

Learning the match between the administrative structures and tasks: follow the information

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Abstract

This paper presents learning as structured connections between systems, people, institutions, and tasks for better alignment between decisions' specifics and different types of knowledge present in different institutional units. A conceptual framework is thus given that integrates individual group activities with institutional forms and the latter with societal institutions. The presentation of appropriate types of institutions for different administrative tasks can be useful at the time of teaching, learning, training, and development of public servants, and also at the time of administrative implementation. These aspects should be focused more on how information is recognized, how the results are interpreted, and how they are recognized and gathered in different environments. This understanding calls for the shift from "predict and control" to "measure and react" in the public administrations.

Keywords: Public administration, cybernetics, learning, complex adaptive systems.

1. Introduction

Although public administration (PA) addresses various "systems" (Peters & Pierre, 2012; Rosenbloom et al., 2014), it is also the system itself. To successfully administrate itself as a system and other systems PA could gain more insight into them from a natural science point of view that addresses biological and natural systems. PA as a social organization is rooted in biology (Fukuyama, 2012, 2014) and should also adapt to new circumstances, to the information on which the latter are based to survive. A human and PA are both the biological complex adaptive system (CAS; it is also *e.g.* the environment, language, bacteria, ecology, economy). CAS is not only a system (Greek *systema*, an arrangement, system, from *synistanai* to combine, from *syn-* together and *histanai* cause to stand (Merriam-Webster, 2017)) as the assemblage or combination of correlated parts forming a complex or unitary whole, but it can also adapt, change and self-organise. Designing the socially-adaptive, legal and administrative system that at the same time reflects the basic insights of CAS is difficult, but there is a way: in studying CASs, due to many consistent parts an observer can 'follow what happens to the information' (Gell-Mann, 2002, p. 23). As the law comes to life in institutions (Waldron, 2011), it is important hence how institutions such as CAS' manage information, organize actions, and communicate knowledge to simplify their processes. The adaptability of CAS is hence based on the administration of *dynamic network of interactions*, and is of utmost importance also for PA in the more and more changing environment. Complexity theory despite numerous works that emphasized the benefits of CAS for the law-and-society system's behaviour (Ruhl, 1996), organizations (Anderson, 1999), public service (Haynes, 2015), public

administration (Kiel, 2014; C. J. Koliba et al., 2010; Snellen & Klijn, 2009), public administration research (Klijn, 2008), public decision-making (Gerrits, 2012), political science and public policy (Cairney, 2012; Morçöl, 2012), public institutions and public policies (Room, 2011, 2016) and governance systems (G. Teisman et al., 2009) is still absent in the practice of PA. Rhodes and her colleagues (Eppel & Rhodes, 2018a, 2018b; C. Koliba et al., 2016; Rhodes, 2008; Rhodes et al., 2010; Rhodes & MacKechnie, 2003; Rhodes & Murray, 2007) along with other authors (Bovaird, 2008; Haynes, 2008; Klijn, 2008; G. R. Teisman & Klijn, 2008) emphasise how little attention has been paid to how complexity theory can be translated into practise or the teaching of PA (Eppel & Rhodes, 2018a), despite claims on the relevancy of systems/cybernetic approaches for public institutions (European Commission, 2017; Gharajedaghi, 2007; Morgan & Yeung, 2007; OECD, 2017). PAs are networks and as such are 'the ensemble of direct and indirect linkages defined by mutual relationships of dependency' (Scharpf, 1978, p. 362). These connections could be determined with the flexible structural *perceptions*, where *learning/awareness* – with its two forms, *i.e.* with the single-loop learning that corrects mistakes concerning instrumental aspects and double-loop learning that refers to goals, values, and assumptions (Argyris, 2006) – may be more understandable and hence usable than the already established, but stable models of PA (e.g. Weberian, NPM, Good Governance, Neoliberal and Digital Era Government). This paper thus aims to narrow the gap between CAS and their models in PA based on alignments between the knowledge types, institutional forms and societal institutions that all up to a point differently address of the same information.

This paper's idea is that a decision's nature or background – connected with different types of knowledge and institutional units – could be better understood through a framework that integrates individual group activities with institutional forms and the latter with societal institutions.

This idea is not simple, but neither are CASs. The above given alignments can provide new aspects on the work environment, organizations, individuals, and decisions that are present in PA, *i.e.*, how different types of institutions can address different administrative tasks; the knowledge on such network of interactions, can be useful for the learning, training, and development of public servants, administrative implementation and simplification. *Learning* can distinguish the random from the regular (Gell-Mann, 2002) and is synonymous with *adaptation* (Holland, 1995; Holland et al., 1989), which is the very important element of all CAS. Learning about new perspectives here presented as being aware of the relations between types of knowledge, institutional units, individual/group activities, institutional forms and societal institutions, can shed light upon ways through which PA can better deliver its services. The paper in the second section hence presents some aspects of CAS that can be used for the public servants' training, development, implementation and simplification. All are based on the learning of public servants, so the third section presents the idea of *learning* as a complex adaptive element in complex environments in which different types of knowledge are presented in the fourth section. Learning/adapting as one of the main tools by which CAS copes with

changes, will serve than to point out the appropriate types of institutions in the fifth section, after which the conclusion follows in the sixth section.

2. Aspects of CAS *vis-à-vis* the Public Servants' Training, Development, Implementation and Simplification

Various aspects of CAS could be integrated into the learning, training, and development of public servants for better implementation of administrative tasks or to simplify the existent ones. Teaching, training, and development of public servants should be focused more on *how* information is recognized, how the results are interpreted, and how they were gathered in different environments. *Information* as “communicated knowledge” is *per se* based on *activity*: *in-formation* means grouped things (animals, humans) that move in a formation, in a particular order or pattern. The more or less static regulation and implementation cannot be successful when CASs are addressed. This logical inference shows on problems present on the practical and cognitive levels. Some basic elements of CAS are thus enumerated as challenges (put in the *italicised font*) that need to be more fully grasped and integrated into the PA's study, training programs, public servants themselves, and PAs to be better aligned with the flexible changing environment.

One but many, and not vice versa. Traditional thinking/learning neglects the system's *interconnections*. Instead, it only looks towards final goals and assumes a single (or few) cause(s) rather than multiple interrelated causations. If one system part is taken out or when its performance is changed, the whole system changes. By focusing on one part, the experience is based only on that part, although from this standpoint later conclusions are usually erroneously deduced on larger entities (without considering their connections and relations). A whole system will not be more effective when the focus is given only on one part – the whole system and especially its connections should be considered. Many times, only the initial conditions are (apparently) known, under which final results are (prematurely) predicted. Rules regulate *pro futuro* cases wherein the time of enactment there are also unknown causal relations; they are hard to establish even for past or present states because causality ‘is not a thing that causes an event, but a process...[in which] certain processes or events cause other processes or events’ (Carnap, 1966, p. 190). This element of “one but many, and not vice versa” warns against conclusions that are only feedback into the regulatory cycle or other forms of decision-making in PA: such conclusions are based on connections and relations that evaluated solid rules/decisions do not have. From this standpoint, so numerously emphasized ex-post-regulatory impact assessment is shown as more complex: every experience enacted and implemented changes the one who acts and implements, while this modification affects also the quality of all consecutive experiences.

Self-organization means ‘the appearance of a structure or pattern without an external agent imposing it’ (Heylighen, 1999, p. 253). It addresses the spontaneous emergence of order (seen in, for example, the ice structure or in the snowflake). The British cybernetician Ashby introduced the principle of self-organization through which a dynamic system, independently of its type or composition, tends to evolve towards a state of equilibrium, when ‘the system is complex enough, or large enough, to show: (1) a high

intensity of selection by running to equilibrium, and also (2) that this selected set of states, though only a small fraction of the whole, is still large enough in itself to give room for a wide range of dynamic activities' (Ashby, 1960, p. 231). In the same year as Ashby, von Foerster formulated the principle of order from noise: 'in the long run, only those components of the noise were selected which contributed to the increase of order in the system' (Foerster, 1960, p. 48). The greater the random perturbations that affect a system, the more quickly the system will self-organize. Self-organization should not be equated with simple regime order – 'it tends towards "complex order" spontaneously by adaptation (when all parts are in equilibrium they stop, become inflexible, and order tends to disappear) in a complex environment' (Kauffman, 1993, p. xv). From this point of view, PA's actions can be viewed as an element within a larger space of possibilities and different combinations. All cases to some extent self-regulate until they reach the point of equilibrium, and with PA is the same; it hence needs to be pushed/regulated on a different level. When actions and reactions are left alone, they *will* regulate *themselves*, and not necessary according to public goals. It should not be disregarded that PA is always embedded in other systems with their own rules (morals, values, habits, practice) that will codetermine the first in complex equilibria. There are always parallel arrangements present alongside the enacted ones. The challenge of spontaneous self-organization compels PAs to *focus on the real-time, non-stop interactions* that impact on formal rules in each case differently.

Emergence. Self-organization is tightly connected with a puzzle regarding how new things or processes adapt to changing contexts. The order from chaos (Odell, 2003; Prigogine & Stengers, 1984) presented by self-organization 'is often associated with emergence, which means the appearance of a level of complexity more advanced than the existing components of a system' (Feltz et al., 2006, p. 341). Emergence is not reducible to the properties of the elements (Feltz et al., 2006). All is not only more than the sum of its parts, but what is or could be 'all' *cannot* be known in advance; it emerges only ex post through interactions. A further characteristic of emergent property is its complex behaviour that emerges from simple rules. Rationality emerges in processes; for Durkheim, the reason is the fundamental categories took together, not how an individual thinks but how 'collective representations...translate states of the collectivity. They depend upon how the collectivity is organized, upon its morphology, its religious, moral, and economic institutions, and so on' (Durkheim, 1995, p. 15). The challenge of emergence obliges public servants to be watchful and prompt to spot and react to changing patterns in administrated environments. Even better, there could be some indicators that could show the actual state of affairs, regardless of subjective interpretations.

Collectivity. Rationality and rules emerge in some complex, combinatory form of collectivity (a result of emergence), of common representations of "how are things done here". In PA this is known as path-dependence or 'a sequence of events narrowing the scope of action eventually resulting in a state of persistence or inertia' (Schreyögg & Sydow, 2009, p. 4). Path-dependence and collectivity emerge through the mutual tensions of different parts in different combinations, in the former (closed), without a possibility to predict which factors were the prevailing ones and in the latter (open) what the next

result will be. Collectivity puts public accountability and integrity of public bodies and employees on a higher level: to demand accountability, consequences must be attributed to a specific action of a public agency or an individual, while a result in the complex, non-linear and adaptable system is always (up to a point) different from the planned one, and thus not fully knowable. The challenge of collectivity can be addressed in the frame of accountability only when different scenarios are given upfront, otherwise, there will always be reasons for someone else to blame.

Rational robustness applies to accountability. Reason and knowledge cannot be monopolized; they are distributed and represented at multiple places in the system. If one part is taken down, others are still present; there will be no essential loss of rationality or knowledge in other parts because of this. Although the system could be changed as a whole it remains robust in case of damage (or the abuse of power). This is another reason why formal secrecy is not efficient – at least on the long run. Formal decision-makers are usually as intelligent as other people are (the first have only formal powers to decide), and to have a really new, unique decision numerous and diverse interactions are needed that will by other routes come to the same or similar conclusion as the one in PAs. This is the argument to apply public participation in the form of collective intelligence.

The stochastic indicators/sensors are a tool for the more successful management of the above-mentioned challenges. A network can be put together, but it instantly produces more or less unmanageable unpredictable processes. Actions are based not on information but on our *attention* that collects the former. Decision-action-adjustments can be improved with the focus given on *relations* in the real-time dimension. The cause of “time-gap” is in different positions between the time of their evaluation and the time when they were in a time of action. In the evaluation time, they are already different in content or in place, connected with different things than they were before. To manage such positions there must be real-time sensors by which a controller could gain insight into the current state of affairs in the shortest time possible. Indicators should be *stochastically* taken from a larger list to prevent subjectivity or bias. The mentioned challenges can only be systematically monitored, while decisions and/or adjustments should be in the meantime based on several stochastic indicators that can go over a current state of affairs, over the conventional, accepted wisdom in a relevant field. This mode (of thinking) requires a different approach to the adoption and execution of decisions: different perspectives, shared experiences, used different skills, brainstorming. Just these elements of CAS alone (there are more of them) show that the reality is much more complex than can be deduced from official documents of PA. In the next sections, a try to approximate these elements is made through the presentation of the appropriate types of institutions for different administrative tasks through the types of knowledge and institutional structures.

3. Learning as the adaptive element in complex environments

The above given challenges can be addressed with learning as the basic element of humans as CASs. Learning is a process of acquiring knowledge and skill by the prediction-based internal feedback (Holland et al., 1989); it is the ability not only to identify

constraints but to remove them, not only to (re)solve a problem but to eliminate it. Learning uses invisible indicators or anchors upon which content is attached and processed in the surrounding of other anchors. This is known as a schema and/or a pattern of thought that organizes categories of information and the relationships among them (DiMaggio, 1997). The process of learning – contrary to final results or path dependence – develops ways of behaving that are not only internally (in PA) or externally (in the environment) caused and determined. The application of tacit (TN) and explicit knowledge (EN) depends further on the system's capability of integration and creation of new knowledge (incentives, innovations). An institutional knowledge or expertise is thus conditioned by the institution's organization and/or structure, its division of work, and coordination mechanisms, while they all depend on the society (its values, perspectives, metaphors) in which this institution operates. The societal level is focused on how societal practices shape institutional routines and coordination rules. They all adhere to systemic, dynamic elements. In the lines below, these elements are shown in the case of knowledge combined with an institutional structure to be able then to show appropriate types of institutions for different administrative tasks.

3.1. Types of knowledge

Alongside EN – as the knowledge that can be easily articulated, codified, accessed and verbalized – there is also TN, because ‘we can know more than we can tell’ (Polanyi, 2009, p. 4). This kind of knowledge in the form of actions, skills, techniques, know-how, routines or “learning by doing” is present also in PAs; connected with the level of complex (simple-complex) and dynamic (stationary-dynamic) tasks they emanate in organizational culture. The interaction between EN and TN knowledge thus causes the emergence of new knowledge. Based upon the division between the EN-TN and the individual-collective level, Lam (2000) enumerates four types of knowledge: embrained (explicit-individual), encoded (explicit-collective), embodied (tacit-individual) and embedded (tacit-collective). These types are here further accustomed to PA.

Embrained knowledge depends on the public servant's mental frames, rationality, logic, theoretical knowledge, abstract concepts and cognitive abilities to compare, divide, assemble and infer. This field is run mainly by *lex artis* and administrative discretion that can be taught, trusted and controlled. Public servants are usually professionals in this field (doctors, teachers, social workers, inspectors, public employees in adjudication) who know how to do their jobs. This knowledge is based on trust and high morality that emanate from collaboration through professional (in)formal networks. With the help of their professional organizations, ‘peer pressure is subject to norms that may be more a reflection of the collective interests of the profession concerned than of the individual interest of the user’ (Grand, 2007, p. 23). This type of knowledge is based on trust, present in professional roles in the more or less static environment.

Embodied knowledge is based on practice; instead of abstract and rational concepts (“knowing”) here prevails experience (“doing”). Knowledge is dispersed and subjective; the rational processes (soft skills) include analytical and conceptual skills, creative and critical thinking, deductive and inductive reasoning, logical thinking and "on spot"

problem-solving. Public servants are here presented as professionals who know how to do their jobs, but along with formal knowledge also intuition, emotions, common sense and other personal elements (like the personal ability to negotiate, sense, communicate, to put yourself in an opponent's role and/or empathy, give and take, etc.) are used. Such employees are highly committed and have developed emotional and social intelligence (conflict resolution, active listening, [non]verbal communication, motivation). This form of knowledge is connected with the problem of interpretation and application of rules, for which Kant in *Critique of Pure Reason* argues that it is not based on law but wit, the acumen of a person (2011). This type of knowledge is based on incentives; employees use their know-how in a dynamic environment.

Encoded knowledge is codified in written rules that demand unified and knowable behaviour in the implementation processes (command-and-control or C&C). This domain of formal law is based on centralization, coordination, and control of the highest levels *vis-à-vis* their subordinate units. Due to the knowable, more standardized procedures and work roles, performance criteria can here show a level of institutional success, regardless of the complex and uncertain environment. This can be helpful in the short run, while in the longer one, a collision with the good governance principles that include efficiency and compassion (Endicott, 2011) could be expected. In this type of “normative” knowledge employees perform (more) simple duties in the static environment.

Embedded knowledge is TN present on a collective level in the forms of organizational culture and informal rules that emanated from the institutional-specific and diverse contexts. Lipsky's street-level bureaucracy (2010) or Simon's bounded rationality (1997) can serve as examples of developed routines and psychological simplifications. The cognitive types of knowledge address wanted goals (effectiveness) but tools/means are further needed to address and achieve goals (merely stating the types of knowledge is unlikely to have any impact on higher effectiveness). Transmission methods by which knowledge is turned into daily practice are thus important.

4. Institutional structure

The purpose of this section is to analyze the relationship between the types of knowledge and institutional structures. As flies are caught by the spider's pre-arranged system according to which the web is built, human perspectives can also be viewed as our tools by which things are done, and here institutions have an important role. Institutions are not only formal but also informal structures; they are frames/perspectives through which people evaluate public/private goals. Institutions are 'stable, valued recurring patterns of behaviour' (Huntington, 1968, p. 12), or the 'persistent rules that shape, limit, and channel human behaviour' (Fukuyama, 2014, p. 6). The institutional ethos decides what is similar, different, complex and chaotic. Such a view on ethos fits into embedded knowledge because '[t]he institution works as such when it acquires...the harnessed moral energy of its members' (Douglas, 1986, p. 63). The institutional structure with its formal rules, goals and tools, co-determines and directs the cognitive types of knowledge, and use means by which goals can be achieved. It matters how different types of knowledge address different types of institutions. These, institution-knowledge relations,

are presented in the following four subsections to be able also to propose appropriate types of institutions for different administrative tasks in the next section.

4.1. Closed System

The mechanistic, Newtonian view of the world is reflected in Weberian bureaucracy, where jurisdictional areas control lower officials through written rules, procedures and standards. From a systems point of view, Weberian bureaucracy is a closed system that works independently of its environment. This system has “closed-loop controls”, where ‘information about the system behaviour ... is fed back to the controller for evaluation. This may lead the controller to adjust the control signals ... under decision rules’ (Daellenbach, 1996, p. 41). This organizational form can achieve efficiency and stability in a stable, closed environment; control can be achieved with internal disciplinary proceedings or official complaints. Here encoded knowledge prevails, useful for the routine, simple and formalized tasks and/or the delivery of more static public goods and services.

4.2. Market System

Institutions are not only closed systems. They are open to information from the environment, stakeholders, participants, and citizens. Information depends also on the institution’s structure, how the latter assembles and filters the data, and how data are then transformed into information. Outputs here depend on the inputs, but the first are isolated from the second (buyers independently decide what to buy and from which seller). The market is an open system with “open-loop controls” where ‘inputs imposed on the system are based only on the prediction how the system behaviour responses to them. No account is taken of how the system responds to the control inputs’ (Daellenbach, 1996, p. 40). In this “recipe scenario” everyone works for his own interest, known as Smith's invisible hand (Smith, 2010). Success here depends on the diverse and embodied knowledge of individuals and ingenious experts, who innovate, experiment with new approaches, communicate with different stakeholders and adjust to the point where they see advantages. In the public sector, this system is appropriate for the private-public partnerships, concessions, public tenders, negotiations, collective bargaining and other procedures where a country acts similarly as other legal persons on the market.

4.3. Trust System

This type of “fraternal” institution (e.g. the inspections, police, financial offices, armed forces, independent public agencies, public institutes with teachers, and doctors) is based on autonomy, decentralization and subsidiarity because complexity does not allow decisions to be made at the highest levels. This system has negative feedback (it semi-self-regulate), because (only) professional bureaucrats – based on human input – in their expert roles “mechanically” influence the behaviour of (passive) citizens as they see fit, as they understand how their state of equilibrium (in the form of human rights, health, etc.)

should be. They (discretionally) adjust *lex artis* following a matter of context to minimize discrepancies between a present and a wanted state. Tasks are complex, but more or less static. Institutions act here as the embodied natural systems focused on the actions, informal survival and adjustments in the dynamic environment of multiple collectives. Actions are based on an individual's (more spontaneous, intuitive) activities and attitudes. Embrained knowledge grows proportionately with more practice in which skills are intuitively perfected. This kind of system is appropriate for more complex problem-solving, administrative adjudication, and procedures in which officials use their expert, embrained knowledge.

4.4. Net System

The embedded type of knowledge is usually found in networks. This system uses a feed-forward control mechanism that enlarges differences between the present and a wanted state. It predicts 'how changes in uncontrollable inputs are likely to affect system behaviour and then sends control signals that will maintain system behaviour as closely as possible on the desired course, thereby counteracting the effects of input disturbances' (Daellenbach, 1996, p. 44). In this system, past actions do not fully control future ones – the first only forms a base rate (or available information) for future decisions. Although the system is here the most open, it still has its boundaries in the number of components (citizens are eligible to give opinions or voices). According to diversity trumps ability theorem (Page, 2008), there are conditions under which randomly chosen people can be more intelligent than experts: when a problem is hard to solve, when people are smart and diverse and when the group of people is larger than a handful and chosen from a large population. Each prediction contains bits of truth mixed with various errors; the bits of truth add up to a larger truth, whereas the errors cancel each other in a negative correlation. People sometimes know more than experts (P. E. Tetlock, 2006; P. Tetlock & Gardner, 2015), especially in a dynamic environment. This kind of system is known as governance that includes people in activities to which problems can be addressed, goals can be formed, and means attached, to have the most effective and efficient action. The importance of this system proportionately increases with the complexity of the environment and society; the public deliberation and aggregation of data are especially applicable for decisions that influence a greater number of the population or society as a whole.

The net system represents the most advanced institutional form of a cybernetic model that self-regulates, *i.e.* goes towards its equilibrium in the complex environment where numerous parts in synergy interact with each other in "tension and compression" to produce unpredicted (Fuller & Applewhite, 1997), but still understandable actions. Future behaviour cannot be predicted based on any part of the system considered separately; people usually take for granted that such a system is thus unusable, but on the other hand, the volitional democratic systems are among the basic forms of such a system. A net system is a form of collective action; as in the market system, people in this system work independently on a single issue, but by the aggregation of their diverse information, they can form new knowledge.

5. Appropriate types of institutions for different administrative tasks

Learning by considering the different types of knowledge for different institutional structures can give PAs not only useful information on the use of appropriate types of institutions for different administrative tasks at the time of teaching and training of public servants, and at the time of administrative implementation and simplification, but it also highlights PA's efficiency and hence also legitimacy.

The closed type of institution is equal to the encoded type of knowledge. Based on the other three types, this type cannot deal with the surrounding open environment, with citizens and other groups (because knowledge is present also outside bureaucratic institutions). The needed institutional structure is more complex and cannot be fully addressed in this type of system. Because a purpose exists only when there is a choice, PA in the closed type (despite its specialization, standardization, and control) cannot address new problems. The closed system is nevertheless good for routine tasks when the environment is *static*. The mandatory rules and adjudication are used mostly without discretion. Public servants here mainly use formal rules and established knowledge; due to this, there is a low possibility to solve complex problems or innovate new things/approaches. Entrance exams into PA are here not needed, because formal knowledge is obtained in the process of formal education.

The market system is open to the environment; offer and demand are here the main elements of effectiveness. This system works in the domain of civil law; incentives are transferred into contracts between buyers and sellers. Situations change quickly; information and knowledge are transferred on all sides. Because of the ingenuity of individuals to gain an advantage over competitors, there is more room for "information signals", for TN that employees gain proportionately with a longer time of their practice. Such knowledge cannot be formally taught; employers can only indirectly influence employees by "pushing" them into solving specific problems. Choosing a good business partner depends, therefore, more on their past results than on their formal education. Despite the main use of civil law, public elements are also here present for the protection/acceleration of the public interest. PAs can use different nudge strategies or grant programs to softly direct citizens into a wanted direction; the first can also control the quality of products and due to the asymmetry of information demand disclosure of important products' information for the public. PAs can also, with private companies, enter into public-private partnerships and other forms of administrative contracts through which the private sector can fulfil public goals for appropriate financial compensation. Public employees who deal mainly with private companies are higher officials with enough practice to "see the other side", to negotiate with it and predict what the other side will do.

The trust or *lex artis* model is appropriate for complex tasks that do not often change their nature that are more static. Due to the complexity and uniqueness of problems, there is no formal recipe on how to solve them. Employees are here – based on their formal professional education, combined with practice and specialization – experts in their fields. Employers hardly control every step of employees as professionals, so they

focus more on their final results. Due to the complexity of tasks, entrance exams are sometimes needed to guarantee citizens the best service (e.g. the exams for teachers, doctors, police officers or inspectors). Innovation is also possible here and usually arises proportionately with the longevity of practice.

Within the net system, public employees deal with different citizens. Dealing with them demands a decentralized PA that can spot differences and react if needed. Public servants here need a lot of practice (to transform themselves into the position of citizens), strong bargaining abilities, intuition, common sense, and cognition. They must have organizational skills to be able to recognize relevant information in “every corner” (in the sense of Pasteur’s saying that “fortune favours the prepared mind”), to organize public participation and to extract information from citizens into meaningful conclusions. This is the argument for performance indicators that can address the dynamic regulatory elements to be able to align decision-makers’ goals with the flexible environment.

Relations among the dynamic elements, institutions, and knowledge are shown in Figure 1 below. The different types of knowledge correspond to the different administrative positions and institutions present in the different system types (public servants as the encoded clerks, embodied entrepreneurs, embrained experts, and embedded innovators) in which different regulatory techniques and other approaches are more appropriate. Based on the elaborated institutional structures (closed, market, trust and net system) it is evident that PA always addresses the various, smaller or bigger number of people. Based on these relations also different stakeholders are presented for them. In the command and control part of the system, encoded (normative) knowledge prevails (codes, obligatory rules, regulation, adjudication) within the bureaucratic, hierarchic and centralised model of civil service where citizens are subordinated clients. In the *lex artis* or trust system prevails embrained knowledge of experts with more emphasis on autonomy, decentralization and subsidiarity in which certification, advices, consultation, and standards are appropriate regulatory techniques (here is the place for various independent agencies). Here citizens are also subordinated to experts. In the market system the market model prevails with the embodied knowledge, based on various interactions and dispersed practices, where PA can use for the private companies and customers the grant programs, nudge strategies administrative and classical contracts. Citizens are here clients. In the net system the collective embedded knowledge is present in the forms of organizational culture and informal rules where complexity demands the negotiations, collective agreements and other forms of public participation. Due to very flexible environment instead of experts, more various knowledge is needed in the form of collective wisdom. Citizens are here full citizens, on equal footing as public employees.

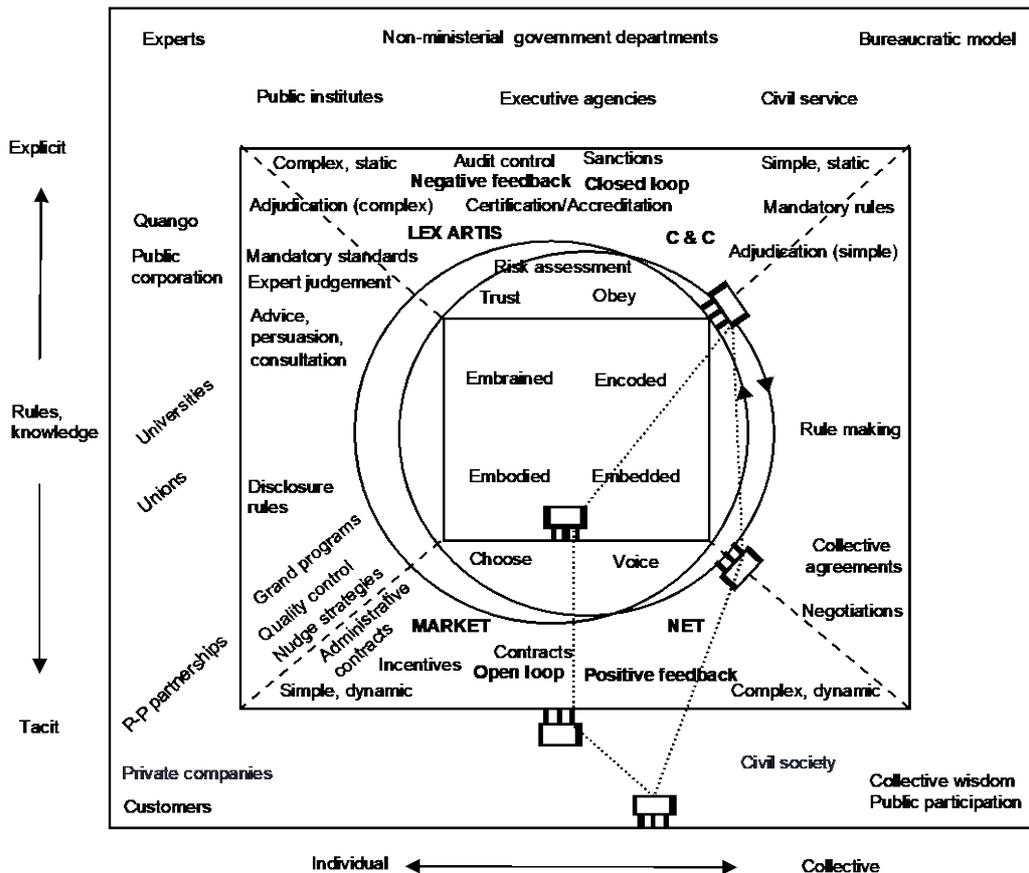


Figure 1: Complex and Dynamic Landscape
 Source: Author's own contribution

Decision-makers and people as the CASs hypothesize situations, but the understanding can be further advanced when the system is controlled (otherwise known as the output regulation problem), when the system knows what has happened with the information: this can be done with the connected sensors/indicators (there are five of them in Figure 1) at different levels that form a unifying whole that allows recording of relations between inputs and outputs (PA as the black box) that show patterns while maintaining closed-loop stability (based on new decisions that change a relation between the input and output that has a different impact on a resulting pattern). A new network can be put together, but it instantly produces more or less flexible and thus hardly manageable processes. This understanding calls for the shift from “predict and control” to “measure and react”; this shift ‘is not just technological...but psychological. Only once we concede that we cannot depend on our ability to predict the future are we open to a process that discovers it’ (Watts, 2011, p. 196). The measure-and-react (emergent) strategy opens new possibilities to experiment with new things, approaches or methods. Actions are based on information but the latter is ex ante based on our *attention* (through different sensors in the widest sense possible, e.g., senses, data collection, performance criteria, intuition) that collects the former through more or less predetermined criteria or perspectives. A further step away from biased attention can be in the usage of stochastic, real-time indicators or sensors (some sensor or indicator is applied from a list of possible sensors based on a formula that randomly selects them) by which a controller could gain not only an insight

into a current state of affairs in the shortest time possible (this could be a solution for the above-mentioned challenge of unmanageability) but it can also provide a more objective assessment (indicators should be hence stochastically taken from a larger list to prevent subjectivity). This approach requires different perspectives, shared experiences, different skills, brainstorming and variety. This method could give a new insight into the present conditions to administrate them better in the future. PAs could in this way more easily – by having relevant data in real-time and space – align their tasks with the appropriate types of knowledge, environment, and institutional positions.

6. Conclusion

This paper presented learning as a structured effort that emphasizes connections between the systems, people, institutions and tasks. Actions of CASs can be explained and followed/changed in a short period but never fully predicted. Combinations emerge, re-arrange, diminish, grow, self-organise or stop. In CASs, only a possible solution can be given: PAs should be attentive to the above-mentioned challenges and should develop a self-corrected learning model of decision-making that must be, due to different versions of rationality, at first communicated in cognitively-open domains (learning and teaching), to convince also the structurally closed (institutional implementation) ones. In complex environments, the main element that will differentiate between a failure and a success is the ability to create organizational arrangements among the mentioned systems, to create connections between the types of knowledge and between individuals and collectives. These connections depend on a dynamic environment and public servants, who should put themselves “in the shoes” of citizens. There are many interactions present in PA that can be seen as a failure, but they may simply be the needed processes towards a future success (“everything that happens is for something good”). A stabilizing element in the flexible environment may only be *non-stop learning or communication*, based on the flexible systemic structure. Argumentation can be very consistent and founded on stable arguments, but it may only be a fairy tale or an astrological prediction (apart from making our lives more tolerable, there is no further advantage from such consistency). Optimum circumstances include goals that are widely shared, measures that can be observed, incentives that apply to stakeholders that have insight into the relevant inputs and processes, incentives that are meaningful to those being incentivized, clear competing interests or requirements and adequate resources to design, implement and operate systems. *Contrary*, when such conditions are absent, the need to involve more of the public (participation) is proportionately higher.

Ongoing system evaluation and monitoring should be the integral component of all workable systems that address CASs. Evaluation and monitoring provide the necessary information to refine and improve the functioning of the system over time. The true choice is usually not to follow a rule *per se* because it is rarely given in isolation. A true choice is rather between the different but always interconnected rules/parts and various authorities/stakeholders that enact/implement them. It is crucial to have not only the means through which decisions or answers can be made but also the cybernetic perspectives by which outcomes are only inputs for other outcomes. The conceptual

framework that integrates individual-group activities with institutional forms and the latter with societal institutions is the first step, but not the last. Practice, evaluation, and corrections are always needed. They all are parts of adaptation that along the dynamic elements of reality represent the *sine qua non* of our lives.

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