect philosophy and other endeavours outside science. For example, it is now recognized that the orbits of asteroids and some planets (including Earth) may be chaotic, possibly resulting in sudden large excursions from regular, quasi-periodic orbits. In the field of ecology, it was once thought that populations could achieve steady states in steady environments, but here too it has been shown that population may be inherently unstable and exhibit chaotic fluctuations. Chemical reactions were once thought to be predictable, but some catalytic reactions in both organic and inorganic chemistry have been shown to be chaotic and this has proven relevant for understanding the biochemistry of the nervous system. Chaos theory has had a large influence in economics, where an important question arises as to whether one can distinguish between the existence of a low-order attractor and high-order noise. The existence of the former would imply some degree of finite-time predictability" (E. Kerry, *Edward Norton Lorenz 1917–2008: A Biographical Memoir*, Washington 2011, pp. 18–19).

the desired outcome at the end.[20] Finally, a complex adaptive system should pay attention to numerous initial conditions, a characteristic that is closely related to the previously stated butterfly effect. This is particularly important because "the power of an altered initial condition can lead to desirable as well as noxious results, an insight that highlights the wisdom of paying close attention to detail in the policy-making process".[21]

Using theoretical approaches from the natural (chemistry-physics, evolutionary biology, biology/cognition, chaos theory), as well as from the social sciences (economics), E. Mitleton-Kelly identifies ten generic characteristics of complex evolving systems. These are: self-organisation, emergence, connectivity, interdependence, feedback, far from equilibrium, space of possibilities, co-evolution, historicity and time, and path-dependence.[22] J. Ladyman, J. Lambert and K. Wiesner identify seven elements of complex systems: nonlinearity, feedback, emergence, self-organisation, robustness, hierarchical organisation and numerosity.[23]

Over the last several decades, complexity theory has diversified into several directions and methodological approaches, ranging from case-based qualitative techniques, visual methods, modelling and statistical analysis, and multi-level networks methodology, all the way to mixed methods.[24] It represents a very rich theoretical framework, applicable in many natural, technical and social science disciplines.

COMPLEXITY THEORY AND ADMINISTRATIVE SCIENCE

Some of the core concepts of complexity theory from the natural sciences have found their place in the social sciences, particularly in public administration theory and research.[25] Also, a completely new scientific journal "Complexity, Governance and Networks" was launched in 2014. The journal is exclusively devoted to com-

[20] "In nonlinear systems, the effect may not be proportional to the cause; a small change in initial conditions can lead to a radical change in a later state of the system – the so-called 'butterfly effect' – or, inversely, a large change in initial conditions might not lead to any significant change in later states of the system" (R.K. Sawyer, *op. cit.*, p. 16).

[21] J.N. Rosenau, *Many Damn Things Simultaneously…*, p. 38.

[22] E. Mitleton-Kelly, *op. cit*.

[23] J. Ladyman, J. Lambert, K. Wiesner, *What Is a Complex System?*, "European Journal for Philosophy of Science" 2013, vol. 3(1).

[24] E. Mitleton-Kelly, D. Paraskevas, C. Day (eds.), *Handbook of Research Methods in Complexity Science: Theory and Applications*, Cheltenham 2018.

[25] An overview of how complexity theory is applied to public administration and public policy can be found in L.D. Kiel, *Complexity Theory and Its Evolution in Public Administration and Policy Studies*, "Complexity, Governance & Networks" 2014, vol. 1(1); G. Morçöl, *A Complexity Theory for Public Policy*, New York 2012; G. Teisman, L. Gerrits, *The Emergence of Complexity in the Art and Science of Governance*, "Complexity, Governance & Networks" 2014, vol. 1(1); J.W. Meek,

plexity theory in public administration and other related disciplines such as public policy, politics and non-governmental organisations.[26]

Complexity theory has been used as an analytical framework for various public administration themes. M. Crozier and J.-C. Thoenig analysed the French local government system in the 1970s and concluded that "French public affairs at the local level are managed by a complex, stable system of groups and institutions. The analysis also lends support that to the contention that inter-organizational relations are regulated by a complex, and more or less organized, system rather than by an inter-organizational network".[27] E.H. Klijn analyses three concepts of complexity theory that are used in public administration research: dynamics, self-organisation and co-evolution.[28] The concept of self-governance defined as "the capacity of social entities to govern themselves autonomously"[29] is an important concept in public administration, especially in some of its vital components such as local and regional self-government and more or less autonomous functional systems of public services (e.g. education, health, welfare, etc.).

It should be noted that complex adaptive systems can take various structural forms, ranging from a firm hierarchical structure to a somewhat loose network structure. "A complex adaptive system (…) may be an integral part of another CAS, or it may be a loose aggregation of complex adaptive systems, forming a composite CAS. Thus a CAS has a tendency to give rise to others".[30] All this makes the concept of a CAS applicable to different aspects of public administration which, on the one hand, is in itself a very complex human endeavour and, on the other, constantly changes and evolves. Owing to such characteristics public administration possesses many elements that make it qualify as a complex (or dynamic) adaptive system, which is – as has already been shown – a central concept of contemporary complexity theory.

The extensive use of complexity in public administration research resulted in a move from the concept of government to a new concept of governance, with all its variants.[31] Also, along with the important and seminal concept of a system, net-

Complexity Theory for Public Administration and Policy, "Emergence: Complexity & Organization" 2010, vol. 12(1).

[26] https://ubp.uni-bamberg.de/ojs/index.php/cgn/index (access: 12.04.2025).

[27] M. Crozier, J.-C. Thoenig, *The Regulation of Complex Organized Systems*, "Administrative Science Quarterly" 1976, vol. 21(4), p. 547.

[28] E.H. Klijn, *Complexity Theory and Public Administration: What's New? Key Concepts in Complexity Theory Compared to Their Counterparts in Public Administration*, "Public Management Review" 2008, vol. 10(3).

[29] J. Kooiman, L.M. van Vliet, *Self-Governance as a Mode of Societal Governance*, "Public Management" 2000, vol. 2(3), p. 360.

[30] M. Gell-Mann, *The Simple and the Complex*, [in:] *Complexity, Global Politics, and National Security…*, p. 5.

[31] J. Pierre (ed.), *Debating Governance: Authority…*; R.A.W. Rhodes, *The New Governance: Governing without Government*, "Political Studies" 1996, vol. 44(4).

works – as a special type of system – became a widely applied theoretical concept applicable to public administration research and theory. This is especially the case with issues connected to the policy process in all its stages, from policy formulation to its implementation and evaluation. Interactions of various public, semi-public and private actors in network settings brings a completely different set of relations to the table. As Klijn states, "attention to complexity in public administration phenomena was enhanced by the well-known conceptual move from government to governance, where much attention was paid to the networks in which public policy is formed and realised".[32]

The concept of complexity has been used in Croatian public administration mainly in the work of late E. Pusić and his close associates from the Faculty of Law (S. Ivanišević, M. Ramljak, Ž. Pavić), who were the most prominent representatives of the Zagreb School of Public Administration for several decades.[33] Using mostly the theoretical framework of systems theory,[34] the Zagreb group researched and published many articles and books tackling the concept of complexity and other similar concepts used by the systems theory approach. The following generation of public administration researchers in the Zagreb group gradually shifted from solely applying systems theory and expanded their interests to organisation theory, new institutionalism and network theory, as well as human resources management.[35]

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[32] E.H. Klijn, *op. cit.*, p. 300.

[33] The focal point of the Zagreb School of Public Administration is the postgraduate study programme of politico-administrative sciences at the Zagreb Faculty of Law. It was established in 1961 as the second postgraduate study programme at the Faculty of Law (the first was a programme in criminal law). The name of the programme was the Postgraduate Studies of Politico-Administrative Sciences. The programme still runs under the name Postgraduate Studies of Public Law and Public Administration and is one of the seven postgraduate study programmes offered by the Zagreb Faculty of Law. The study programme used to result in PhD holders in politico-administrative sciences, but since the change of its name, it has resulted in PhD holders in public law and public administration, who are employed by Croatian universities, as well as the civil service, local and regional government, and the private sector.

[34] E. Pusić, S. Ivanišević, M. Ramljak, Ž. Pavić, *Upravni sistemi*, Zagreb 1988; E. Pusić, *Društvena regulacija*, Zagreb 1989.

[35] I. Koprić, *Struktura i komuniciranje u upravnim organizacijama*, Zagreb 1999; G. Marčetić, *Upravljanje ljudskim potencijalima u javnoj upravi*, Zagreb 2006; A. Musa, *Agencijski model javne uprave*, Zagreb 2009; V. Đulabić, *Utjecaj institucionalnog okvira regionalne politike na regionalnu samoupravu*, Zagreb 2011 (PhD thesis); G. Lalić-Novak, *Pravni i institucionalni aspekti azila*, Zagreb 2012 (PhD thesis); M. Škarica, *Lokalni poslovi i suradnja jedinica lokalne samouprave*, Zagreb 2013 (PhD thesis); J. Džinić, *Utjecaj instrumenata unapređenja kvalitete na organizacijsko učenje u upravnim organizacijama*, Zagreb: 2014 (PhD thesis); T. Giljević, *Utjecaj organizacijskih varijabli na upravnu koordinaciju*, Zagreb 2014 (PhD thesis); R. Manojlović Toman, *Utjecaj odabranih organizacijskih varijabli na mjerenje učinka upravnih organizacija*, Zagreb 2014 (PhD thesis); T. Vukojičić-Tomić, *Zapošljavanje društvenih manjina u javnoj upravi*, Zagreb 2016 (PhD thesis); I. Lopižić, *Utjecaj kapaciteta lokalne samouprave na teritorijalnu državnu upravu*, Zagreb 2017 (PhD thesis).

The application of complexity theory to public administration is very well elaborated by L.D. Kiel.[36] Using Schumacher's 1986 model of evolutionary change, which "includes a four-stage process that is intended to describe evolutionary processes in all living systems, including human socio-technical systems",[37] Kiel explains the four stages of the development of complexity theory in public administration. The first stage is emergence (1989–1998), which can be viewed "as testing the relevance of the complexity sciences to the field of public administration and policy studies". The second stage is convergence (1999–2002), in which complexity theory has been used to research public administration issues. In the stage of proliferance (2003 to the present) an increasing number of studies have been produced and this stage "represents a stage of increasing production".[38] According to Kiel, the field has not yet reached the fourth stage of divergence. Insights from other scientific areas could, and probably should, be used in the future to explain complex phenomena in public administration.

Today, complexity theory is gaining influence in public administration research and theory, and topics connected with complexity theory are taught at different high education institutions which offer various study programmes, including political science, public administration, public management and business administration.[39]

EXOGENOUS AND ENDOGENOUS FACTORS OF PUBLIC ADMINISTRATION COMPLEXITY

Turning to public administration from a complexity theory perspective and the influence of complexity theory on the components of public administration, several important questions emerge. What are the factors of public administration complexity? How might public administration complexity be better understood? What are the implications of applying complexity theory to public administration theory and research?

The main factors of public administration complexity come from endogenous and exogenous sources. Speaking of internal public administration complexity (endogenous complexity), one may include: (1) different organisational forms and

[36] L.D. Kiel, *op. cit*.

[37] *Ibidem*, p. 72.

[38] *Ibidem*, p. 75.

[39] N. Ivanovic, L. Gerrits, *Teaching Complexity in Public Administration Across the Globe: An Overview*, "Complexity, Governance & Networks" 2018, vol. 4(1); M.L. Rhodes, E. Eppel, *Public Administration and Complexity: Or How to Teach Things We Can't Predict?*, "Complexity, Governance & Networks" 2018, vol. 4(1).

intra-organizational dynamics, (2) various personnel, (3) conflicting values and (4) multiple methods of work, skills and competences required for the work of public administration bodies. On the other hand, the main external factors of public administration complexity (exogenous complexity) are: (1) a complex environment and (2) wicked, complex problems which public administration has to deal with.

These dimensions of complexity sources are differently reflected in the three main components of modern public administration, namely central administration, local and regional self-government, and public services (services of general interest). However, they are present in all three public administration building blocks (see Table 1).

Table 1. Public administration complexity

	Public administration complexity		
	Central level	Local/regional level	Public services (services of general interest)
Organisations and intra-organisational dynamics	– ministries – agencies (type 0–5*)	– local political and administrative bodies – deconcentrated central bodies	– public companies – public institutions – private companies – NGOs
People	– politically appointed officials – civil servants – support staff – political counsellors	– (directly!) elected officials – local civil servants	– local companies – local institutions – (local) private companies – NGOs
Values, norms and interests	– traditional: political, legal, managerial, social – new: ecological, neo-managerial – reform doctrines: from NPM to GG and Neo-Weberian PA		
Methods, knowledge, skills and technology	– general: public policy, general administrative procedure, public management, legislative process – sector specific, e.g. agriculture, regional policy, welfare, culture, economy, architecture, transport, etc.		
Environment	– administrative: horizontal and vertical dimension – political: political parties, politicisation of public administration – social: citizens, entrepreneurs, trade unions, media		
Issues and problems	– wicked problems: spanning time and various administrative fields and levels – (poly)crisis		

* K. Verhoest, S. Van Thiel, G. Bouckaert, P. Laegreid (eds.), *Government Agencies: Practices and Lessons from 30 Countries*, London 2012.

Source: Author's own elaboration.

The main factors of endogenous public administration complexity are as follows.

A variety of organisational forms encompassing public administration both horizontally and vertically as well as intra-organisational dynamics. Public administration operates through different organisational forms at the central, regional and local level. From classical administrative organisations such as

ministries to emerging forms of public agencies,[40] the organisational complexity of public administration becomes very tangible and easy to comprehend both horizontally and vertically. These organisational forms span both classical hierarchical and network type organisational settings. When the issue of public administration size – expressed through the number and structure of employees, type and level of their education, financial and material resources of public administration, and other factors – is added to this, the picture of the organisational complexity of public administration becomes very clear.[41] Although public administration has been organisationally complex since its beginnings, it is evident that this complexity has been progressive in the last few decades of the last century, especially following NPM-inspired reforms and the intensive inclusion of the private sector (through outsourcing, PPPs, vouchers, and other market mechanisms) and civil society (through coproduction) in the performance of public administration tasks. All this takes the dimension of public administration complexity to another level. Parallel with number and diversity of organisational forms, the intra-organisational dynamics should also be added to this factor. Organisation theory is very rich and diverse in showing the varieties of intra-organisational dynamics, especially when it comes to communication, interest coalition and other crucial intra-organisational variables.[42]

Human resources management. The number and various statuses of public administration employees is one of the most important factors of complexity in public administration.[43] Constant interaction between politicians (directly elected and/or politically appointed) and professional civil servants introduces additional dynamics to the whole system. Human resources management in the public sector

[40] See K. Verhoest, S. Van Thiel, G. Bouckaert, P. Laegreid (eds.), *Government Agencies: Practices and Lessons from 30 Countries*, London 2012.

[41] This claim is vividly illustrated by the constant growth of general government outlays in the percentage of GDP in OECD countries. Since 1965, when average government spending stood at 29.9% of GDP, it has grown significantly and in 2012 general government spending in OECD countries stood at 40.1% of GDP. The euro-area has recorded growth from 33.1% to 48.2% of GDP, while the United States has seen growth from 25.6% to 38.4% of GDP. See P.M. Jackson, *The Changing Shape of the Public Sector*, [in:] *Public Management and Governance*, eds. T. Bovaird, E. Loeffler, New York 2016, p. 30.

[42] For example, see T. Christensen, P. Lægreid, P.G. Roness, K.-A. Røvik, *Organization Theory and the Public Sector: Instrument, Culture and Myth*, New York 2007; T.D. Lynch, P.L. Cruise (eds.), *Handbook of Organization Theory and Management: The Philosophical Approach*, London–New York 2006; I. Koprić, *op. cit.*; S.R. Clegg, C. Hardy (eds.), *Studying Organisation: Theory & Method*, London 1999; J. Pfeffer, *New Directions for Organization Theory: Problems and Prospects*, New York–Oxford 1997. Intra-organisational dynamics could also be noticed in other factors elaborated in this section, particularly those factors dealing with human resources, values, norms and interests. A significant bulk of organisation theory knowledge has been generated from research of different intra-organisation variables.

[43] G. Marčetić, *op. cit*.

is one of the most important factors contributing to its success. Without a skilful workforce, it is hard to run a public organisation and consequentially the whole executive branch at various governance levels. With tendencies to outsource some public tasks to private sector providers and to provide public services through vouchers and coproduction,[44] complexity is additionally emphasised. Issues such as accountability, control, performance measurement or performance related pay are differently realised in the case of in-house or outsourced service provision.

Values, norms and interests. There are many conflicting values, norms and institutions that form an inherent part of public administration.[45] The main challenge is to strike a balance between the various values in different segments of public administration and in different historical periods. One set of values has been applied in the context of Weberian and Neo-Weberian public administration, while other values have been emphasised under the doctrine of New Public Management and its successor, the Good Governance doctrine.

Methods, knowledge, skills and technology. Complexity which comes from different processes, procedures, methods of work and skills required leads to administrative reforms and the complexification of competencies required of civil servants.[46] Technology and literature written in this regard are very rich and diverse.[47]

The main factors of exogenous (environmental) public administration complexity are as follows.

Complexity of the external environment. From W.A. Ross and the *Law of Requisite Variety* of 1956 and the "causal texture of organisational environment",[48] the environment of public organisations has been treated as an important factor in attempts to understand them. Societal demands, citizen associations, trade unions and entrepreneur associations, national and local media – they all represent various aspects of the environment within which public administration operates. Organisations may and should have various strategies that help them to effectively deal with their environment, which is becoming increasingly complex.

Complex issues and wicked problems. Complex issues often need to be addressed by public administration, creating "complex governance challenges".[49]

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[44] V. Đulabić, *Mogućnosti i rizici primjene tržišnih instrumenata u javnoj upravi*, [in:] *7. Forum za javnu upravu*, ed. A. Musa, Zagreb 2014.

[45] D.H. Rosenbloom, *Public Administration: Understanding Management, Politics and Law in the Public Sector*, New York 1993; I. Koprić, *op. cit*.

[46] T. Christensen, P. Lægreid, *Administrative Reforms and the Complexification of Competencies Requested from Civil Servants*, [in:] *Administrative Reforms and Democratic Governance*, eds. J.-M. Eymeri-Douzans, J. Pierre, London 2011, pp. 41–54.

[47] I. Koprić, *op. cit.*; I. Perko Šeparović, *Tehnologija – moć – samoupravljanje*, Zagreb 1983.

[48] F.E. Emery, E.L. Trist, *The Causal Texture of Organizational Environments*, "Human Relations" 1965, vol. 18(1).

[49] M. Edwards, J. Halligan, B. Horrigan, G. Nicoll, *Public Sector Governance in Australia*, Canberra 2012, p. 224.

Also, "wicked problems"[50] have become an unavoidable part of the everyday work of public administration. Complexity theory has something significant to offer in order to better understand and search for possible (not definite!) solutions to complex issues and wicked problems faced by public administration. However, there is a need for innovation in preventing potential problems instead of merely responding to existing problems.[51]

Bearing in mind the inevitable interweaving which is a result of how various dimensions of complexity reflect on different segments of public administration, it has to be noted that situations in which a one-size-fits-all approach could be utilised are rare to explain modern public administration or serve as a guiding principle for everyday administrative action. Thus public administration research has to be carefully designed, bearing in mind which segment or process in public administration is taken as a concrete research unit. Different theoretical approaches could lead to different research solutions and conclusions, which in turn have limited potential for generalisation, adding to the dynamics and growth of how we understand public administration.

IMPLICATIONS OF COMPLEXITY ON RESEARCH, THEORY AND PRACTICE

Public administration and its various components should be considered as a complex adaptive system. Insights from complexity theory should be useful in order to understand and explain phenomena related to public administration.

[50] H.W.J. Rittel, M.M. Webber, *Dilemmas in a General Theory of Planning*, "Policy Sciences" 1973, vol. 4(2). Rittel and Webber coined the term "wicked problem" as early as 1973, referring to problems encountered with planning issues. According to them, wicked problems have the following ten characteristics: (1) there is no definitive formulation of a wicked problem; (2) wicked problems have no stopping rule; (3) solutions to wicked problems are not true-or-false, but good-or-bad; (4) there is no immediate nor ultimate test of a solution to a wicked problem; (5) every solution to a wicked problem is a "one-shot operation" and because there is no opportunity to learn by trial-and-error, every attempt counts significantly; (6) wicked problems do not have an enumerable (or an exhaustively describable) set of potential solutions, nor is there a well-described set of permissible operations that may be incorporated in the plan; (7) every wicked problem is essentially unique; (8) every wicked problem can be considered to be a symptom of another problem; (9) the existence of a discrepancy representing a wicked problem can be explained in numerous ways and the choice of explanation determines the nature of the resolution to the problem; (10) the planner has no right to be wrong (*ibidem*, pp. 161–167).

[51] C. Bason, *op. cit.*, pp. 29–31.

Complexity theory should be seen as an answer to the increasing complexity of modern human societies and to wicked problems.[52]

There is a need for constant innovation and adaptation of public governance in order to find solutions to the complex reality within which public administration exists and functions.[53] The concept of "public design" is defined as "systematic, creative processes that engage people in exploring problems and opportunities, develop new ideas and visualise, test and develop new solutions. In the public sector, the use of such methods is often framed in the context of new forms of citizen involvement and collaborative innovation".[54] This could serve as an innovative approach in public administration that could help deal with everyday problems.

An answer to public administration complexity should be sought in innovative approaches to public administration issues. As Y. Dror puts it, "the history of governance also shows that unless innovations in governance – often radical ones – occur, obsolescence ensues, especially under conditions of rapid change in the main dimensions of human and social existence, with stagnation, decline and even catastrophe following inevitably".[55] Innovation should help to find accurate and functional solutions to wicked problems faced by public administration in the context of increasing technological development and everyday use of technology in society.[56] In its approach towards better public management, the World Bank states that "public sector reform is a pragmatic problem-solving activity, which seeks to improve results by identifying sustainable improvements to the public sector results chain".[57] Thus innovation capacity becomes a vital component of overall administrative capacity. It could be defined as "a set of conditions that supports innovation or provides a supportive infrastructure; it is the set of factors that either allows innovation to occur or (more positively) actively encourages it".[58]

The question regarding the predictability of administrative science arises as a natural consequence of the application of any theoretical approach to different social phenomena. Bearing in mind all that has been said in the previous part on

[52] "Complexity-informed research is able to deal with blurred issues that are not easily definable and demarcated, with large amounts of data that are not coherent and countable in a direct sense and with relations that reach beyond simple takes on causality" (G. Teisman, L. Gerrits, *op. cit.*, p. 18).

[53] M.H. Moore, *Break-Through Innovations and Continuous Improvement: Two Different Models of Innovative Processes in the Public Sector*, "Public Money & Management" 2005 (January).

[54] C. Bason, *op. cit.*, p. 4.

[55] Y. Dror, *The Capacity to Govern: A Report to the Club of Rome*, London 2001, p. 3.

[56] B.S. Noveck, S. Verhulst, *Encouraging and Sustaining Innovation in Government*, Washington 2016.

[57] World Bank, *The World Bank's Approach to Public Sector Management 2011–2020: Better Results from Public Sector Institutions*, Washington 2012, p. 1.

[58] J.M. Lewis, L.M. Ricard, E.H. Klijn, *How Innovation Drivers, Networking and Leadership Shape Public Sector Innovation Capacity*, "International Review of Administrative Sciences" 2017, vol. 84(2).

the exogenous and endogenous elements of public administration complexity, it should be noted that there is "also a need to balance the desire for prediction against the heightened levels of uncertainty associated with studies of complex systems. Researchers (…) must consider the extent to which CAS approaches to governance provide predictive power, that is, the question whether research on complexity allows for prediction and whether prediction is even possible given the inherent uncertainty within complex systems".[59]

It should be noted that wicked problems require tailor-made solutions. There are many challenges in the simplified transferring of solutions from other political and administrative environments without an awareness of the context in which these solutions should be implemented. There are no "one-size-fits-all" solutions when it comes to public administration. In this sense, the "conceptual framework of complexity theory is suitable for so-called wicked problems. Thus, it is a conceptual approach, which resembles governance theories, network theories, and other theories that focus on the analysis of complex processes and problems".[60]

The importance of complexity theory for public administration research lies in the fact that it may serve as a tool for the explanation of various research phenomena. "Complexity-informed research is able to deal with blurred issues that are not easily definable and demarcated, with large amounts of data that are not coherent and countable in a direct sense and with relations that reach beyond simple takes on causality. The challenge is to gain scientific and transparent insights from a variety of messy data, delivered by a variety of contributors and sources. Theory transfer and complex causality are the two sensitizing concepts we use in our search into complexity-informed research techniques, methods and methodology".[61]

CONCLUSIONS

Complexity theory has become an important theoretical framework in public administration. Originally developed in the natural and technical sciences, it has gained a foothold in the social sciences as well. This has also been the case with administrative science and public administration, which have a notable tradition of accepting theoretical frameworks in which various concepts connected with complexity are reflected.

[59] C. Koliba, L. Gerrits, M.L. Rhodes, J.W. Meek, *Complexity Theory and System Analysis*, [in:] *Handbook on Theories of Governance*, eds. C. Ansell, J. Torfing, Cheltenham 2016, p. 373.

[60] E.H. Klijn, *op. cit.*, p. 315.

[61] G. Teisman, L. Gerrits, *op. cit.*, p. 18.

Bearing in mind the inevitable interweaving which is a result of how various dimensions of complexity reflect on different segments of public administration, it has to be noted that situations in which a one-size-fits-all approach could be utilised are rare to explain modern public administration or serve as a guiding principle for everyday administrative action. Thus "if we ever unknowingly revert to simplistic formulations, complexity theory serves to remind us there are no panaceas. It tells us that there are limits to how much we can comprehend of the complexity (…), that we have to learn to become comfortable living and acting under conditions of uncertainty".[62]

Public administration research has to be carefully designed, considering which organisation or process in public administration is taken as a concrete research unit. Different theoretical approaches could lead to different research solutions and conclusions, which in turn have limited potential for generalisation, adding to the dynamics and growth of how we understand public administration.

Complexity theory enriches the theoretical pool from where various concepts could be taken when conducting public administration research. It provides us with an opportunity to better understand and explain many phenomena connected with contemporary public administration.

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[62] J.N. Rosenau, *Many Damn Things Simultaneously…*, p. 41.

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ABSTRAKT

Administracja publiczna jest bardzo skomplikowanym przedsięwzięciem i wiąże się ze złożonym środowiskiem, gdyż jest wyrazem działania wielu zaangażowanych podmiotów oraz mierzy się z wieloma nieprawidłowościami. W artykule zastosowano pojęcie złożoności do administracji publicznej oraz przeanalizowano wpływ złożoności administracji publicznej na badania i praktykę. Pojęcie złożoności stanowi ważny element klasycznych teorii administracji publicznej, jak np. teoria systemów czy teoria organizacji, a także istotną część współczesnych podejść teoretycznych (jak np.

teoria sieci) i podejść praktycznych/doktrynalnych do administracji publicznej, takich jak rozmaite koncepcje związane z ogólniejszym i niekiedy rozmytym pojęciem zarządzania (np. prawidłowe zarządzanie, zarządzanie wielopoziomowe itp.). Autor skupił się na głównych wymiarach złożoności administracji publicznej, opartych na różnych źródłach złożoności, mających wpływ na teorię i badania dotyczące administracji publicznej.

Słowa kluczowe: administracja publiczna; nauka administracji; złożoność; teoria złożoności