# The public governance ecosystem: institutions as open infrastructures for collective decision-making

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#### Abstract

Over the past 20 years, the term "digital ecosystem" has evolved from a more or less valid metaphor for explaining the digital transformation of companies and their context to a way of reflecting on and strategically planning various areas of the economy and society. Its use in government in particular, and public and public management in general, has converged with other models such as the quadruple helix, open government, and social innovation. The subsequent impacts of the 2008 financial crisis and the COVID-19 crisis have both brought to light and driven new dynamics of collective creation and governance that are easy to explain from the ecosystem model of citizen governance, while also providing empirical support for the model through its practices.

#### I. Crisis and innovation in the Network Society

Despite the enormous complexity surrounding any social advance, J.A. Schumpeter (1943) reminds us that such advances, such innovations, always leave behind a scenario that will eventually perish. The concept of *creative destruction* generally refers to the need to put an end to obsolete practices and everything associated with them: procedures, applications, origin of resources or the resources themselves, change of actors, etc. However, creative destruction implies not only the end of these components of a given productive universe, but also the entire context and the entire scenario in which they have occurred and which, in turn, they have helped to define.

One of the ways we can define the digital revolution is precisely as an era of great processes of creative destruction. But not just a destruction and creation of old and new ways of doing things, but a destruction and creation of new ways of destroying and creating.

Models such as open innovation, quadruple helix innovation, and quintuple helix innovation (Chesbrough, 2003; Carayannis et al., 2012; European Commission,

2012, 2016, 2016) are, beyond merely modeling a form of innovation, a representation of an epochal change. A change of era that generates crises at all levels—understood as the destruction of old ways of creating—but that in turn generates new ways of responding to these crises.

A particularly relevant issue regarding new responses to crises in particular, and the new way of innovating in general, is that the innovator increasingly appears on the margins of the system and, moreover, does not wait for the system's permission to implement new formulas. Innovators innovate constantly and, more importantly, they do so through their daily practices, from the uses, adoptions, and adaptations of goods and services—including public ones. Innovators eventually find other innovators with whom to create clusters, communities, and innovation networks, sometimes tacit, sometimes explicit. Innovations spread, and both the process itself and the result of innovation end up becoming democratized (von Hippel, 2005).

This concurrence of new actors, from all corners of society (Shirky, 2008), ends up generating dynamics of collective intelligence (Surowiecki, 2004) that become true innovations that, despite not being planned or directed, can end up forming large projects once their small and diffuse parts manage to fit together into a whole (Raymond, 1999).

These dynamics are made possible by mass self-communication media (Castells, 2009), that is, the possibility that with minimal resources the individual – not the institution – is able to make his voice heard to an audience that potentially extends to the entire planet.

In politics, this ability to reach everyone without having to depend on any institution—a parliament, a government, a political party, a union, an organized civil society entity—is undoubtedly a complete subversion of the grand apparatus that representative democracy had become since the fall of the Ancien Régime and the rise of liberal democracies.

Thus, new actors are also emerging in politics, working in new spaces and with new instruments, taking politics and activism beyond institutions and into nonformal and informal spaces of democratic action (Peña-López, 2018). While these types of practices have always existed outside of institutions, the difference is that these new practices form "para-institutions" (Peña-López, 2014a) with the operating characteristics of institutions but without their formal characteristics. This enables emerging practices of varying granularity, revaluing actions such as "clicktivism" (the 21st-century equivalent of voting with your feet).

Ultimately, these practices and the individuals and collectives behind them end up gaining in intentionality, organization, and, above all, shared strategies and objectives. Strongly supported by technology, these practices of citizen action constitute technopolitical practices (Kurban et al., 2017) that use networked architectures and distributed decision-making systems to advance in parallel and often at the margins—of democratic institutions, creating true spaces of autonomy (Castells, 2012). However, this world of new forms of (self)organization and (social) innovation opened up by the digital revolution is not evenly distributed and is far from hegemonic, as demonstrated by the differential impact that the COVID-19 crisis has had on the population (Peña-López, 2020), not only depending on their social background, but also on their level of integration into a new digital society that has yet to arrive... for everyone. While some groups have been able to selforganize into self-help networks, many others have seen how what were opportunities for others have become significant challenges for them, due to the lack of electronic devices or connectivity, the lack of new skills to make the most of the potential of digitalization, or because their personal network (emotional, professional, cultural, etc.) was disconnected from electronic networks, generating new vectors of social exclusion and widening the gaps that had led to exclusion in the first place.

These vectors of exclusion accentuate the already existing tension between self-organization and centralization, which emerged in the shadows between the death of an era, the industrial age, and the slow but steady dawn of the information age. These shadows are characterized by the absence of a new governance model, deepening the crisis of democratic legitimacy of institutions that characterized the first two decades of the 21st century:

The "solutions" that have emerged for one case (mass man) or another (post-democracy) are both opposed and complementary: faced with a mass man incapable of governing himself, the solution is technocracy, political meritocracy to the limit, professional rulers, and, at the expense of the uninformed and ignorant citizenry regarding public affairs, political aristocracy. Moreover, the struggle of post-democracy, the struggle of the elite that "does not represent" the citizen, has often resulted in populisms where a messianic leader, belonging to the people and not to the reviled elite, sets himself up as the possessor of every solution, easy and simple, and often consisting of finding a scapegoat to sacrifice alongside the political elite. (Peña-López, 2018)

We are, therefore, faced with two extremes. On the one hand, the new spaces of autonomy and distributed self-management, perceived by many as pure anarchy and, at best, as phenomena completely disconnected from the legitimately established institutions of public governance. On the other hand, technopolitical and populist solutions, falsely de-ideologized and, consequently, dangerously delegitimizing.

We propose a path between these two extremes. Or, in reality, a path of forward transformation that allows us to overcome past structures and create a new paradigm of public management.

If open social innovation is characterized by decentralization and distributed decision-making, individual initiative as a driver of the collective, and the high granularity of contributions to the public, the Administration must respond by designing, articulating and facilitating this network of new actors, spaces and instruments (Peña-López, 2014b).

The public governance ecosystem is based on providing context, facilitating infrastructure, and fostering interaction; on the government not being the apex of a hierarchy, but rather a central node, an exchange in a network governed not by rules but by infrastructure construction and proactivity.

## II. Ecosystems: communities and knowledge infrastructures

The concept of an ecosystem as a business organization model emerged from biology to adapt to the environment of technology companies in the early 21st century. Although the metaphor has as many proponents as detractors, its adoption has increased over time, penetrating other sectors to the point of reaching the realm of public management—especially in the fields of *smart cities,* the Internet of Things, and open data.

*digital business ecosystems,* is attributed to Francesco Nachira's (2002) discussion paper, where he defines these ecosystems as the "dynamic aggregation of offerings, training and knowledge sharing, selection and natural evolution between services and solutions."

Nachira configures digital ecosystems in three layers:

- Generic ecosystem infrastructure: a common supporting environment and core infrastructure, with core service components.
- Sector-specific ecosystems: specialized services, solutions and components, and cross-functional applications.
- Instances of the sector-specific ecosystem, applied to a specific innovation node.

Thus, digital business ecosystems are competitive markets where companies tend to operate in networks, not just hierarchically following a vertical suppliercustomer structure. And they can operate in networks because they share a series of common infrastructures. These infrastructures can be provided by a main player-as in the case of proprietary digital platforms, patents, or distribution channels-or be built collectively-as in the case of open source solutions. standards. or public infrastructures. Ecosvstem software infrastructures, therefore, come in many forms-platforms, services, tools, technologies-that allow all nodes to use them to improve their performance (lansiti & Levien, 2004).

In a digital business ecosystem, the logic of value capture is different from that of a purely competitive market, given that part of the value is returned to the ecosystem to nourish, strengthen, and, above all, expand its network economies. In other words, it is in the interest of all actors to maintain and improve the digital ecosystem so that it fulfills its primary functions of intentionality, value creation, and sustainability (Harrison et al., 2012). The structural principles of digital ecosystems (Nachira et al., 2007) are decentralization, autopoietic architecture and adaptation to the environment, which gives it the following properties:

- There is no single point of control or breaking point.
- The digital ecosystem does not depend on any single entity or actor.
- All actors have equal access opportunities.
- Scalability and robustness.
- Ability to constantly evolve, differentiate and self-organize.
- Power to activate and support self-reinforcing products and process networks.
- Ability to enable global solutions that adapt to local or sectoral needs.
- Global solutions that emerge from local and sectoral inputs.
- Local autonomy.

These structural principles configure new forms of organization where emergent behaviors between entities emerge from basic norms and shared environments. The ecosystem self-organizes through interaction and participation, and mechanisms are articulated to rebalance or maintain the ecosystem's equilibrium. Sectoral clusters related both internally and to the rest of the ecosystem through weak and reconfigurable ties are made possible (Boley & Chang, 2007).

This issue of common infrastructures, of maintaining and improving a shared environment, has very interesting implications for public goods and services, as well as the role of the public sector in creating favorable conditions for both economic and social development. We can conceive of the public system, the Administration, in addition to being a provider of friendly goods and services for the economy and society, as a key player in generating legitimate, guaranteed, and equitable environments: the principle of legality and the rule of law. However, the construction of the rule of law can be seen as this surrender to the Hobbesian Leviathan, or as a collective construction. As an ecosystem from which everyone benefits—safe exchanges, respect for individual rights, etc. but also to which everyone contributes—some more than others, undoubtedly not only by complying with the norm, but also by co-designing and advancing the public ecosystem by actively participating in its construction.

This approach is not only in line with the spirit of the rule of law and the public sector in general, but can also contribute to making it more resilient to crises (economic, political, or social) and, ultimately, more stable in the medium term.

In addition to infrastructure, ecosystems often have in common the "understanding and appreciation of the interrelationships and interdependencies between agents and entities" (Heimstadt et al., 2014).

Thus, to the triad with which we began this reflection – actors, spaces, instruments – we add this awareness of the connections between them, which configures communities that exchange knowledge as currency, the classic definition of the gift economy.

Bringing the digital ecosystem model into the public sphere implies, on the one hand, the Administration's renunciation of maintaining its monopoly on collective decision-making (exclusivity of actors, exclusivity of spaces, exclusivity of instruments) and, on the other hand, articulating networks of communities (organized and extra-institutional civil society, various levels of administration) that exchange knowledge (data and information, methodologies and processes) on distributed and open infrastructures (protocols, technology, physical and virtual spaces), all of which configure the public governance ecosystem.

#### III. Shared infrastructures and the digital commons

"In the digital ecosystem approach, shared knowledge, common models, training modules are considered a form of human capital accumulated, formalized and embedded within digital ecosystems" (Dini et al., 2005)

This description of the role of knowledge is fundamental to understanding the concept of infrastructure in the field of digital ecosystems. When physical infrastructures do not exist—or they are merely instrumental—the concept of infrastructure includes all those instruments, protocols, codes and languages, tools, technologies, platforms, etc. that help manage knowledge comprehensively, from storage to transmission and practical application.

These common infrastructures are the setting for dynamics of both competition and cooperation and collaboration. Brought to the realm of public governance ecosystems, collaboration and cooperation occur at the level of shared projects between the administration and citizens, or between democratic actors and institutions at the same level. However, this does not go to the detriment of competitive practices between actors of opposing political persuasion or with divergent interests regarding a public issue.

While this definition can be perfectly applied to the playing field of political parties and, more specifically, parliaments, in a public governance ecosystem, the playing field expands beyond the institutional sphere and the actors of representative democracy.

In the public governance ecosystem, the institutional framework extends to community processes, with its "business models" encompassing data, information, dynamics, facilitation, training—from open resources to training programs—deliberation methodologies, and tools for conflict management and consensus-building, among many others.

At this point, the question often arises as to how the Administration or the Government-which has the duty and responsibility to represent all citizenswill be able to continue maintaining these functions if it loses control over the instruments it uses to carry them out. It is important to emphasize that the formalization of knowledge, languages, codes, channels, platforms-all of this must be defined, designed, and implemented. And the shift in culture from a centralized hierarchy to a public governance ecosystem does not mean relinquishing power, but rather exercising it as authority, as an authority that does not direct but facilitates, that does but enables. But, and we emphasize this, this is still compatible not only with influencing but with determining the culture of the ecosystem, what can happen within it, and its direction. Vertical integration strategies are highly effective for managing ecosvstem interdependencies (Adner & Kapoor, 2010), an integration that in the public sphere can occur de facto through the promotion of one or another form of governance and co-governance.

But, and it is important to emphasize this, the driving role of the Administration must be just that: driving, not "central" as traditionally understood by bureaucratic theory. It is a matter, here, of nurturing knowledge-intensive organizations—the essential nature of the Administration and the institutions of democracy and actors that make up the public governance ecosystem—that can manage and increase the stock of intangible organizational assets, intellectual capital, human capital, structural capital, and relational capital. In short, social capital (European Commission 2012).

The public governance ecosystem is therefore based on a social capital management system, with open innovation as a vector for the evolution of structural capital. For these systems, these infrastructures, to generate capital that serves the goals and ambitions of the public sector, they must necessarily be open and shared infrastructures that also distribute their products, proposals, and improvements into the open and shared spheres: the digital commons.

Thus, open knowledge, open governance and community (Nachira et al. 2007) end up forming the public governance ecosystem which, in a similar way to the configuration of the Internet ecosystem (Nachira & Bria, 2003) incorporates civic and political action platforms, a layer of data and information management applications, relationships between institutions and with citizens, the value chain in the form of public policy proposals, interest groups, the regulatory framework and the entire public governance scheme.

We can also conceive the public governance ecosystem from the progression in data infrastructures (Calzada & Almirall, 2020) and make it evolve from the political artifact (a norm, a public policy action), to the asset (diagnoses, proposals), the processes (procedures, decision-making institutions) to the ecosystem itself (networks, social innovation spaces).

Although the concepts of ecosystem and platform are not entirely synonymous – the platform being a part that facilitates the ecosystem – it is useful to identify and adapt to the case of the public governance ecosystem the components that

make a (here public) platform economy based on the commons possible (Fuster, 2018):

- The governance of the system, including all the actors that make democracy and collective choice possible (beyond institutions and formal spheres).
- The management model, how value propositions are generated that advance the collective that inhabits the public governance ecosystem.
- The technological model and technology that will support information management and communication across the entire ecosystem—and the more open and free it is, the closer it will be to the optimum for distributed public governance.
- The data, information, and knowledge management model, a model that must be consistent with the open data and transparency policy, and which, in the case of public administrations, will collectively constitute the open government model.
- The policy orientation and expected impact, which, in line with the above, will overlap with evidence-based policy, evaluation policy, and accountability policy.
- Social responsibility, which in political terms and extends to the entire ecosystem, will be linked to social auditing and integrity policies.

We have, therefore, a paradigm shift that opens up new spaces with enormous potential linked to new ways of innovating—and of overcoming increasingly systemic crises. These spaces, their actors, and their instruments are formed—and in their view can be fostered—as (digital) ecosystems where the role of communities is crucial, and where their autonomy to exchange, appropriate, and apply knowledge is their way of creating value, both for themselves and—especially in the case of public knowledge—the community that hosts them. For these knowledge communities to interact, shared infrastructures are necessary—among them, but not limited to, open and dynamic platform economy platforms that also yield benefits for the public sector, for the commons.

How should the Administration, the State in a broad sense, adapt to this new ecosystem?

#### IV. The State as a platform

When discussing citizen disaffection with democratic institutions, one of the recurring reasons is the alienation they feel toward politics. Paradoxically or not, the efforts made by many representative democratic institutions have also failed to bear fruit, reproducing in the virtual world the same culture and vices that were already present in traditional spaces (Peña-López, 2011).

While, as we stated, platform and ecosystem are not interchangeable, there are already several experiences where a transition from public management and collective decision-making to platform cooperativism has resulted in changes in perceptions and even attitudes among citizens (Sholz, 2016). Not surprisingly, the concept of platform cooperativism is based on the collective—but not exactly public—ownership of these platforms, very much in line with the open infrastructures and digital commons we mentioned earlier. Key issues such as transparency and open data, recognition and meritocracy, and co-design and co-management are also in line with what constitutes a digital ecosystem in general, and a potential public governance ecosystem in particular.

Considering public decision-making as an exercise in cooperation, we can (re)conceive the Administration—or the State, in general—not as the main actor making these decisions, but as the one that promotes the cooperation technologies necessary for these decisions to be made openly, plurally, and with broad participation. The main characteristics of these cooperation technologies can be listed as follows (Saveri et al., 2005):

- Moving from designing (closed) systems to providing platforms.
- Involve and engage the community in designing standards that perfectly fit their culture, goals, and tools.
- Learn to recognize wasted or invisible resources.
- Identify key thresholds for reaching tipping points in behaviors or performance.
- Monitor and promote the various emerging feedback loops.
- Find ways to convert present knowledge into historical heritage.
- Support participatory identities.

However, as experience has shown, the nature of administration makes it very difficult to achieve this broad scope and outward projection while maintaining the bureaucratic and hierarchical system that characterizes modern administration.

This is why a fundamental transformation is often proposed as more necessary than an evolution: that the Administration not provide platforms for promoting public governance ecosystems, but rather that the government itself, the state, becomes the platform (O'Reilly, 2010; Peña-López, 2019b). After all, in the public sphere there is a great deal of confusion (in the most etymological sense of the word) between actors and infrastructures, and it may even seem logical to view institutions not as drivers of something, but as that something, as an infrastructure to be used to achieve other ends—namely, collective decision-making.

Thus, for the State to become a platform means opening that space to the participation of other actors, namely, the general public, and not just the institutions that make up the system of representative democracy. Citizens will now be able to play a new role, active rather than passive, constructive rather than clientelist, which includes everything from the co-production of public services to the joint formulation of public policies and the development of the regulatory framework (Al-Ani, 2017), contributing to "the transition from a model of public decision-making based on the monopoly of information and decisionmaking instruments to another model based on facilitation and cooperation" (Peña-López, 2019b). This model, however, must go beyond the exercise of transparency and accountability. It is crucial that it undergo a profound transformation and become another node in the network, in the ecosystem of public governance that it has helped to build and facilitate. This means governing not only to make decisions and promote public policy instruments directly (a function that can hardly be ignored) but also to withdraw somewhat from direct government action to make room for a citizenry that will now also make those decisions and will also promote public policy instruments, sometimes collaborating with the Administration, to the limit autonomously (Al-Ani, 2017; Peña-López, 2019b).

This new state takes on a new role "that protects the P2P infrastructure of cooperation and the creation of commons: the state becomes a manager of a 'market', stimulating, enabling and organizing the country's assets – the skills and motivations of its citizens – in an efficient way" (Al-Ani, 2017).

Of course, it's not enough for this to happen at a single level of government. It's necessary to build a multi-level system—an ecosystem—that, just as with a healthcare system, has tools that operate from primary care to the highest levels of specialization (Serra, 2013).

Consequently, it is not enough to operate only at the macro level, of the country's major political policies, but in addition to the major public policy and the regulatory framework, it must act at the meso level, training all actors, and at the micro level, stitching the social fabric at its base - and, of course, operating at the socioeconomic stratum level, providing resources and making them operational (Lupiáñez-Villanueva et al., 2018).

This approach of turning the government or the state into a platform for open social innovation implies, as we have already mentioned, the opening of formal spaces to extra-institutional ones, and the creation of conditions that enable bottom-up initiatives, gradually changing social intervention for capacity building and citizen empowerment (Lupiáñez-Villanueva et al., 2018).

### V. Public governance ecosystem

A public governance ecosystem is a self-organizing, autopoietic, replicable, and scalable technopolitical system that articulates actors, spaces, and instruments around a set of open and distributed knowledge-rich infrastructures for collective decision-making.

It is important to remember that the ecosystem concept goes far beyond the concept of public administration networks (Janowski et al., 2012), which focus exclusively on the administration's relationships with other actors. The ecosystem focuses on the autonomy of the nodes and the multifaceted nature of the interrelationships.

Furthermore, by definition, the public governance ecosystem is co-designed and maintained by the ecosystem members themselves, and it is pertinent to remember that, "in the information age, whoever designs and facilitates a network ends up shaping society. Even despite the power of the incumbent hierarchies" (Peña-López, 2019b). This statement, however, has two interpretations. The first, and most obvious, is that if the Administration remains outside of being part of and contributing to the public governance ecosystem, with greater or lesser success, the ecosystem will continue to function without it—and, consequently, will form a new society where the Administration has an increasingly diminishing role, with all that this entails. The second interpretation is that if, on the other hand, the Administration takes a proactive and relevant node role in the ecosystem, it is possible that it could even easily continue to exert a strong influence on the architecture of the ecosystem and, by construction, on the shaping of society.

The role of the Administration in the articulation of the public governance ecosystem is absolutely transversal to the entire ecosystem, having influence in the six areas that are identified as the main thematic conglomerates of an ecosystem focused on social innovation (Bria, 2015): the transformation of processes, open democracy, the collaborative economy (closely related to open infrastructures), awareness networks for the impact on behaviors, open access, and the financing, acceleration and incubation of ideas and projects.

This cross-cutting role is, above all, the management of interactions and interdependencies, of communication and its feedback between different actors. In short, it is about empowering ecosystem actors (Dawes et al., 2016) by feeding it with data and information that flow within the ecosystem, generating emotional bonds between them and changing the paradigm of collective action (Atluri et al., 2017). As in any constructivist approach, citizen involvement here is primarily in their capacity as innovators, participants in the creation of new services, providers of services, or providers of ideas that can be captured for the ecosystem (European Commission, 2012).

Of course, breaking away from the vertical hierarchy doesn't necessarily mean having to participate in the entire ecosystem as a whole—at least not for all nodes. Contrary to the myth that "citizens will now have to participate in everything," the reality is that the ecosystem will eventually generate centers of interest that will become sub-ecosystems (Ju et al., 2019). The role of the Administration here is to use this platform-state to weave a network between sub-ecosystems that maintains global coherence and maintains the overall articulation of the larger public governance ecosystem.

The public governance ecosystem – also known as the citizen participation ecosystem, although this way of naming it can lead to confusion about its scope

- is an evolution of the concept of digital government, referring to the "use of digital technologies, integrated into government modernization strategies for the creation of public value" (OECD, 2014) and open government as "a governance culture that promotes the principles of transparency, integrity, accountability and stakeholder participation" (OECD, 2017). An ecosystem that "is composed of government actors, non-governmental organizations, businesses, citizens' associations and individuals and that supports the production of and access to data, services and content through interactions with government" (OECD, 2014).

Again, the capital importance of interactions at all levels: political environment and context, diagnosis and content, interdependencies and mapping of actors, design, performance and impact evaluation (Zuiderwij & Janssen 2013; Zuiderwijk et al 2014).

The public governance ecosystem has an impact on efficiency and effectiveness, which its main promoters can better capture (Ceccagnoli et al., 2012). It is no small matter for the Administration to lead the formation of this ecosystem. This is especially true if, in addition to questions of efficiency and effectiveness. the impacts can also be measured in far-reaching transformations (Peña-López, 2019a): the meanings of the concepts that define democracy, the norms (explicit and tacit) that shape society's behavior, and, ultimately, how power is distributed.

#### VI. Bibliography

Adner, R. & Kapoor, R. (2010). "Value Creation in Innovation Ecosystems: How the Structure of Technological Interdependence Affects Firm Performance in New Technology Generations". In *Strategic Management Journal, 31* (3), 306-333. Indianapolis: John Wiley and Sons.

Al-Ani, A. (2017). "Government as a Platform: Services, Participation and Policies". In Kamalipour, Y. & Friedrichsen, M. (Eds.), *Digital Transformation in Journalism and News Media: Media Management, Media Convergence and Globalization, Chapter 14*, 179-196. Boston: Springer International Publishing.

Atluri, V., Dietz, M. & Henke, N. (2017). "Competing in a world of sectors without borders". In *McKinsey Quarterly, 2017 Number 3*, 32-47. New York: McKinsey.

Boley, H. & Chang, E. (2007). "Digital Ecosystems: Principles and Semantics". In *Digital EcoSystems and Technologies Conference, 2007. DEST'07. Inaugural IEEE-IES*, 398-403. Washington, DC: IEEE.

Bria, F. (Dir.) (2015). *Growing a digital social innovation ecosystem for Europe*. DSI final report. Brussels: European Commission.

Calzada Mujika, I. & Almirall, E. (2020). "Data ecosystems for protecting European citizens' digital rights". In *Transforming Government: People, Process and Policy, Ahead-of-print. Published online 21 April 2020*. Bradford: Emerald. Carayannis, E.G., Barth, T.D. & Campbell, D.F. (2012). "The Quintuple Helix innovation model: global warming as a challenge and driver for innovation". In *Journal of Innovation and Entrepreneurship, 1* (2). Boston: Springer.

Castells, M. (2009). *Communication power*. Cambridge: Oxford University Press.

Castells, M. (2012). *Redes de indignación y esperanza*. Madrid: Alianza Editorial.

Ceccagnoli, M., Forman, C., Huang, E. & Wu, D. (2012). "Cocreation of Value in a Platform Ecosystem: The Case of Enterprise Software". In *MIS Quarterly,* 36 (1), 263-290. Minneapolis: University of Minnesota.

Chesbrough, H.W. (2003). "The Era of Open Innovation". In *MIT Sloan Management Review, Spring 2003*, 35-41. Cambridge: MIT Sloan School of Management.

Dawes, S.S., Vidiasova, L. & Parkhimovich, O. (2016). "Planning and designing open government data programs: An ecosystem approach". In *Government Information Quarterly, 33* (1), 15-27. London: Elsevier.

Dini, P., Darking, M., Rathbone, N., Vidal, M., Hernández, P., Ferronato, P., Briscoe, G. & Hendryx, S. (2005). *The Digital Ecosystems Research Vision: 2010 and Beyond*. Brussels: European Commission.

European Commission (2012). *Open Innovation 2012*. Brussels: European Commission.

European Commission (2013). *Open Innovation 2.0 Yearbook*. Edition 2013. Brussels: European Commission.

European Commission (2016). *Open Innovation 2.0 Yearbook*. Edition 2016. Brussels: European Commission.

Fuster, M. (2018). "Qualities of the different models of platforms". In Fuster, M. (Ed.), *Sharing Cities: A worldwide cities overview on platform economy policies with a focus on Barcelona, Chapter IV*, 125-158. Barcelona: UOC.

Harrison, T.M., Pardo, T.A. & Cook, M. (2012). "Creating Open Government Ecosystems: A Research and Development Agenda". In *Future Internet, 4* (4), 900-928. Basel: MDPI.

Heimstädt, M., Saunderson, F. & Heath, T. (2014). "Conceptualizing Open Data Ecosystems: A Timeline Analysis of Open Data Development in the UK". In Parycek, P. & Edelmann, N. (Eds.), *CeDEM14. Proceedings of the International Conference for E-Democracy and Open Government 2014*, 245-255. 21-23 May 2014, Danube University Krems, Austria. Krems: Edition Donau-Universität Krems.

Iansiti, M. & Levien, R. (2004). "Strategy as Ecology". In *Harvard Business Review, March 1, 2004*. Cambridge: Harvard University.

Janowski, T., Pardo, T.A. & Davies, J. (2012). "Government Information Networks - Mapping Electronic Governance cases through Public Administration concepts". In *Government Information Quarterly, 29* (1), S1-S10. London: Elsevier.

Ju, J., Liu, L. & Feng, Y. (2019). "Design of an O2O Citizen Participation Ecosystem for Sustainable Governance". In *Information Systems Frontiers, 21* (3), 605–620. Cham: Springer Nature.

Kurban, C., Peña-López, I. & Haberer, M. (2017). "What is technopolitics? A conceptual scheme for understanding politics in the digital age". In *IDP. Revista de Internet, Derecho y Ciencia Política, 24*. Barcelona: Universitat Oberta de Catalunya.

Lupiáñez-Villanueva, F., Theben, A., Porcu, F. & Peña-López, I. (2018). *Study on the impact of the internet and social media on youth participation and youth work*. Brussels: European Commission.

Nachira, F. (2002). *Towards a network of digital business ecosystems fostering the local development*. Brussels: European Commission.

Nachira, F., Nicolai, A., Dini, P., Le Louarn, M. & Rivera León, L. (Eds.) (2007). *Digital Business Ecosystems*. Brussels: European Commission.

Nachira, F. & Bria, F. (2013). *Internet Identity Ecosystem. The evolution of the Internet: Towards a common or capture and surveillance of collective intelligence*?. Rome: W3C.

O'Reilly, T. (2011). "Government as a Platform". In *Innovations: Technology, Governance, Globalization,* 6 (1), 13-40. Cambridge: MIT Press.

OECD Council (2014). *Recommendation of the Council on Digital Government Strategies*. Paris: OECD.

OECD Council (2017). *Recommendation of the Council on Open Government*. Paris: OECD.

Peña-López, I. (2011). "Striving behind the shadow – The dawn of Spanish politics 2.0". In van der Hof, S. & Groothuis, M. (Eds.), *Innovating Government. Normative, policy and technological dimensions of modern government, Chapter 8*, 129-147. The Hague: TMC Asser Press.

Peña-López, I. (2014a). "Casual politics: del clicktivismo a los movimientos emergentes y el reconocimiento de patrones". In Cotarelo, R. & Olmeda, J.A. (Eds.), *La democracia del siglo XXI. Política, medios de comunicación, internet y redes sociales, Capítulo 10*, 211-229. Il Jornadas españolas de ciberpolítica, 28 de mayo de 2013. Madrid: Centro de Estudios Políticos y Constitucionales.

Peña-López, I. (2014b). "Innovació social oberta: l'organització política com a plataforma". In Costa i Fernández, L. & Puntí Brun, M. (Eds.), *Comunicació pel canvi social. Reflexions i experiències per una comunicació participativa, emancipadora i transparent*, 59-75. Girona: Documenta Universitaria.

Peña-López, I. (2018). "Fomento de la participación democrática no formal e informal. De la democracia de masas a las redes de la democracia". In Laboratorio de Aragón Gobierno Abierto (Ed.), *Abrir instituciones desde dentro. Hacking Inside Black Book, Capítulo 11*, 113-124. Zaragoza: LAAAB, Gobierno de Aragón.

Peña-López, I. (2019a). Convirtiendo participación en soberanía: el caso de decidim.barcelona. Barcelona: Huygens Editorial.

Peña-López, I. (2019b). "L'Estat com a plataforma: la participació ciutadana per la preservació de l'Estat com a bé comú". In *Nota d'Economia, 105*, 193-208. Barcelona: Generalitat de Catalunya.

Peña-López, I. (2020). "El impacto diferencial de las crisis en la Sociedad del Conocimiento". In Gutiérrez-Rubí, A. & Pont Sorribes, C. (Coords.), *Comunicación política en tiempos de coronavirus, Capítulo 25*, 142-147. Barcelona: Cátedra Ideograma–UPF de Comunicación Política y Democracia.

Raymond, E.S. (1999). *The Cathedral & the Bazaar*. (revised edition: original edition 1999). Sebastopol: O'Reilly.

Saveri, A., Rheingold, H. & Vian, K. (2005). *Technologies of Cooperation*. Palo Alto: Institute for the Future.

Scholz, T. (2016). *Platform Cooperativism. Challenging the Corporate Sharing Economy*. New York: Rosa Luxemburg Stiftung.

Schumpeter, J.A. (1943). *Capitalism, Socialism and Democracy*. (2003 edition). New York: Routledge.

Serra, A. (2013). "Tres problemas sobre los laboratorios ciudadanos. Una mirada desde Europa". In Organización de Estados Iberoamericanos para la Educación, la Ciencia y la Cultura, *Revista Iberoamericana de Ciencia, Tecnología y Sociedad, 8* (23), 283-298. Buenos Aires: Centro de Estudios sobre Ciencia, Desarrollo y Educación Superior.

Shirky, C. (2008). *Here comes everybody. How change happens when people come together*. London: Penguin Books.

Surowiecki, J. (2004). *The Wisdom of Crowds: Why the Many Are Smarter Than the Few*. London: Abacus.

von Hippel, E. (2005). Democratizing Innovation. Cambridge: MIT Press.

Zuiderwijk, A. & Janssen, M. (2013). "Open data policies, their implementation and impact: A framework for comparison". In *Government Information Quarterly, 31* (1), 17-29. London: Elsevier.

Zuiderwijk, A., Janssen, M. & Davis, C. (2014). "Innovation with open data: Essential elements of open data ecosystems". In *Information Polity*, *19* (1), 17-33. Amsterdam: IOS Press.