The London School of Economics and Political Science

The complexities of Government as a Platform, Co-production and Public Value Creation: the need of Public Value Orchestration

Andrea Paletti

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I confirm that Papers 1 and 3 were jointly co-authored with Dr Antonio Cordella and Paper 2 also with Dr Maha Shaikh. My contributions included literature review, data collection, analysis, important parts of the theoretical development, as well as writing. Dr Antonio Cordella provided critical guidance in the paper's overall direction, and needed support in focusing, refining and effectively communicating the paper for a top-journal audience.

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I can confirm that my thesis was copy edited for conventions of language, spelling and grammar by Dr Dagmar Myslinska.

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Papers included in the thesis

The thesis is presented as a series of papers that have been published. The three papers are accessible to the public only through the links to the journals for copyright issues. The papers were all researched, developed and written during my enrolment in the PhD in Information Systems and Innovation at the Department of Management, London School of Economics, during 2015-2019

1. Published as a paper: *Cordella, Antonio and Paletti, Andrea (2018) ICTs and value creation in public sector: manufacturing logic vs service logic. Information Polity, 23 (2). pp. 125-141. DOI: 10.3233/IP-170061*
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Abstract

This thesis aims to contribute to the literature that discusses the impact of e-government systems on the value that is created by public services. Specifically, this work sheds light on how Information and Communication Technologies (ICT) mediated co-production of public service offers innovative ways to produce public services and on the value they create. An in-depth analysis of how the Government as a Platform (GaaP) can enable co-production of services across the entire public administration is presented to support the proposed argument. The thesis is based on three published papers that discuss the limitations and the complexities of co-production enabled by ICTs and the specific case of the GaaP. The first paper explains that, although ICTs-mediated co-production helps to improve efficiency, it also reduces control over the public administration's action and hence it is not suitable to produce public services that need a high level of control to deliver the expected outcome. The second paper adopts the public value perspective and explains that, in order to create value for the public, it is necessary to overcome the siloed view of value creation and thereby to serve not only the need for greater efficiency but also all citizens' needs and expectations. Hence, when public agencies adopt ICTs-mediated co-production, they should also ensure a suitable level of control over the impact of public interests served by other public agencies. The third paper argues that the GaaP is constituted by multiple platforms and ecosystems which favour co-production of more services for citizens but also decrease control over the impact on other policy domains. The impossibility to control implications for other policy domains threatens public value creation. From the study of the Italian public administration that has recently adopted an e-government architecture based on the GaaP principles, it has emerged that to mitigate negative externalities of co-production, public agencies should adopt a governance mechanism called public value orchestration, which consists of continuous configuration of production in order to meet multiple needs and expectations.

Table of Contents

Introduction

This chapter outlines the key elements necessary to understand the research topic and the PhD's main contributions. The first section provides the context, outlines the gap in the literature and the PhD research question. The section also provides an overview of the recent evolution in public service production and explains the importance of public agencies' operational capabilities in evolving the production process and the public value creation process. The second section explains why technologies should not be regarded as neutral elements of the public agencies' operational capabilities and demonstrates how they influence the public value creation process. The third section discusses, more specifically, the technologies that form the focus of the research, and explains how their characteristics can affect the public value creation process. The fourth section presents the complexities of public value creation mediated by the above technologies and how it is possible to mitigate them. The final section presents the structure of the thesis.

1.Societal changes require a new model of production

Great economical, ecological, technological, political and social changes which transcend political and geographical boundaries have led to a progressive transition from an industrial society to a postmodern and complex society described by Beck (1994) as "risk society". The more interconnected and globalised society, together with the rise of complex problems such as global warming and the uncertainty about the future economic prosperity have put the lives of individuals, households and entire communities at risk. The inability of traditional beliefs and social support to help people cope with new societal and environmental adversities have led to the detachment of individuals from communities and social groups (Zuboff and Maxmin, 2002). As a result of the dissolution of the power of social groups over individuals, clients as well as citizens started to self-determine their own needs and expectations. Since the 1980s, the spread of neo-liberal ideologies has reinforced this trend towards transformation of citizens into clients, accentuating the importance to individuals of the private sphere over the public sphere of each individual (Benington, 2011). As distinct to citizens, clients do not actively participate to achieve a collective good but passively consume services and pursue the satisfaction of personal needs and expectations (Sennett, 1977; Hoggett, 2000; Marquand, 2004; Cooper and Lousada, 2005). In order to serve and satisfy personalised needs, industries have had to adapt their production processes (Zuboff and Maxmin, 2002).

Companies have transformed their manufacturing production line designed to serve standardised needs and expectations, into a more open and networked production system which has enabled clients to assemble together different options of services to meet their personal needs. According to Pekka Himanen (2001), networked production is the result of the informationalism of society that has significantly reduced transaction costs by allowing everybody to access means of production. In the past, the need to reduce transaction costs of exchanging goods in the market was solved by individuals forming companies or organisations which more efficiently organise needs and capabilities to facilitate the production and exchange of goods and services (Coase, 1937). However, the diffusion of Web based technologies has reduced transaction (Cordella, 2006; Chen, Su and Hiele, 2017) and production costs to a minimum (Bharadwaj, 2000) and individuals can now pursue their goals without the intermediation of a company (Kallinikos, 2011). The creation of a network of actors which interact to exchange and produce services has changed the logic of production of services and goods (Normann and Ramírez, 1995; Lusch and Nambisan, 2015; Best *et al.*, 2018). The networked production is multidirectional, spontaneous, unplanned, and involves unknown actors from different fields and countries (Stoker, 2006; Kallinikos, 2011; Negoita, 2018). Behind this change of production, there is also a change in work ethics. As discussed by Weber (1905), the Protestant ethic of work, which characterised manufacturing production, led employees to act in the production process to accomplish a duty, rather than for their personal satisfaction. On the other hand, in the networked production, actors (individuals, companies, NGOs, etc.) choose to participate in the production process for passion or because they believe in a common goal (Hertel, Niedner and Herrmann, 2003; Budhathoki and Haythornthwaite, 2012). Himanen (2001) and others call this new ethic as 'hacker' ethic of work. Himanen's conceptualisation of hackers goes beyond the free software movement born in the early 1980s. Hackers are all consumers who often work in communities to share information, pursue common projects, and create or modify existing (digital and non-digital) products in order satisfy needs or mitigate societal problems which the market or the state are unable to solve. This change of work ethics, together with the rise of personalised and fast-changing needs, represent a drastic societal change which has induced many organisations to review their model of organisation and processes of production. For example, many companies, primarily in the digital market, have left a centralised model of production and have started working with communities of developers to create more options of services and products for their clients. Similarly, public administrations have begun adapting their model of organisation to produce services able to create value for new generations of citizens.

1.1 The public administration evolution to meet citizens' needs

Over the past century, public administrations have evolved their organisational model to adapt their production process of public services and to meet citizens' emerging needs and expectations. In order to understand how the adoption of a new model of organisation of public administration impacts value creation for the public, Moore (1995) invites us to envision the production process as public value chain constituted by a collection of activities performed by a public agency to create value (Benington and Moore, 2011b; Osborne, 2018). The role of public agencies which constitute the public administration is to link all the production activities or tasks, in order to add a specific value to the public services, which then they propose to citizens. Each public agency is in charge to serve different policy domains, such as healthcare or education, and then to pursue a specific aspect of what is valuable for the public. In order to meet citizens' needs, public agencies need to pay particular attention to the production configuration because it determines the characteristics of the service and then the type of value created for the public (Crosby, 't Hart and Torfing, 2017). Since over the past decades citizens' needs have changed, the production configuration of public service has also evolved.

During the 19th and 20th centuries, the state and society used to profoundly influence citizens' needs and their perception of value for the public (Zuboff and Maxmin, 2002). As a consequence, citizens used to have predictable, stable and objective needs (Benington and Moore, 2011b) that could be easily standardised according to a predefined list of public needs. Most of these needs were related to the public welfare (public health, education, safety, etc.), and in certain countries also to the basic democratic principles of equality, transparency and fairness. The traditional model of public administration often described as a bureaucratic organisation has proven to be particularly suitable to configure a production process able to meet the above needs and to create value for the public. Indeed, the bureaucratic model of production is characterised by precise norms and regulations which effectively coordinate the mass production of public services and also ensure a high level of standardisation of each step of production. The characteristics of the bureaucratic production process based on the linkage of different standard activities result in a public value chain able to embed efficiency, equality, fairness, and transparency into public service used by citizens.

The diffusion of neoliberal ideologies in many western countries led citizens to become mere clients of the public administration. This switch of focus from citizens to clients is due to the major emphasis that neoliberal reforms put on the creation of economic value for individuals. The supremacy of

economic value creation for individuals over the achievement of value for the public reduced the difference between public agencies and private companies to the minimum. De facto, the new organisational model of public administration summarised by the New Public Management (NPM) approach led public agencies to behave as companies. The NPM reshaped the production process according to corporate business logics which aim to create value for clients by offering more outputs for lower costs. In fact, similarly to companies, public agencies' main objective was to assemble different resources and production activities to shape an efficient value chain able to create more economic value for each citizen.

In the last two decades, the search of economic value has become insufficient to create value for the public. The neoliberal reforms have been ineffective to prevent and mitigate the economic crisis, and the rise of complex problems, such as global warming, pollution, terrorism, natural disasters and pandemics, have shown that the pursuit of economic prosperity should be combined with the reach of other societal goals (Mazzucato, 2018). In this new societal context, citizens have started to evaluate not only the efficiency of public services but also their impact on other values such as safety or a clean environment which belong more to the public sphere of each individual (Benington and Moore, 2011b; Page *et al.*, 2015; Osborne, 2018). Moreover, as a result of a more globalised and interconnected society, citizens' needs have become so variegated and fast-changing, that formally elected governments often do not represent people's needs. According to the public value approach, in order to create value for the public in this novel socio-political environment, public administration has to rapidly adapt its model of organisation and also offer multiple options of public service to serve several needs. This means that it is crucial for public agencies to continually adapt or assemble different production activities to shape a public value chain able to create the value that the public expect.

1.2 The importance of operational capabilities

The possibility to adapt or change the public value chain, and create value for the public depends on the operational capabilities which determine what public agencies can or cannot produce (Moore and Khagram, 2004; Benington and Moore, 2011b). The operational capabilities are contingent on the operational resources available in a public agency. More resources correspond to more possibilities to assemble different options of production processes and result in more operational capabilities (Moore, 1995; Alford and O'Flynn, 2009; Johnson and Galea, 2009; Benington and Moore, 2011a). Moore (1995) identifies four types of organisational resources which affect the operational capabilities of a public agency: skills, finance, human resources, and technology (Moore,

1995; Benington and Moore, 2011a). Skills refer to general and specific organisational competencies of each public agency. General competencies are the skills that all public agencies should have, such as the ability to innovate, to coordinate different actors or to acquire resources necessary for the production process (Pang, Lee and DeLone, 2014; Goh and Arenas, 2020). Specific competencies are the organisational skills required to serve their policy domain. Finance refers to the funds that each public agency requires to run its operations and buy new organisational assets. Human resources refer to the personnel involved in the production process that can have different educational and physical characteristics according to the policy field in which public agencies operate. Technology mostly refers to Information and Communication Technologies (ICTs).

Public agencies adopt ICTs to automatize the production process and increase production efficiency, producing more outputs without acquiring new operational resources (Pang, Lee and DeLone, 2014; Crosby, 't Hart and Torfing, 2017). Technology can also enhance operational capabilities and lead to the disruption of the original public value chain, suggesting new ways to serve citizens' needs (Benington and Moore, 2011b). Thanks to the diffusion of the internet, ICTs have also enabled the acquisition of additional organisational resources from external actors in order to enhance public agency operational capabilities. In fact, ICTs simplify collaboration with public and private actors because they reduce information asymmetries among actors (Cordella, 2006; Bertot, Jaeger and Grimes, 2010; Persson and Goldkuhl, 2010). More available information reduces coordination and transaction costs and facilitates the exchange of goods and services. Hence, thanks to ICTs public agencies can configure new forms of production, collaborating with other public agencies or with non-public actors such as companies, NGOs or citizens (Moore, 1995; Moore and Khagram, 2004; Stoker, 2006). According to the type of actors public agencies collaborate with, it is possible to distinguish two primary forms of collaboration. Collaboration among public agencies at a different levels of governments (local, national and international), known as vertical collaboration, consists in sharing organisational resources and in producing public services jointly (Ling, 2002; Keast, 2011; Hodges, 2012). Alternatively, public agencies can also collaborate horizontally, by involving non-public actors to share their resources with public agencies or in co-producing public services (Bovaird and Loeffler, 2012; Eriksson, 2012; Pestoff, Brandsen and Verschuere, 2013).

Although co-production is not new in the public management literature (Brandsen and Pestoff, 2006; Alford, 2009a; Armitage *et al.*, 2011; Pestoff, Brandsen and Verschuere, 2013), in the last two decades, participation of external actors in the production of public services has become critical to provide public agencies with the operational capabilities necessary to deal with complex challenges

that the public administration alone cannot manage (Stoker, 2006; Mazzucato, 2018). In fact, thanks to ICTs, public administration, market and society have become more interdependent and can easily collaborate to create greater value for citizens (Pestoff, Brandsen and Verschuere, 2013; Dickinson, 2016; Howlett, Kekez and Poocharoen, 2017). The digitalisation of society has in fact not only simplified collaboration among actors, but it has also enabled both public and private organisations to assemble complex products and services constituted of several layers or components produced by a network of variegated actors (Yoo, Henfridsson and Lyytinen, 2010). In these mutated production conditions, distinctions between producers and consumers of public services are no longer accurate or realistic (Stoker, 2006; Chatfield and Reddick, 2020) because potentially all actors can add value to the public value chain and then help to satisfy more needs. As a result, the public value chain is not always linear and straightforward as in a typical manufacturing line, but instead, it can also be open and networked (Stoker, 2006; O'Flynn, 2007; West and Davis, 2011).

A more open and networked production of public services can provide the operational capabilities which public agencies need to potentially meet all citizens' needs and expectations. However, the impact of ICTs-mediated co-production has been usually discussed in terms of economic efficiency but not in terms of public value creation. The creation of public value is not limited to the satisfaction of economic interests, but also of other public interests such as health, safety, or education. Therefore, the main research question of this PhD thesis is *how does ICTs-mediated co-production impact the creation of public value?* The research question aims to explain how ICTs-mediated co-production impacts the overall public value process described by Moore (1995). In order to answer this question, it is necessary first to contextualise the research question in public management, e-government and information systems literature. The next sections explain how contributions from the three literatures complement each other and what is the main PhD research proposition.

1.3 The public value creation process

In the public management literature, there is a diffused opinion that a more open and networked production can help to create more value for the public than a closed production process (Osborne, 2010; Bao *et al.*, 2013; Pestoff, Brandsen and Verschuere, 2013; Negoita, 2018). This common view builds on the idea that the acquisition of more operational resources from external actors would enable public agencies to produce more options of services for citizens at lower costs. However, according to the public value literature "the more, the better" principle is not sufficient to create value for the public for two main reasons.

Firstly, the value created for the public cannot be calculated by looking at the input/output ratio because more services do not always mean more value for the public. Citizens perceive as valuable not only the quantity or costs of services but also other values such as safety or environmental protection embedded in the service proposition. Therefore, public agencies should use their operational capabilities to configure production activities to meet multiple and fast-changing needs.

Secondly, the way in which public agencies configure the public value chain is not only influenced by citizens' needs, but it is also affected by other forces which can be other public interests or simply other contextual factors. In fact, public agencies do not operate in isolation but in a specific environment where there are multiple actors at different levels of Government that can influence - through regulation, policies, and reforms - how public agencies can configure the production of services. This is the reason why given the same needs and operational capabilities, the configuration of public service production which is successful in certain countries might fail to create value for the public in other countries. The importance of contextual factors and actors in the value creation process is well-known in the business management literature which invites companies to be "locally responsive" by evaluating the production process not only according to what is operationally feasible but also based on the local needs and other contextual factors such as Government, type of market or demographics (Zeithaml and Fry, 1984; Porter, 1997; Chandler and Vargo, 2011; Belton, 2017; Arana-Solares *et al.*, 2019; Khan and Mir, 2019).

To help public sector managers to address these complex challenges, Moore (1995) provides a strategic framework: the strategic triangle of public value creation. Moore's framework is conceptualised to help public agencies visualise the three main aspects of the public value creation process and configure the public value chain considering not only what they can operationally do to satisfy citizens' needs, but also what the different contextual factors allow them to do (Weinberg and Lewis, 2009; Benington and Moore, 2011a).

The first aspect of the framework refers to the primary need of public agencies to define the strategic goals that should be pursued to create public value. Because citizens are the only arbiter of public value, the definition of strategic goals consists of observing citizens' needs and evaluating their level of satisfaction about public services performance (Benington, 2011; Benington and Moore, 2011a).

The second and most important aspect of the public value creation process is to explore the environment where the public agency operates. Although public agencies have a formal mandate from legislation and/or policies, they still need to build sufficient support among all the actors that constitute the authorising environment such as political bodies (municipalities, Ministry, cabinet etc.), other public agencies, relevant interest groups (professional associations, unions, lobbies) and others (the media, NGOs, universities, group of citizens etc.) (Mintrom and Luetjens, 2017). All these actors can formally (e.g. through policies, regulations or protocols) or informally (e.g. through strike or protest) influence the configuration of the public value chain and then affect the value creation process. Therefore, public agencies need to engage the above actors to gain awareness of all the interests involved and to understand under which conditions they can legitimately pursue their strategic goals.

The third aspect refers to the operational capabilities which determine what the public agency can materially produce (Moore and Khagram, 2004; Weinberg and Lewis, 2009).
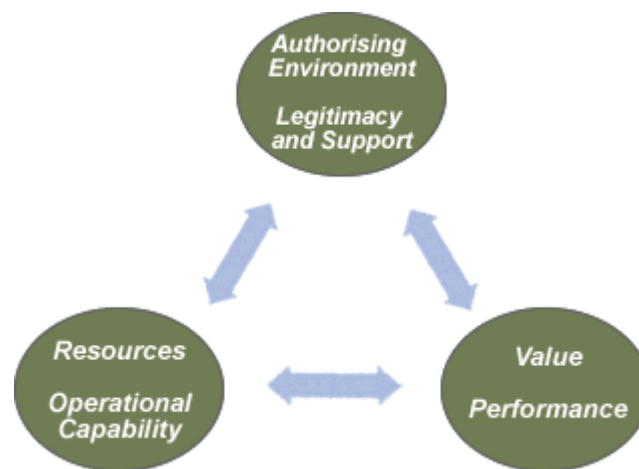
Figure 1: Strategic Triangle of Public Value Creation (Moore 1995)

The configuration of the public value chain is the result of a process of negotiation across different aspects of the public value creation process indicated by the strategic triangle (Moore and Khagram, 2004; Meynhardt, 2009). Public agencies need to negotiate a workable trade-off between what citizens want, the different public interests of the authorising environment and what is operationally feasible (De Graaf, Huberts and Smulders, 2016). In many public agencies which have adopted e-government systems to better produce public services, the above process of negotiation is not straightforward, but rather, it is mediated through technology. Differently from Moore's

conceptualisation, technology adoption in the production process is not neutral and apolitical. Public agencies design ICTs systems to serve specific purposes, interests, logics of production, and public values, and therefore can enable or constrains certain production configurations (Cordella and Iannacci, 2010). For example, the e-government system designed to support the England and Wales criminal justice system was designed not to exchange data with the police. The Criminal Justice Act 2003 reformed the relationship between the police and prosecutors to favour more collaboration. However, the previous e-government system, designed with opposite goals, initially represented an obstacle which influenced the new production configuration proposed by the reform (Cordella & Iannacci, 2010). Therefore, ICTs systems are carriers of value propositions which can affect how public agencies organise their public value chains. Moreover, e-government systems are often composed of several technological components. Hence, public agencies need to trade-off different interests and values which the different components of e-government systems embed. The evolution from siloed e-government systems usually based on in-house components to more networked and layered ICTs systems has further increased the complexity of public value creation because most of the components of e-government systems are not built within the boundaries of the public agencies but instead are sourced by external actors.

Hence, when public agencies assemble different technological components to configure the production of public service, they need also to coordinate interests and values pursued by external actors, which are also mutable. As a consequence, in order to create public value, public agencies need to simultaneously: 1) configure e-government systems to serve their public interests and values; and 2) coordinate multiple interests embedded in the different technological components of their e-government systems to maximise public value creation. In this acceptation, ICTs systems mediate the public value creation process both as enablers to pursue specific values, and as instruments to balance the multiple interests carried by the other digital components. The trade-off among all the different interests embedded in the digital components is not a sum or subtraction of interests, but the result of a continuous negotiation which takes into account multiple situated factors and priorities in order to find the optimal production configuration to create public value. This latter perspective of how ICTs system impact the public value creation process has not been sufficiently addressed, even if e-government systems are becoming more networked and modular than in the past (Panagiotopoulos, Klievink and Cordella, 2019). It implies that the impact of production configuration of public services mediated by ICTs should be studied according to an

integrated perspective which includes the perspective of technology both as a carrier of interests and as an instrument to coordinate different interests to reach a specific public value goal.

2. The impact of technology on public value creation

Public value literature, as well as many public managers, have often considered technology as a malleable organisational asset which could automatize certain tasks and improve the overall production efficiency (Moore, 1995; Moore and Khagram, 2004; Benington and Moore, 2011a; Bryson *et al.*, 2017). According to this perspective, the impact of e-government systems on the production of public services and on the creation of public value depends on the technical characteristics of the ICTs systems. Consequently, the value created by e-governments systems is the result of the sum of its technical features. For example, comparing two e-government systems, the one with more processing power, a higher speed of communication and greater storage capabilities will automatically improve the efficiency and then generate more value for citizens. Similarly, the adoption of the same ICTs systems which have been successful in a public agency or company will also be considered automatically successful in other organisational contexts since the technology is expected to generate the same types of effects on the production process. Hence, following this perspective, looking only at the technical characteristics of ICTs system, it is possible to predict and generalise how technology can contribute to public value creation. However, studies have revealed that the technological impact on production configuration is more complex and cannot be easily generalised by only looking at the technical characteristics of e-government systems (Bonina and Cordella, 2009; Cordella and Willcocks, 2010; Scott, DeLone and Golden, 2016).

In fact, when public agencies design and develop e-government systems, they assemble and connect different technical and organisational components to reach specific political goals (Lanzara, 2009). Therefore, two public agencies can adopt e-government systems with similar technical characteristics (e.g. processing power, storage, etc), but they are likely to configure the production of public service differently because they are pursuing different sets of public value goals. The process of configuration of public service production consists in designing and developing e-government systems according to logics of production, values, interests, procedures as well as regulations typical of the organisational context where public agencies operate. Once all these elements are embedded in the components of e-government systems such as algorithms, data standards or web interfaces, then technology starts mediating the entire production process, influencing the public value creation process. For example, based on a set of parameters, political

interests and logics embedded during the production configuration process into an algorithm, e-government systems can automatize government spending and reduce corruption – such as ChileCompra, the procurement system of Chile that has digitalised most of the public administration procurement process (Bertot, Jaeger and Grimes, 2010). Thanks to the mediation of technology, each step of the process is mapped and can be checked by both government officials and citizens, leaving public officials no possibility to manipulate the process. The adoption of ICTs systems in the production of services then enhances control over the production process because it hides from public officials the logics or goals embedded in the system and forces them to perform specific tasks (Bovens and Zouridis, 2002; Kallinikos, 2005). Thus, the automatization through ICTs of certain production tasks increases both the efficiency of the production process and the control public agencies have over the public value chain because it reduces at the minimum the discretionary power of public officials which allows them to modify how the service is produced. However, the control power offered by ICTs system to public agencies not only depends on the logics, regulations, and decision-making tasks embedded in the system, but also on how public agencies configure the overall production of public services (Lanzara, 2009; Cordella and Iannacci, 2010).

The strength of the e-government system control power is not the same and cannot be generalised because the way in which e-governments are designed and operate depends on the interaction between the organisational layer (constituted by regulations, policies, and protocols etc.) and the technological layer (Helbig, Ramón Gil-García and Ferro, 2009). The two layers are deeply intertwined, and any change in one of the two layers leads to changes in the other (Luna-Reyes *et al.*, 2005; Heeks and Bailur, 2007; Lanzara, 2009). Changes in one of the two layers or in both are related to changes to the public service production configuration. The production configuration continuously mutates because the creation of public value is negotiated according to what citizens want, the different interests, the resources available and what e-government systems can support (e.g., Cordella & Iannacci, 2010; Janssena et al., 2009). Based on how public agencies reshape the production configuration, the control power offered by the e-government systems also change. As a consequence, a different configuration of the production mediated by an e-government system can increase or decrease the discretionary power public officials or other actors have on the public value creation process. For example, in many American cities like Los Angeles or New York, the police has adopted e-government systems that analyse data about past crimes to predict future crimes (Karppi, 2018). In the initial production configuration of the policing service production, the system was often considered the sole source of information to plan policing activities. Changes in

political views led to considering an extensive use of predictive policing unethical; hence, the policing service was re-configured accordingly. In the new production configuration process, an e-government system's use to predict crime become one of the sources relied on by police officers to plan policing activities (Hardyns and Rummens, 2018). Therefore, the same e-government systems which embed the same logics, regulations and values can have different regulative power on the creation of public value according to how public agencies configure the public service production process. Moreover, the previous example shows that public agencies are not free to set production configuration, but are conditioned by contextual factors such as new or pre-existing regulations, laws, political interests, logics of production etc.

In fact, public agencies do not configure public services from scratch. When public agencies configure production of public services, they first have to deal with pre-existing regulations, political interests, organizational resources and e-government systems. Public agencies adapt or change the production configuration mediated by ICTs through a process of negotiation with the value propositions embedded in the pre-existing e-government system. While the value proposition of production configurations that do not involve technology can be changed, the ones mediated by e-government systems might be frozen in the architecture of ICTs systems (Kallinikos, 2004a; Lanzara, 2009). Therefore, past ICTs design choices to pursue public values which are no longer appreciated by citizens can still condition existing production configuration and the public value delivered to citizens. For example, many e-health systems initially developed to support a siloed production logic represent today an obstacle to support a more collaborative provision of public health services (France, Taroni and Donatini, 2005; Robertson *et al.*, 2011). In fact, the design, technical standards and protocols that constitute many e-health systems were originally developed to serve other logics or goals which are incompatible with the current ones. E-government systems can then lock-in public agencies to old public value propositions or condition the future ones (Lanzara, 2009). However, the level of lock-in dynamics influences on public services production configuration is not generalisable because it is the result of a process of negotiation between previous and new production configurations which is different in each context. An emerging technical solution to easily configure the production of public services by mitigating lock-in dynamics it is to move public agencies' e-government systems from a siloed architecture to a modular and open architecture (Janssen and Estevez, 2013).

Open architecture favours the creation of e-government systems constituted by modular components which public agencies can easily assemble and dissembled like LEGO bricks (O'Reilly,

2011; Thompson, Ravindran and Nicosia, 2015; Brown *et al.*, 2017). The possibility to combine and recombine modules ad infinitum allows public agencies to re-configure the public value chain easily according to citizens' needs, without the risks to remain locked in with previous production configurations. Moreover, open architecture allows public agencies to access and reutilise existing modules/services developed by third parties without the need to create ex-novo services which are already available on the market. For example, instead of developing a payment module for its e-government system ex-novo, a public agency would likely re-use the ones offered by other public agencies or companies, in order to save money and time. However, if the owner of the module changes how the payment service works (e.g. it starts accepting only debit cards) then, this would also affect the overall production configuration and the public value creation process of the public agency that has adopted it. Therefore, the possibility to configure the production as public agencies want only apparently increases control over the public value chain because more open and interoperable systems are also more difficult to control. Furthermore, e-governments systems designed according to an open architecture can also serve as a base to enable a massive network of external actors to co-produce thousands if not millions of modules/services on top of their core services. Although more modules represent more opportunities and resources to offer value for citizens, they also represent a challenge for the public agency that is responsible for the public value creation process. For example, Greater London Authority developed London Datastore, an e-government system to enable a network of actors to use the city's data about transportation, criminality, education, healthcare etc., to co-produce services (Coleman, 2013). Nevertheless, suppose that thousands of services are built on top of that e-government system. In that case, it becomes difficult for public agencies that own e-government systems to ensure that all external actors are contributing to the creation of public value. Thus, public agencies should configure the public service production to address or properly regulate the contributions of internal (e.g. public agencies in the same public administration) and also external actors (e.g. citizens, companies, NGOs, etc.) in order to maximise public value creation.

Therefore, public agencies that adopt open architecture can hypothetically create more public value because they can easily configure public service production and at the same time enable the co-production of public services on a large scale. However, public management literature as well as e-government literature have not considered the complexities related to an open architecture which can potentially threaten public value creation. As discussed by IS literature, ICTs systems based on an open architecture are constituted by different technological and organisational layers which are

categorised as infrastructure, platforms and ecosystems (Hanseth and Lyytinen, 2008; Ghazawneh and Henfridsson, 2012). The next section explores the differences and the relationships between infrastructure, platforms and ecosystems and how they interact. The discussion will better clarify the complexities related to how ICTs-mediated the co-production of public services and their impact on public value creation.

3. Infrastructures, platforms, ecosystems

In e-government literature, differences between digital infrastructures and platforms and their effects on the public value creation process have not been discussed at length. The terms 'infrastructure' and 'platform' are often considered as interchangeable (Janssen *et al.*, 2009; O'Reilly, 2011; Janssen and Estevez, 2013; Joseph and Avdic, 2016; Okunola, Rowley and Johnson, 2017; AlSayegh, Hossan and Slade, 2019). In fact, both infrastructure and platforms appear to have a dual role: 1) connectors of a network of heterogeneous actors, and 2) enablers for the co-production of diverse and unforeseen services.

As connectors, they facilitate a network of actors to interact through a set of components which allow the exchange of data (Tilson, Lyytinen and Sørensen, 2010; Grisot and Vassilakopoulou, 2013; Henfridsson and Bygstad, 2013; Plantin *et al.*, 2018). As enablers, infrastructure and platforms are the common foundation or the core building block which provides an essential service/functionality to multiple other modules or components for other services and uses (Hanseth and Lyytinen, 2010; Tilson, Lyytinen and Sørensen, 2010; Grisot and Vassilakopoulou, 2013). In both roles, all the network activities co-produced are mediated by infrastructures and platforms. Therefore, changes at the core service/foundation would impact all the activities built upon it (Contini and Lanzara, 2008).

However, even if infrastructures and platforms have apparently the same roles, they are not the same because they offer a different level of control over the co-production of public services (Plantin *et al.*, 2018; Rossi and Sørensen, 2019). Therefore, their impact on the public value creation process has fundamental differences.

3.1. Digital Infrastructures

One of the historical roles of public administration was to build and maintain public infrastructures such as electric power grids, water pipes, highways, underground transport, railways etc. (Hughes, 1987; Plantin *et al.*, 2018). These infrastructures act as deep foundational structures of society. Hence, when public agencies modify infrastructures' design or their functioning, this impacts all the

societal activities (Hughes, 1987; van der Vleuten, 2004) built on top of the infrastructure. Infrastructures and their influence on the value created by societal activities can be studied according to two main perspectives: as pure technical and engineered systems with effects on society that can be predicted by looking at their technical characteristics; or as large technical system (LTS), composed of several heterogeneous technical and organisational elements that interact with each other, generating unpredictable effects for society (Bijker, Hughes and Pinch, 1987; Plantin *et al.*, 2018). Through the lens of LTS, infrastructures such as power grids are studied as socio-technical systems which include technical components such as cables and high voltage poles, and by organizational components such as law, regulations, standards, and business strategies. All these components are assembled by public administration, which acts as a system builder (van der Vleuten, 2004). As a system builder, public administration pursues an agenda which aims to deliver certain public goals. These public goals are inscribed in the technical features of infrastructures to generate certain organisational routines and to address the behaviour of third parties that use the infrastructure (Hughes, 1987). Once the technical features are live, then they often shape the organisational layer - for example, making some development paths technically more difficult, while others easier to accomplish (Aanestad *et al.*, 2017).

The diffusion of information systems in society has led public administration to develop digital infrastructures such as e-health or e-justice systems which today represent the foundational layers of many public services co-produced by a network of public and private actors (Antonio and Francesco, 2012; Bygstad and Hanseth, 2016; Fragidis and Chatzoglou, 2017). The most important and diffused example of digital infrastructure developed by a public administration is the Internet. During the 70s, the American public administration acted as a system builder, when the US Defense Department's Advanced Research Projects Agency (DARPA) and the US National Science Foundation (NSF) developed the Internet to permit scientists to share supercomputers available only in few research centres (Plantin *et al.*, 2018). The internet as a socio-technical system was composed of technical components such as processors and cables, and of social elements, for example, intra-agency agreements or protocols to use the infrastructure (Hanseth and Lyytinen, 2010; Plantin *et al.*, 2018). Similarly to many public infrastructures, the internet was initially centrally designed by public administration. In fact, DARPA and NSF assembled all of the Internet's technical and organisational components to reach specific public goals. However, when users and third-party developers had the opportunity to access the Internet infrastructure, they also started to modify or

extend the infrastructure to co-produce services and reach their own goals (Plantin *et al.*, 2018). The extension of the Internet beyond the initial design has been possible through the linkage of the existing infrastructure with external systems assembled by external actors (Hanseth and Lyytinen, 2010; Plantin *et al.*, 2018). The existence of standards enabled the linkage of the Internet with third parties' systems. Explicit and shared standards are centrally imposed by those who design the infrastructure or by those that win the "standard competition" within the network of actors that use public infrastructures like the Internet or power grids (Schilling, 1998; Hodgson and Cicmil, 2007; Fomin and Matinmikko, 2014). In the case of power grids, the example of a standard that became dominant is AC/DC power converters, while in the case of the internet the most important standard became the Transmission Control Protocol/Internet Protocol (TC P/IP) (Plantin *et al.*, 2018). AC/DC power converters and TCP/IP have become fundamental to expanding power grids and Internet infrastructure because they tend to act as gateways.

Standards are often described as gateways because they act as links or connectors between components, objects, data and systems, and are essential for the growth of digital infrastructures (Hanseth and Monteiro, 1997; Fomin and Matinmikko, 2014). The way in which standards mediate the linkage among different systems is not simply a technical issue but the result of a process of negotiation which involves both technical and organisational components of digital infrastructures. One or multiple actors that use or manage digital infrastructures translate and inscribe their interests into standards to reinforce specific logics, rules, law, models of business etc., and to intentionally steer the infrastructure towards certain development paths (Hanseth and Monteiro, 1997; P. N. Edwards *et al.*, 2007). In fact, standards have the power to harmonize interests of the actors (public agencies, companies, citizens, regulators etc.) that participate in the development of the infrastructures according to specific principles (Grisot and Vassilakopoulou, 2013; Constantinides and Barrett, 2015). The process of harmonization of third parties' systems consists in designing or adapting their systems according to a single mode of interaction, which allows integration with the digital infrastructures (Fomin and Lyytinen, 2011). Therefore, the process of connection is not straightforward, but rather, it is the result of a process of negotiation between standards and external systems that aim to be integrated within the infrastructure (Bekkers and Liotard, 1999). When the systems are combined with the digital infrastructure, they become inseparable and result in new socio-technical dynamics.

The integration of different systems within a single infrastructure is accomplished only when all technological and organisational parts are linked together and harmonized in technological and organisational terms (Geels, 2002). Without the mediation of standards, digital infrastructures are just a collection of separate independent systems which cannot exchange information or work as a single integrated system (Aanestad *et al.*, 2017). The inability to connect a digital infrastructure with other systems impedes the ability to evolve or innovate infrastructure's functionalities to meet emerging needs or to adapt to a changing environment (Hanseth, 2001). National e-Health systems are a typical example of digital infrastructure that in many countries struggles to expand. The Ministries of Healthcare of many western countries have invested in national digital infrastructures to allow the exchange of patients' electronic healthcare records among different public and private hospitals (O'Keefe, Greenfield and Goodchild, 2005; Pirnejad *et al.*, 2007; Constantinides and Barrett, 2015; Margheri *et al.*, 2020). However, years of decentralisations have favoured the proliferation of different standards for electronic healthcare records which have made hospitals unable to exchange data through a single national digital infrastructure (O'Keefe, Greenfield and Goodchild, 2005). The impossibility of integrating the hospitals' systems with the national e-Health systems decreases the value that the entire national health system can create for citizens (Dunleavy, 2005).

The adoption of common standards among actors that belong to the same domain, such as the healthcare domain, is thus fundamental to coordinating multiple actors and to enable third parties to transcend boundaries of the infrastructure and develop new functionalities. In fact, digital infrastructures are often conceived to be potentially never finished or completed (Zittrain and Lessig, 2009; Tilson, Lyytinen and Sørensen, 2010). Standards embed a set of potential socio-technical practices which actors can enact to add unforeseen properties, services, products, or contents (Hanseth *et al.*, 2006). However, while actors attempt to enact the infrastructure to configure the production process and pursue their goals, they are not isolated. The design and evolution of digital infrastructure is an ongoing and situated process that can be compared to the realization of a puzzle or a collage (Ciborra *et al.*, 2001). This process involves a multitude of human, technological and organisational actors interacting with each other and with the external environment (Ciborra *et al.*, 2001; Braa *et al.*, 2007; Tilson, Lyytinen and Sørensen, 2010). These interactions are unplanned, and the ongoing negotiations among all the actors that participate in the infrastructure evolution can lead to an unexpected outcome (Ciborra *et al.*, 2001; Fomin and

Matinmikko, 2014). This continuing process of expansions and co-production is the result of the generative mechanisms of digital infrastructure. The generative mechanism describes the dynamics through which external actors enact all the possible options of production configuration offered by digital infrastructure to create, generate, expand and produce a new structure without any input from the builder of the system (Zittrain, 2006; Henfridsson and Bygstad, 2013).

In terms of generativity, there are some fundamental differences between digital infrastructures and classical infrastructures (Tilson, Lyytinen and Sørensen, 2010). Electric or water utilities cannot generate different types of infrastructure or co-produce alternative new services, while digital infrastructures can enable third parties to develop alternative types of services or digital infrastructures. The explanation of this difference is mainly related to the nature of data. In fact, both water and electrons have fixed physical properties which limited their generativity to certain domains. Conversely, properties of data are not fixed but are negotiated and arranged by those actors that use digital infrastructure (Kallinikos, Aaltonen and Marton, 2010). Third parties can repackage, combine and recombine data in infinite forms (Kallinikos, 2006a). Although third parties can potentially use data to generate many types of services or to extend digital infrastructures, access to digital infrastructure is not fixed but depends on the flexibility and openness of digital infrastructures (Tilson, 2008). In fact, the flexibility and openness of digital infrastructure is the results of socio-technical and regulatory arrangements embedded in standards. For example, strict protocols or regulations agreed by infrastructures' owners and embedded within standards can reduce this openness, and thus impact the level of generativity.

The design and configuration of standards impact the level of openness and control, and thus affect the level of generativity. Infrastructures that have more open standards which enable multiple paths of infrastructure development or evolution are often able to generate more services and more value (Grisot and Vassilakopoulou, 2013). However, more openness also corresponds to lesser control. The relationship between openness, generativity and control creates a phenomenon defined as the paradox of control (Tilson, Lyytinen and Sørensen, 2010). According to this paradox, when digital infrastructures are open, they favour the expansion and co-production of services. However, the decentralised infrastructure evolution and production of services results in allowing a network of actors to address the development and co-production of infrastructure. As a consequence of this major freedom, infrastructures might deviate from their original purposes and might follow other

path dependencies (Ciborra *et al.*, 2001). The way in which infrastructures' owners correct their development paths is by adapting or creating standards, such as legislation or protocols often embedded in the technical components (Hanseth and Lyytinen, 2010). Once these standards start mediating the interaction with external actors, they start conditioning the opportunities of production configuration and then the value creation process.

Following the previous example, the Ministries of Healthcare can enable private and public hospitals to share electronic healthcare records through a single digital infrastructure, but they cannot control how hospitals' systems use and process patients' medical data (King, Smith and Williams, 2012). External actors can potentially misuse medical data and co-produce services which generate negative public value (Shenoy and Appel, 2017). Hence, the only action that the Ministry of Healthcare can take is to modify or introduce new standards to prevent or mitigate the generation of negative value or to steer the network towards a certain development path. By introducing and modifying standards, public agencies do not intervene directly in the co-production process, but instead "cultivate" the production configuration to address and limit co-production of services within certain boundaries (Ciborra, 1997; Constantinides and Barrett, 2015). However, if control over the infrastructure is completely removed from the public administration to the network, the process of cultivation can be difficult. External heterogeneous actors such as company associations, groups of users or a single company might have the power to impose standards in certain digital domains and then to influence the value creation process.

In the public sector, 40 years of neoliberalist reforms have weakened the control of public administration over many digital infrastructures. The need to cut public spending has forced public administration to stop investing in digital infrastructures which have been usually considered too risky from a financial perspective (Mazzucato, 2011). Powerful private actors such as Google, Facebook or Amazon have filled the infrastructural gap left by the public and have invested their own funds to build digital infrastructures which today have become the pillars of the services co-produced in many public domains such as transportation and communication (Plantin *et al.*, 2018). As a result of the privatization of many digital infrastructures, the public administration has lost the role of being a "system builder" and has become a regulator of the market enabled by privately owned infrastructures. However, differently from classical infrastructures such as power grids or highways, digital infrastructures like the Internet are a complex assemblage of a large number of

heterogeneous technical and organisational components often developed by third parties which continually shape each other (Edwards et al., 2007). The above complexity generates high asymmetry of information, which makes it difficult for public administration to control or regulate how third parties use the infrastructures (Zuboff, 2018). An example is the European Union Directive about "the right to be forgotten". The distributed and unstructured architecture of the internet has favoured a decentralised production of data and therefore, the enforcement of this Directive represents a challenge for the public administration of many EU countries (Bennett, 2012). The impossibility of directly controlling and addressing the co-production of services might result in a higher risk that digital infrastructures might drift away from the public administration agenda to pursue other interests.

Therefore, the need to enhance control over the production of public services mediated by ICTs has become critical for public administrations which have started to invest in open architecture based on platforms. Differently from digital infrastructures, platforms allow the coordination of multiple actors and co-production on a large scale, but offer higher control over the value created.

3.2 Platforms

The transition from infrastructures to platforms has never had a univocal explanation (Rossi and Sørensen, 2019). However, platforms are often considered as built on top of digital infrastructures like the Internet to facilitate control over the transmitted data among different actors (Hanseth and Lyytinen, 2010; Plantin *et al.*, 2018; Helmond, Nieborg and van der Vlist, 2019). In fact, digital platforms organise, aggregate, and coordinate user-generated content exchanged among heterogeneous actors through digital infrastructures. According to this perspective, private and public organisations have invested in platforms to introduce control points on top of digital infrastructures and to monitor and address free flow of data among distributed actors. Another perspective considers platforms as a new organisational model which can boost innovation and co-production on a large scale. In the mid-1990s, the term 'platform' started getting diffused in the tech industry as synonymous with interoperability and co-production. Microsoft described its Windows operating system as a platform which could connect and become interoperable with other digital products developed by third parties. During the following years, other companies such as Google, Spotify, Uber and Airbnb followed and evolved the platform model which in two decades has transformed the global economy (O'Reilly, 2011; Zuboff, 2018; Cusumano, Yoffie and Gawer, 2020). Governments have also invested in developing digital platforms for their public

administration to facilitate the co-production and innovation of alternative options of public services (O'Reilly, 2011; Fishenden and Thompson, 2013). All the digital platforms developed by the market and by the Government share common dynamics and characteristics which can be studied according to different theoretical perspectives.

Economic literature approaches platforms as intermediaries that mediate transactions between two groups of actors such as buyers and sellers (Rochet and Tirole, 2003; Boudreau and Hagiu, 2009). As intermediaries, platforms create economic value by acting as a bridge to fill gaps in the market and by connecting two or multiple groups of actors. Thanks to their positions, digital platforms can collect data from all the parties and have superior knowledge of the market. This knowledge is used to decrease transaction costs by reducing uncertainty among actors or acting as controllers of the transactions (Akbar and Tracogna, 2018). The ability of platforms to create economic value also depends on economic mechanisms defined as network effects. Network effects imply that the value of platforms increases as the number of users increases (Katz and Shapiro, 1985; Shapiro and Varian, 1998). The bigger the users' base, the more useful and attractive the platform becomes for both users and co-producers of services (Arthur, 1989). This is particularly evident for mobility apps such as UBER. Their economic value is not determined by functionalities and business models (which often are identical), but it depends on both sides of the market which influence each other. As more users use the app, the demand of mobility becomes higher and more service providers will join the app. As more services are co-produced by third parties, the bigger is the offering of additional options of services or products and more users will use the app (Katz and Shapiro, 1985). Therefore, the ability to innovate and co-produce new services and products is a critical goal for all platforms that want to offer more value to their users.

Innovation management literature approaches platforms as enablers of innovation and co-production of services and products. According to this conceptualisation, platforms are constituted by a central and stable core which acts as a foundation for a modular architecture that allows external organisations to easily plug-in modules to add complementary services (Henderson and Clark, 1990; Baldwin and Clark, 2000). Thanks to this architecture, organisations can decrease cost of development when they launch a new product or service because instead of building an entirely new system from scratch, they only have to develop a module to sustain the new functionality. Therefore, the modular architecture facilitates the production of new products and services by

decreasing costs, delivery time as well as risk of failure. However, platforms do not enable the co-production of services in the same way. In terms of production process scope, platforms can be distinguished by belonging to three main categories (Gawer, 2014). Internal platforms enable actors within the organisation to develop complementary modules of services. Supply chain platforms allow restricted and selected number of suppliers to co-produce additional modules. Finally, industry platforms enable external actors to co-produce and then co-invent modules and services. Usually, these three categories of platforms are described as innovation platforms because their role is to facilitate the innovation process. They can be therefore distinguished from transaction platforms which serve to mediate and facilitate exchanges and interactions among actors. Nevertheless, most innovation platforms offered by companies like Google or Facebook can be categorised as innovation and transaction platforms (Gawer, 2014). It is likely that the platform organisational model will evolve and new platform categories will probably emerge in the future (Cusumano, Yoffie and Gawer, 2020). However, the evolution of platforms is not exclusively limited to changes in the organisational structure. The technical layers are not neutral. Both the organisational and architectural layers mutually affect each other, and their interactions influence platform configuration and thus the value creation process (De Reuver, Sørensen and Basole, 2018).

According to the socio-technical view, the impact of platforms on the value creation process cannot be determined by looking only at the organisational or technical aspects of its architecture because platforms are constituted by both layers intertwined together (Tilson, Sørensen and Lyytinen, 2012). Platform architecture is neither neutral nor homogeneous because it embeds organisational components such as rules, goals, and business models which belong to the organisational context where the platform is situated. As a consequence, the process of plugging in modules to the core of the platform is not straightforward, but the result of socio-technical negotiations. Both the module and the platform embed different organisational and technical properties which need to be aligned and combined together in order to interoperate (Tiwana, Konsynski and Bush, 2010; Ghazawneh and Henfridsson, 2015). The process of integration is mediated through some resources such as Application Programming Interfaces (APIs) and software development kits (SDKs) defined as boundary resources (Eaton *et al.*, 2015). The platform owner inscribes in APIs and SDKs the rules, and goals to enable and address how external actors co-produce services and products. If external actors do not adapt and align their modules to the APIs and SDKs requirements, they would not be able to connect to the platforms and co-produce products and services (Eaton *et al.*, 2015).

Therefore, the platform owner can affect the generativity of the platform by modifying the boundary resources (Henfridsson and Bygstad, 2013). If for example, the requirements of the APIs and SDK are too strict and offer only limited access to data, co-production of services will be weak. Differently, more open and less regulated APIs will facilitate co-production of services. Hence, APIs enable public and private organisations to govern the platform's generativity and enact the desired level of control over the co-production of services (De Reuver, Sørensen and Basole, 2018; Jacobides, Cennamo and Gawer, 2018; Plantin *et al.*, 2018). In fact, the way in which APIs mediate the flux of data affects the entire public service production configuration. For example, Transport for London (TfL), the public agency that manages public transportation in London, opened to the public a set of APIs to enable external actors to access data about public transportation. The goal of TfL was to incentivize external actors to develop multiple options regarding information services about public transportation in order to provide a better public service with no further public investments. Given this goal, TfL has used its APIs to configure a production process which implied the involvement of third parties in the production of the information service. APIs represented the medium through which TfL enabled and addressed co-production of the information service. TfL has today reached its goals because its APIs power hundreds of mobility apps in London developed by external actors, such as City Mapper, which complement the information services offered by TfL.

As it appears from the TfL' case, access to data can be clearly beneficial to foster efficiency of the production process. However, the problem is that third parties can edit, reprogram and distribute data in different ways (Yoo, Henfridsson and Lyytinen, 2010; Kallinikos, Aaltonen and Marton, 2013). In fact, digital products tend to be constituted of several layers of hardware and software which often combine data sources from different platforms (Yoo, Henfridsson and Lyytinen, 2010). This problem has also emerged in the case of TfL, when one of the thousands of co-producers found the way to use data about bike-sharing to threaten citizens' privacy. Once TfL noticed this problem, it closed the APIs about bike-sharing to not allow the co-production of this negative service for the public (Hogge, 2016). By taking this action, TfL used the API not as a medium to enable co-production but as a medium to enact control and address the co-production of the service. This example shows that public agencies can use e-government systems based on platforms to simultaneously enable co-production on a large scale and also control, address or limit how co-producers use platform resources in order to protect general interests and create value for the public.

In fact, differently from digital infrastructures, digital platforms enable public agencies to confine the activities of external actors within the boundaries of an organisational space defined as an ecosystem (Ghazawneh and Henfridsson, 2012). The platform ecosystems organise the co-production of public services according to a shared view, rules and values, which help public agencies to address value creation towards predefined paths (Lusch and Nambisan, 2015; Hein *et al.*, 2020). Therefore, e-government systems based on platforms represent a potential opportunity for public agencies which can use the platforms' ecosystems to exploit co-production with the possibility of managing its potential negative side effects. The next section discusses how digital ecosystems impact co-production of public service and their impact on the public value creation process.

3.3 Ecosystem

The term 'ecosystem' has been originally used in the field of biology to describe a community of organisms which interact with each other and live within an environment (Loreau, Mouquet and Holt, 2003). In a similar acceptation, Moore (1993) used the biological ecosystem metaphor to describe the business community characterised by companies from different industries which cooperate, compete and evolve within a specific area. According to this perspective, organisations, companies and individuals conduct their activities which mutually affect each others' supplies and the overall value proposition for costumers (Iansiti and Levien., 2004; Teece, 2007). The actors that populate ecosystems share the same fate of the community where they operate because their individual performances are often connected with the performances of the others (Iansiti and Levien., 2004). However, the success of business ecosystems is not only the result of the interaction among autonomous actors, but it also depends on the foundational layers which enable those actors to co-produce value (Kapoor and Lee, 2013). Silicon Valley is an example of flourishing business ecosystems. Its success was due mainly to the American public administration and not only to the interaction of independent Venture Capitalists and high qualified engineers who populate the Silicon Valley community. The US Department of Defence (DoD) invested in GPS, hard disk drive, microprocessor, and LCD displays which are today the fundamental layers of many digital products such as iPhones (Mazzucato, 2011). The role of the public administration in the case of Silicon Valley was not limited to the provisions of foundational layers which enabled the co-production of digital services and products. As an enabler of the Silicon Valley ecosystem, the American public administration has also governed its development using incentives such as fiscal benefits and legal policies to facilitate the brain circulation across different companies and thus make the ecosystem

flourish (Mazzucato, 2018). Today, most of the tech companies founded in the Silicon Valley, such as Google or Facebook, are acting as the American public administration. They developed digital platforms which enable ecosystems of digital services and products. The main difference between digital platforms and the American public administration is that the former allow the above companies to have more power to coordinate and address the contribution of external actors to certain value creation streams.

In fact, differently from classic business ecosystems, the value creation process of digital ecosystems can be better addressed and controlled. Thanks to the platforms' mediation, platforms' owners can govern the ecosystem value creation process by addressing and coordinating the co-production activities. Existing literature about platforms and ecosystems has discussed the capability to influence the value creation within ecosystems according to different perspectives. According to a technical perspective, the capability to address ecosystems towards a specific value creation process is a technical matter (Tiwana, Konsynski and Bush, 2010). Ecosystems are an array of peripheral technical components developed by third parties which are connected to the central platform. The platform mediation consists in the provision of a technical core codebase which external actors can extend to add complementary technical functionalities to the platform, defined modules (Tiwana, Konsynski and Bush, 2010; Boudreau, 2012). Due to the dependency of modules to the platform, the technical characteristics of platforms can influence the functioning of the modules and then the value creation process within the ecosystems (Eaton *et al.*, 2015). For example, the e-government systems which diffuse machine-readable data facilitate external actors to co-produce more effective digital services because it reduces the risk of technical errors in processing data (Janssen, Charalabidis, and Zuiderwijk 2012). The value creation dependency between platforms and modules is also bidirectional (Eaton *et al.*, 2015). If the services/modules built on the platform have a technical failure, they would negatively affect the ecosystem's value proposition as well. Therefore, according to the technical perspective, the ecosystems' governance results in finding the most suitable technical arrangements for both platforms and modules which help the ecosystems to create more value for the public. However, a recent study that has analysed and compared several data portal configurations of the major Australian cities revealed that the success of ICTs-mediated co-production is not only related to technical arrangements of platforms and ecosystems, but it also depends on organisational aspects such as the adoption of an open data policy (Chatfield and

Reddick, 2017). Therefore, technical variables alone are not sufficient to determine the value creation process within an ecosystem.

According to the organisational view, organisational variables such as policies, protocols, strategic positioning, production flow, and organisational structure frame the roles and the range of activities of external actors in the ecosystems, and have an impact on the value creation process. However, the way in which the platform owner organises the ecosystem might not correspond to the goals, values and interests of external actors (Adner, 2017). Therefore, the platform's owner has to align all the external actors to the rules and values of the ecosystem organisation in order to coordinate the value creation process (Huber, Kude and Dibbern, 2017). The values indicate the code of conduct to operate within the boundaries of the ecosystem as well as the shared vision which inspires all the partnerships and opportunities of collaboration (e.g. norms of collaboration) (Gulati, 1999). Rules define the duties and rights each actor has while co-producing services within the ecosystem (Markus, 2007). In fact, rules inhibit and enable actors to contribute to the value creation process within certain boundaries. For example, the Italian platform of digital Identity SPID[1] enables an ecosystem of different identity providers. In order to join the ecosystem as identity providers, companies like Poste Italiane or TIM have to sign a contract of collaboration, pass several security controls and meet legal standards to co-produce their identification services. If they do not meet the above rules and release digital identities without following the producers, then their licence as identity provider is withdrawn together with their presence in the SPID ecosystem. However, the organisational structure of the ecosystems is not completely detached from the technical layers. In order to become SPID identity providers, companies also have to implement SPID platform requirements contained in the SDK. The SDK libraries are not neutral. They have been designed to meet the principles and rules which regulate the co-production of the identity service. Once implemented, the SDK influences the characteristics of identity service architecture as well as of its organisational structure. Therefore, technical and social elements mutually shape each other, and their interaction determines the value creation process.

According to the socio-technical view, the platform and ecosystem's organisational and technological elements are intertwined and evolve in the context within which the platform is situated (Tilson, Sørensen and Lyytinen, 2012; De Reuver, Sørensen and Basole, 2018). Therefore,

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[1] https://www.spid.gov.it/?lang=en-001

the technical architecture which sustains the ecosystem functioning is not neutral; rather, it is intentionally constructed to support specific value creation logics (Kapoor, 2018). An organisation, such as a public agency, deliberately chooses the ecosystems organisational form and architecture to address the co-production and create a specific value proposition for the public (Boudreau, 2010; Kapoor and Agarwal, 2017). This means that rules, values, interests protocols, policies etc. shape the design of technological connectors such as APIs and SDKs to enable certain activities and inhibit others. Once published, the APIs or SDKs of the platform address how external actors can co-produce services within the ecosystems. The logics and rules embedded in the SDK and APIs set the boundaries within which co-producers can create value for the ecosystem and eventually also for themselves. In the previous example, the SPID ecosystem has set specific rules for the co-production of the identity service, to ensure all identity providers positively contribute to the overall SPID value proposition. Nevertheless, the same rules also offer the possibility to identity providers to create value for themselves by co-producing the identity services according to different processes and models of business. Therefore, today the SPID ecosystem offers Italian citizens a wide range of options of identification procedures and pricing models, which in the past years have changed.

In fact, the design of the digital ecosystems and consequently, their value creation process can evolve and mutate to respond to contextual changes and citizens' needs (Adner, 2017; Hein *et al.*, 2020). For example, the recent Italian reform for digitalisation has changed the business model of all SPID[2] ecosystems and today, most of SPID identity services are free for citizens but not for companies. The ability to realign all the ecosystems according to a new public value proposition was possible because SPID is a digital platform. The power to address and coordinate the co-production within certain boundaries represents the main distinction between the co-production mediated by platforms and digital infrastructure (Plantin *et al.*, 2018). Digital infrastructures enable co-production of public services without the possibility to define specific boundaries and effectively address the value creation process. Instead, digital platforms allow organisations such as public agencies to control how external actors co-produce public services and then avoid possible negative contributions to the overall public value proposition (Eaton *et al.*, 2015). The possibility to coordinate and govern the public value creation process through digital platforms represents an

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[2] https://www.agid.gov.it/it/agenzia/stampa-e-comunicazione/notizie/2019/06/21/spid-nuovo-tariffario-il-mercato-privato

opportunity for public administration, which has often struggled to handle the dark side of co-production (Williams, Kang and Johnson, 2016).

Tim O'Reilly (2011), in his seminal paper 'Government as a Platform' (GaaP), widely discussed the opportunities related to the adoption of digital platforms in the public administration, but mainly in terms of economic value. He has suggested that public agencies should imitate the organisational model of many tech companies which use digital platforms to facilitate co-production and increase production efficiencies. However, his conceptualisation and the subsequent literature about GaaP have not discussed the impact of co-production mediated by digital platforms on other public interests which together contribute to the creation of public value (O'Reilly, 2011; Fishenden and Thompson, 2013; Brown *et al.*, 2017). Based on the above literature and on the main PhD research question, the research proposition is the following: *The co-production mediated by digital platforms (GaaP) can help the public administration not only to improve the efficiency of public services production but also to ensure the creation of public value.* This research proposition has driven this PhD research and fieldwork. However, the three papers which constitute this PhD thesis have unveiled several complexities which challenge the above assumption and consequently, the public value creation process mediated by the digital platforms.

4. The public value creation and GaaP complexities and the need for public value orchestration

The PhD research question's context provided by existing literature and summarized in the previous sections has informed the fieldwork which aimed to find sufficient evidence to confirm or reject the main research proposition.

The main research proposition is built on three related research propositions that the researcher explored through the three papers:

- Paper 1. ICTs-mediated modes of co-production (Crowdsourcing and Opensourcing) are the best production configurations to produce public services because they allow public agencies to produce more or better options of public services
- Paper 2. The adoption of co-production can then help public agencies to satisfy all citizens' needs and create public value

- Paper 3. The entire public administration configured as a platform will provide the operational capabilities that all public agencies need to co-produce services and contribute to the creation of public value

The research was based on two organisational levels: public agency and public administration. The first case studied how the Open Data platform developed by Transport for London (TfL) mediates the co-production process of the information services about transportation service offered by hundreds of apps. The second case study has instead studied how the multiple digital platforms owned by different public agencies of the Italian public administration mediate the co-production of public services on a large scale and impact public value creation. The document analysis, followed by in-depth interviews with the main stakeholders of the two cases have unveiled three main complexities related to three main assumptions that the literature did not previously consider.

4.1 The complexities of public value creation mediated by GaaP systems

Each of the three papers that constitute the PhD thesis has contributed to answering the main PhD research question by unveiling some complexities of ICTs-mediated co-production and public value creation.

In this study, the concept of complexity refers to the inability to predict how ICTs-mediated co-production impacts the public value creation process. This complexity emerges as a result of the interaction of a network of social and technical actors involved in the production process which can lead to non-linear behaviours and therefore to unexpected outcomes (Kallinikos, 2005; Merali, 2006). In the digital age, complexity has increased because ICTs facilitate the interoperability among several actors and different ICTs systems (Hanseth, 2004; Kallinikos, 2005).This interoperability can lead to benevolent or malevolent actions that, thanks to ICTs, can rapidly scale without control or possibility to be predicted (Star and Ruhleder, 1996; Ciborra and Hanseth, 2000).

In this research, the complexity of ICTs-mediated co-production was not immediately evident, but gradually emerged through the interaction with the field, feedback from other academics, and the discovery of new studies and perspectives.

The first paper *"ICTs and value creation in public sector: manufacturing logic vs service logic"* assesses the operational capabilities (skills, finance, technology, human resources) of the four modes of production of public services: in-house, joined-up, crowdsourcing and open sourcing. The research question of the paper is: What is the best mode of production to create value for citizens? According to public management and e-government literature, the best production mode is the

most efficient production configuration (Janssen and Estevez, 2013; Margetts and Dunleavy, 2013). Based on this view, the research proposition is that ICTs-mediated modes of co-production such as crowdsourcing or opensourcing are the most suitable public production configurations to create value for citizens because they enable public agencies to produce more or better options of public services for lower costs (Linders, 2012; Vamstad, 2012; Best *et al.*, 2018). The paper discusses the case of two public agencies which have used these modes of production of public services. TfL has opensourced the production of information service about transportation through its open data platform and it has been able to offer more than 500 options of information service without the need to invest any of its resources in the development of an app. The San Ramon Valley Fire Protection District (SRVFPD) has offered a more efficient first aid service without the need to hire any paramedics, through the development of a crowdsourcing platform that has facilitated the involvement of trained volunteers in the co-production of the emergency service. Therefore, looking at TfL and SRVFPD, all public agencies should choose production configurations such as crowdsourcing or opensourcing to create more economic value for citizens. However, the adoption of co-production implies lower control over the value proposition because when public agencies co-produce a service, they open the value creation process to third parties' inputs. Hence, public agencies cannot fully control the output of the production process and the value delivered to citizens. For certain services like transportation or education which usually require lower level of control, the open value creation process might be the most suitable option. However, for other services like policing or judicial services, which require a high level of control over values such as safety or fairness, a closed value creation system typical of the in-house or joined-up mode of production is probably suitable. In fact, although ICTs-mediated co-production can benefit the efficiency of policing or judicial services, a more open value creation implies higher risks to deliver unsafe, unequal and not homogeneous services which are other important public interests for the creation of public value.

The second paper "*Creating and Capturing Value through Crowdsourcing: Renegotiating Public Value*" explains how ICTs-mediated co-production impacts the creation of public value. The research question of the paper is: How can public administration benefit from co-production to help the creation of public value? The research proposition is that all public agencies should choose an ICTs-mediated co-production configuration typical of platform organisations, to better serve citizens' needs in their policy domain (O'Flynn, 2007; Alford and Hughes, 2008). However, the paper explains that public agencies create public value when their production process impacts positively all public

interests (Bozeman, 2007; Alford and O'Flynn, 2009). Public agencies should then overcome the siloed view of value creation typical of the corporate field to guarantee a sufficient level of control over the effects on the policy domains served by other public agencies. Therefore, to create public value, public agencies should choose the production configuration that ensures a suitable level of control over public values that belong to all policy domains.

The third paper *"Government as a Platform, Orchestration, and Public Value Creation: The Italian Case"* builds on the IS literature about infrastructure, platform and ecosystem presented in the previous section. The research aims at answering the following research question: How does GaaP mediated co-production impact public value creation? The research proposition is that GaaP enables all the public agencies to co-produce services on a large scale while ensuring a suitable level of control over the public value creation process. However, from the Italian case, it has emerged that the GaaP's architecture is not constituted only by a single platform (O'Reilly, 2011; Janssen and Estevez, 2013; Brown *et al.*, 2017), but rather, by several platforms and ecosystems. The existence of multiple ecosystems decreases control over value creation and potentially increases the creation of negative externalities (Hanseth and Lyytinen, 2008). In fact, public agencies govern their ecosystems to ensure that public and private actors serve the interests of their policy domains. Hence, third parties might intentionally or unintentionally co-produce services that create negative externalities in other policies domains served by other ecosystems. For example, the Ministry of Transportation has to govern the public transportation ecosystem to create more value for mobility. In order to create more value in its field, the Ministry can decide to open data about tube station, airport and railway station maps to improve mobility services. However, the same data that enhance the public transportation domain can negatively affect national security because third parties can potentially use third parties to plan terrorist attacks. The siloed perspective of value creation of the Ministry of Transportation, combined with the impossibility of predicting how third parties can impact other policy domains, risks to decrease control offered by GaaP and to potentially create negative value for the public.

All the above complexities represent a threat for the public value creation. Nevertheless, from the Italian case study, a governance mechanism has emerged to mitigate the above complexities and create public value through GaaP. The modular structure of GaaP allows public agencies to assemble and disassemble their production configurations an infinite number of times, like construction made of LEGO bricks (Ciborra, 1996; Cusumano and Gawer, 2002). Thanks to this architecture, public

agencies can then easily configure and re-configure the production process by substituting the modules which threaten the creation of value for the public. The process of configuration and re-configuration of the public service production process is called public value orchestration.

4.2 The public value orchestration

The adoption of ICTs-mediated co-production represents an opportunity but also an additional factor of complexity for the creation of public value. E-government systems based on ICTs systems such as digital platforms can enable the co-production of public services on a large scale and deliver more economic value to citizens (Janssen and Estevez, 2013). Digital platforms can also help public agencies to control the co-production of public services. However, oftentimes, public agencies configure complex public services based on different digital platforms and related ecosystems. The existence of multiple platforms managed by different actors decreases the level of control over the co-production and can negatively impact the creation of public value. Therefore, when public agencies opt for e-government systems based on platforms, they should also adopt a dedicated governance mechanism called "*public value orchestration*" to ensure the creation of public value. The notion of orchestration as a mechanism of governance to create value for the public is not new and has been discussed according to different acceptations. Nevertheless, none of them have considered ICTs as political artefacts able to carry interests or values that influence the public value creation process described by Moore (1995).

The term of orchestration has usually referred to the activity of coordination of multiple interests that public agencies often conduct in the political and administrative realm (Kleinschmit *et al.*, 2018). According to this perspective, the activity of orchestration is limited to the authorising environment that in the strategic triangle of Moore (1995) is the second aspect that describes the public creation process. In this acceptation, public agencies act as a conductor of an orchestra constituted by stakeholders who have different political interests (Abbott and Bernstein, 2015). The stakeholders that compose the "orchestra" can be political bodies, lobbies, unions, NGOs, citizens' associations etc. which together represent multiple societal interests. Hence, orchestration consists of trading off all the public interests and building a consensus among all the various stakeholders about what is valuable for the public (Benington, 2011). However, according to the public value literature, third parties not only contribute to a shared view of public value but also participate in the production process. Therefore, public agencies are not only an orchestrator of multiple public

interests. They are also an orchestrator of contributions and resources offered by a network of public and private actors.

In this second acceptation, orchestration consists of coordinating the internal and external organisational resources (financial, human, technological, skills) to provide the operational capabilities public agencies needs to configure the production process (Janssen and Estevez, 2013). The digitalisation of production implies that most of the organizational resources offered by third parties are embedded or mediated by ICTs system. Therefore, in a highly digitalised context, the process of orchestration might consist mainly of coordinating a portfolio of applications necessary to produce public services (Queiroz *et al.*, 2018). As previously mentioned, the connection of different ICT elements to create an e-government system is not straightforward and is not limited to plug-in different digital platforms. The ICTs elements that compose e-government systems carry political interests, logics, values, regulations etc. and have the power to influence the activities that compose the public value chain (Antonio and Francesco, 2012). Therefore, the influence of technology on the overall public value proposition cannot be limited to the technical sphere. As a consequence, when technology is involved in the production process, the orchestration activity implies a negotiation process among different ICTs systems that mediate the production process.

According to this view, the public value orchestration entails finding the right technological and organisational configuration in order to produce public services able to create public value. Hence, the process described by the chart of the strategic triangle of Moore should be modified because technology mediates all the three aspects of public value creation simultaneously. However, a modification of the strategic triangle is graphically difficult because technology embeds citizens' needs, political interests and regulations, and is deeply intertwined with all the organisational elements which compose the operational capabilities. Depending on how public service production is configured, the mediation of technology can reinforce or address some values instead of others. Hence, technology can become an instrument to enforce control over the public value chain. The level of control offered by the ICTs systems that mediate production is not fixed but is variable and is the result of situated negotiations between the technological and organisational layers. For example, the more open is the public service production process to the contributions of external actors, the lower is the control over the public value creation process.

The ability to control public value creation depends mostly on the type of e-government architecture that enables co-production. E-government systems based on platforms instead of digital infrastructures can facilitate public value orchestration because they help to easily re-configure the production process and govern the co-production of public services within ecosystems. Nevertheless, the co-production of public services mediated by digital platforms can also threaten public value creation. E-government systems developed according to the GaaP model are often composed of different modules or digital platforms (and related ecosystems) owned and governed by other actors that pursue their own interests. As a consequence of the layered structure of e-government systems, the public value creation process becomes dependent on ICTs systems controlled by other actors. If public agencies want to mitigate against the risk of creating negative value for the public, they should continually orchestrate the creation of value by disassembling and reassembling the public service production configuration. For example, the foreign affairs agency configures the production of the service to request resident permits, by combining a module for the identification service, a module to process the required documentation and a module for the tax payment. The modules for the identification and for the payment are usually platforms owned by other companies and public agencies which enable ecosystems of options of identification methods offered by third parties (e.g. phone identification, post office, webcam, etc.) or payment options (e.g. credit card, debit card, check etc.). After a national terrorist threat arises, the foreign affairs agency increases the level of security. The agency disassembles the previous configuration, internalizing the activity of identification through the development of an in-house platform. The action of re-configuration of the production of the residence permit service to increase public safety is an example of public value orchestration.

Moreover, public value orchestration, mediated by e-government systems that enable co-production on a large scale, must also address the tension between openness and control of the public value creation process (Boudreau, 2010). Public agencies deal with the above tension, orchestrating public value creation on horizontal and vertical dimensions (Eisenmann, Parker and Van Alstyne, 2009; Benlian, Hilkert and Hess, 2015). On the horizontal dimension, public value orchestration consists of restricting or enabling the possibility of ensuring interoperability and interconnection between different platforms. Usually, more interconnection and interdependencies among digital ecosystems help to improve public value proposition. Nevertheless, more openness also corresponds to lower control over the production process and then major risks that some external actors' contributions might threaten the creation of public value. On the vertical dimension,

public value orchestration implies the possibility to enable or restricts users from co-producing services within the platforms' ecosystems. More open ecosystems can offer a more prosperous public value proposition but also increase the risk of negative contributions. However, lower control over the value delivered to citizens does not always mean less public value delivered to clients. In fact, public services produce different services in different contexts. Some public services, like the policing service, require a high level of control over the public value chain; while others, like transportation services, are more valuable when open to the co-production with third parties. Moreover, public agencies orchestrate public value creation, also evaluating the impact the production configuration has on multiple policy domains and not only on the one under their direct responsibility. Therefore, a public agency might choose the less economically convenient production configuration to protect other policy domains' interests and create public value.

5. The thesis structure

The thesis is based on three published papers. For copyright issues, the three papers are available through the following links:

- Paper 1 [ICTs and value creation in public sector: manufacturing logic vs service logic.](#)
- Paper 2 [Creating and Capturing Value through Crowdsourcing Renegotiating Public Value with Co-Production](#)
- Paper 3 [Government as a Platform, Orchestration, and Public Value Creation: The Italian Case](#)

The following chapters provide the theoretical background and the structure necessary to link the three papers and appreciate their contributions.

Chapter 1: Methodology

The chapter outlines the overall methodology and explains the relationship between the methodology and the three papers. A clear description of the data collection and analysis of the two cases, Transport for London and the Italian public administration, is included, with brief and significant examples that form a clear link between the sources of data and the main theoretical claims.

Chapter 2: The creation of value in public management literature

The chapter explains the linkage between the different conceptualisation of value for the public and the model of public administration. This chapter seeks to provide a relevant background for the

whole thesis by reviewing characteristics of all five public management approaches and by discussing how their models of organisation for public administration impact the creation of what they think is valuable for citizens.

Chapter 3: The impact of e-government systems on the creation of value for the public

Public administration has adopted ICTs to support and enhance the production of public services and to create more value for citizens. As explained in the previous chapter, the conceptualisation of how public agencies create value for citizens has changed. This chapter critically reviews e-government literature and discusses how the role of technology has evolved to serve different value creation conceptualisations.

Chapter 4: Theoretical framework

The chapter presents the main theoretical framework of the thesis. The first section briefly summarises different research perspectives about the impact of e-government systems on value creation and discusses the socio-technical perspective adopted for this study. The second section describes how the interaction of the organisational and technical dimensions of the GaaP enables public agencies to configure production. The third section discusses the limitations of GaaP in the creation of public value.

Chapter 5: Discussion and conclusion

The chapter provides a synthesis of the findings across the thesis work. The chapter offers a theoretical discussion which links the main research question with the three papers' contributions within the distinct fields of study such as Information Systems, E-government, and Public Management.

CHAPTER 1 Methodology

This PhD research started with an in-depth review of public management and e-government literature. Chapter two reviews public management literature and summarises how the evolution of the conceptualisation of public value has affected public administration's organisational model and how public agencies configure the production of public services. Following the same evolutionary process, chapter three reviews e-government literature and focuses on how public agencies have used ICTs to enable different public services production configurations and to support different value creation processes. Chapter three also discusses the emergent use of e-government systems to co-produce public services on a large scale.

The impact of the adoption of ICTs-mediated co-production has been typically discussed in terms of economic efficiency, but not in terms of public value creation. Therefore, this PhD thesis' main research question is: *How does ICTs-mediated co-production impact the creation of public value?* The research proposition is that ICTs systems that meet GaaP's characteristics enable and mediate public administration's operational capabilities necessary to co-produce services, thereby increasing efficiency and ensuring public value creation.

The above research proposition and the focus on GaaP as an enabler of co-production were defined after a back and forth learning process (Stracke and Kumar, 2010; Aitchison *et al.*, 2012). During the PhD journey, the research method was improved and scope of research refined. At the start of this research project, the type of ICTs system that enabled co-production, its organisational and technical characteristics and its overall configuration had not been defined yet.

This methodology chapter presents the journey from defining the research question to reaching the main findings. The chapter is organised as follows. The first section after a review of e-government research perspectives presents the PhD research perspective. The second section motivates the selection of the case study research method. It explains the process that led to the selection of the two main cases: TfL and the Italian public administration. The third section presents the data collection, analysis and discussion of the main findings of the TfL case. The fifth section presents the data collection, analysis and discussion of the main findings of the Italian public administration case study.

1.1 E-government research perspectives

E-government studies have analysed the impact of ICTs systems on the creation of value for the public, mainly according to the technological determinist, social determinist, and socio-technical research perspectives. The adoption of these three research perspectives has influenced how researchers perceive and investigate technology and organisations' role in shaping production configuration and then the value creation process (Easterby-Smith, R and Lowe, 2002; Guba, 2002). These views are implicitly rooted in the same research philosophies that drive other management and social science researchers. These research philosophies can be ordered along a hypothetical continuum where at one extreme we can find positivism and at the other, social constructivism (Heeks and Bailur, 2007). Influenced by positivism, technological determinist studies analyse specific technological features and assume that technological functions are the main determinants of the trajectory of change and transformation associated with specific e-government systems (Bellamy and Taylor, 1998; Layne and Lee, 2001). On the other hand, e-government studies influenced by social constructivism have adopted the social deterministic and socio-technical approaches that emphasise the role of socio, organisational, and cognitive elements in shaping the trajectory of change associated with deploying ICTs in the public sector.

E-government studies driven by the positivist research philosophy hold an objective ontology that implies the existence of a single universal reality, independent from individual interpretation (Meijer and Bekkers, 2015; Alkhalifah, 2017). As a result of this view, authors of e-government studies are inclined to consider technology, work procedures, organisational culture, and skills as objective variables independent from contextual forces or individual choices (Heeks and Bailur, 2007; Aliyu *et al.*, 2014). In these studies, the value delivered for citizens is conceived as independent, objective, and often measurable (Osborne, 2010). Influenced by the above ontological stance, researchers in the e-government field tend to investigate the dynamics among the social and technological variables and estimate their impact on the public's value via systematic and controlled investigations which are usually based on quantitative research methods (Samuel *et al.*, 2020; Uyar *et al.*, 2021). Findings of these studies are oftentimes statistically generalised to a population and used to predict specific social or technical outcome related to the adoption of specific e-government systems (Alkhalifah, 2017). In most e-government studies, there are no clear references to positivist research philosophy, but its influence can be retraced in those studies categorised as technological deterministic (e.g., Bellamy & Taylor, 1998; Layne & Lee, 2001) which investigate how ICTs systems'

technical variables determine production configuration that generates a specific value for the public (Layne and Lee, 2001; Yang, 2003). This perspective is typical of engineering-oriented studies which tend to approach e-government systems as a composite of hardware and software components (Fleck, Webster and Williams, 1990; Bellamy and Taylor, 1998). Authors of e-government research that have adopted the technological deterministic perspective tend to focus on the characteristics of architectural dimension (e.g. interoperability standards) and to assess the value created for the public by looking to their technical performances (e.g. processing power, speed, storage etc.) (Guijarro, 2007; Janssen *et al.*, 2011). The findings of these researchers are valid in any context because the same ICTs system architecture can be installed and replicated in any public agency to deliver the same technical performance. Oftentimes, e-government studies utilise models that generalise the correspondence between the type of architecture and its results. These models help public agencies to know ex-ante the type of e-government configuration they should adopt to reach a specific value outcome described in terms of technical effectiveness (Layne and Lee, 2001; Torres, Pina and Acerete, 2005; Andersen and Henriksen, 2006). Hence, research that adopts the technological deterministic perspective is very useful to study the technical functioning of e-government systems and their technical impact, but not to understand or explain the production logics and the decisions that had led to the design of e-government systems (Cordella and Iannacci, 2010).

E-government studies that investigate how human choices (e.g. political reforms, new logics of production) shape the functioning of ICTs systems tend to consider technology not as an objective tool but as a social artefact which embeds the subjective view of individuals or social groups situated within specific contexts (Kallinikos, 2004b). This view is typical among authors of e-government studies that adopt the social constructivism ontology (Pinch and Bijker, 1984; Meikle and Bijker, 1997). In these studies, the design, development and management of ICTs systems is subjective to the political or managerial choices of the actors involved in the process of e-government configuration (Suchman, 1987; Williams and Edge, 1996; Heath, Knoblauch and Luff, 2000; Orlikowski, 2000). Authors who have adopted the social constructivist view tend to perceive what is valuable for the public as constructed in the subjective sphere of the individuals involved in the production process or the utilisation of the service (Alford and O'Flynn, 2009; Hartley *et al.*, 2015; Osborne, 2018). The need to capture the view that individuals or groups of individuals have about the functioning of ICTs systems and the impact on the value created for the public has led

researchers to adopt qualitative research methods (Van den Bulck, 1999; Heeks and Bailur, 2007). Studies that focus on understanding how the configuration of an e-government system impacts value proposed for citizens (e.g. Cordella and Iannacci 2010) tend to collect and analyse the views of those individuals involved in the configuration of e-government systems. Conversely, those studies that focus on understanding if e-government systems have effectively created value for the public (e.g. van Velsen et al. 2009) investigate the subjective view of the citizens that use the services mediated or enabled by the e-government system researched. These two types of social constructivist research focuses can be traced in those e-government studies categorized as social determinist and sociotechnical which differ in their opinion about the role of technology.

E-government studies that adopted the social deterministic perspective (e.g., Fountain, 2001; Schellong, 2007) look at social variables such as administrative protocols and regulations to explain how political reforms or organisational changes drive changes in e-government systems and impact the value created for citizens (Williams and Edge, 1996; Yang, 2003; Gil-García J. *et al.*, 2005). Authors of socio-deterministic studies are inclined to consider technology as a neutral tool shaped by human choices (Zuiderwijk and Janssen, 2014; McBride *et al.*, 2019). Conversely, authors of studies that adopt the socio-technical perspective (e.g., Cordella & Iannacci, 2010; Janssena et al., 2009) consider technology as an active actor that embeds certain logics of production which can enable or constrain production configuration. In these studies, negotiations between ICTs systems and other organisational components are continuous and shape the e-government configuration and, consequently, influence the production and value creation process (Helbig, Ramón Gil-García and Ferro, 2009). The socio-technical perspective is common in those studies that aim to research how the organisational and technical dimensions of an e-government system impact the production process (Bekkers and Homburg, 2007; Cordella and Bonina, 2012).

This PhD study adopts the socio-technical perspective to investigate how ICTs-mediated co-production impacts public value creation and looks mainly at how the technical and organisational dimensions of an e-government system mediate and enable the operational capabilities that allow the co-production of public services. The PhD research question can be potentially answered according to three different perspectives common in e-government literature. As presented in this section, each perspective determines the research focus, what type of data should be collected and analysed and how. This study adopted the socio-technical research perspective which, in

combination with an explanatory research question, had led the researcher to choose the case study research method.

1.2. Research method: case study

The e-government field does not subscribe to a predefined research method (Heeks and Bailur, 2007). Authors of e-government studies choose the most suitable research method, based on the type of research question, the level of control over the phenomena studied, and the time when the phenomenon has occurred (Yin, 2009). For this PhD study, the author researched how ICTs-mediated co-production impacts public value creation. The "how" of the research question indicates that the nature of the research is explanatory (Yin, 2009). Case studies, histories, and experiments – unlike archival analysis or surveys - are the research methods suitable for explanatory research because they help explain how ICTs-mediated co-production impacts public value creation. Another factor that helped guide the selection of the research method is that ICTs-mediated co-production is a phenomenon that cannot be isolated and controlled in a lab (Flyvbjerg, 2006; Zaidah, 2007). For this research, experiments could not be conducted on one or two isolated variables because ICTs-mediated co-production is situated within broader and external spatial and temporal contexts where there are variegated organisational and technical variables (Bostrom and Heinen, 1997). In fact, changes in the external environment where public agencies operate - due to political reforms, new privacy regulations or the introduction of new technologies - can influence how e-government systems mediate public services production (Janssen *et al.*, 2009).

Another factor that affected the research method's selection is that ICTs-mediated co-production is a contemporary phenomenon. Therefore, the history research method was not suitable because it is usually adopted to deal with past phenomena, by focusing mainly on document analysis. Conversely, the case study is generally adopted to investigate contemporary events. Here, it offered the possibility to interview and interact with public managers, politicians and regulators, and to understand how their choices have shaped e-government systems' configuration that mediated co-production (Merriam, 1998; Yin, 2009). Through their stories, the researcher gained a collective and situated understanding of e-government system's functioning and its impact on the public value creation process (Lather, 1992). The possibility of discovering the subjective view of the actors involved in the production configuration was also particularly beneficial to meet the requirements of the sociotechnical perspective (Cordella and Iannacci, 2010).

Another factor that specifically affected the case study selection is that ICTs-mediated co-production of public services is a rare phenomenon. The research question required a public organisation that co-produces a public service through an ICTs system. In the public sector realm, a public agency that co-produces services through ICTs represents an extreme and unusual case, which deviates from the widespread use of technology to improve internal efficiency or the interoperability among public agencies (Dunleavy, 2005; Fishenden and Thompson, 2013). The extreme case study is a typology of a case study that aims to extend, develop, or confirm a theory that analyses rare or unique phenomena (Darke, Shanks and Broadbent, 1998; Yin, 2009). In management studies, extreme case studies represent an opportunity to study organisations, processes, or routines that differ from the "average" type of organisation in the same domain (Darke, Shanks and Broadbent, 1998; Elsbach and Kramer, 2016). In fact, most e-government studies or reports (e.g. Ubaldi, González-Zapata, and Barbieri 2020) have studied organisations by sampling similar organisations or looking only at few variables. However, this approach has two methodological limitations which lead to underestimate non-standard or extreme organisations that often cannot be compared with others and therefore do not fit the "average" (Flyvbjerg, 2006; Elsbach and Kramer, 2016). The first limitation is that looking only at the average or at few variables risks to hide or soften outliers or contradictions. The second limitation is that a random and representative sample tends to follow certain guidelines and methods. If an organisation does not fit within these standards, it remains excluded from the study (Elsbach and Kramer, 2016). Nevertheless, extreme organisations can serve as a "black swan" to develop, improve, reject or develop new theories (Flyvbjerg, 2006). In fact, extreme case studies act as anomalies that allow for studying infrequent phenomenon in intensive details.

The focus of one extreme case study represents the most suitable method to answer this PhD research question. However, research findings based on one case study are often criticised for their lack of objectivity because they cannot be statistically generalised (Yin, 2009). Researchers who adopt the case study research method typically rely on theoretical sampling and aim to reach the saturation point when additional data collection does not add more information (Faulkner and Trotter, 2017). By adopting such an approach, the PhD study's findings can corroborate, modify, reject, or extend a theoretical explanation related to the impact that the e-government system that enables co-production has on public value creation (Flyvbjerg, 2006; Yin, 2009). The theoretical

explanation provided by this PhD research remains valid until other studies do not find different answers or exceptions in other contexts.

Another cause of the lack of objectivity of a case study is that, differently from experiments or surveys, the case study researcher is not separate from the object of study (Zaidah, 2007). The researcher involved in qualitative research is also situated and often immersed within the research context and thus constructs an understanding of the phenomenon, which sometimes risks differing from the understanding of the involved actors (Flyvbjerg, 2006). Therefore, the researcher adopted certain design principles to mitigate the potential lack of objectivity and guarantee the findings' quality and validity.

Yin (2009) has set four tests to assess the validity and objectivity of findings. The researcher designed the PhD research plan to logically connect empirical data to the study's proposition, to comply with Yin's tests. The first test, pertaining to "construct validity", aims to mitigate the influence of subjective judgements in the collection and analysis of data. The tactic adopted to satisfy this test was to collect data from different sources and ask key informants to review the study's draft. The second test, concerned with "internal validity", is particularly important for explanatory studies because it ensures that the event X led or caused the event Y. The main tactic adopted to strengthen internal validity was to adopt a thematic analysis which was mainly conducted through NVivo software. The themes used to categorise and organise the data in order to explain the phenomenon logically derived from a precise theoretical framework. The third test was to "build external validity" by ensuring that the findings could be generalisable. As previously mentioned, the goal of the study is to provide a theoretical explanation of the phenomena. The case studies of TfL and the Italian public administration represent an opportunity to shed empirical light on the impact of ICTs-mediated co-production on public value creation and to advance a theoretical explanation of this phenomenon. Another essential test is to verify the PhD findings' reliability, so that if later researchers follow the same procedures as described in this chapter, they will arrive at the same theoretical explanation of the phenomenon. The two main tactics to ensure reliability adopted in the studies of TfL and the Italian public administration were a case study protocol constituted by the list of questions asked during the interviews. The second tactic was the development of folders in the researcher's personal Dropbox to store the documents, recordings of the interviews and the thematic analysis results.

Table 1 Design principles and tactics (Yin, 2009)

Principles	Tactics applied for the PhD research
Construct validity	• Use multiple sources of evidence • Ask key informants to review the study
Internal validity	• Pattern matching
External validity	• Use theory in single case studies
Reliability	• Use case study protocol • Develop case study database

The above tactics were applied to the PhD research plan, which changed several times during the PhD journey. Although the research interests remained the same, the research question, as well as the unit of analysis and the theoretical framework, evolved. As a consequence, the case study data collection and analysis changed. The following section reviews the journey that led to the selection of the TfL case and then of the Italian case.

1.3. The case selection process

In this PhD, two extreme case studies were selected according to specific criteria and rationale to answer the research question. The two extreme case studies represent unique cases of public agency and of public administration that co-produce services through ICTs, respectively. The researcher conducted separated data collection and analysis on each of the two cases to mitigate the risk of not gaining interesting findings and not having the possibility to access each case.

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The initial PhD research question was*: How does a public agency configure an ICTs system to co-produce services and create public value?* This aimed to understand how a public agency could configure an ICTs system to create public value. The combination of two theoretical lenses constituted the theoretical framework for this research: 1) the strategic triangle of Moore invites us to analyse the process of public services production configuration by looking at all the political and operational aspects which influence the production configuration and then the creation of public value (Moore and Khagram, 2004; Meynhardt, 2009); and 2)the socio-technical view of technology, which considers ICTs systems as the result of contextual negotiations between organisational and technical layers (Cordella & Iannacci, 2010). The object of study or the unit of analysis was holistic, and it included the process of configuration of the e-government system that mediates the co-production process. The research output was the explanation of the process that leads a public agency to configure e-government systems to mediate co-production that could create public value.

In order to select a case suitable for the above research, the first principle was that the public agency has to be located in London close enough to the researcher's location to allow multiple access to the field of study (Simons, 2009). The second principle was to find a public agency that co-produces public services through ICTs with third parties. In fact, although many public agencies have ICTs systems like digital platforms to co-produce services, they often fail to co-produce public services with third parties. The third criterion was the availability of abundant sources of data (Simons, 2009; Yin, 2009). Collection from different sources of data is essential to gain more insight and allow triangulation of the understanding case. The fourth criterion was case accessibility, which refers to the possibility of accessing data - for example, by interviewing the main stakeholders of the case.

Table 2 The first case selection criteria

THE FIRST CASE SELECTION CRITERIA			
Criteria	Defra	London Data Store	Transport for London
1. Location (London)	YES	YES	YES
2. Co-production of public services with third parties	NO	YES	YES
3. Abundant availability of documentation	YES	NO	YES
4. Possibility to interview main stakeholders	NO	NO	YES

According to the above criteria, one of the public agencies assessed was the Department for Environment Food & Rural Affairs (DEFRA). In 2015, DEFRA had begun the development of an API platform where it is possible to find environmental data such as about air and water quality. Most of the 100 documents collected about DEFRA Open Data initiative came from the DEFRA and the Open Data Institute (ODI), which presents DEFRA as a model of digitalisation and transparency. From the collected documents and especially from DEFRA's Open Data strategy, it emerged that DEFRA recognised the importance of open data to increase transparency and enable third parties to co-produce services for environmental or farming purposes[3]. In 2016, DEFRA reached the most important milestone of their data strategy, making more than 13,000 Dataset open to the public[4]. The flood monitoring API was designed to potentially help Red Cross or Facebook to inform people about flood risks. The LiDAR (Light Detection And Ranging) data about heights of buildings, gutters and trees were open to help farming and insurance industries to provide more and better services.

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[3]
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/267934/pb14109-defra-open-data-strategy-131219.pdf
[4] https://defradigital.blog.gov.uk/2017/01/02/undesigning-for-open-government-and-enterprise/

Therefore, DEFRA had the intention and the operational capabilities to enable co-production of a public service on a large scale. Although they organised many hackathons and meetings to show all the DEFRA valuable data, the ecosystem of applications built on DEFRA's APIs remained weak. Therefore, DEFRA met only one of four conditions to be the ideal case study for this PhD research and was therefore not completely suitable to answer the research question. However, DEFRA's study opened new connections and further developed my understanding of how the UK government, especially in London, perceived the importance of open data for the British economy.

Initially, the open data initiative in the UK aimed to increase transparency. Only later, British public agencies began to understand the potential and the relationship between Open Data and co-production of public services. Greater London Authority (GLA) founded the London data store in 2010. Its main goal was to release public agencies' data in an open format that could also be machine-readable to enable multiple actors to monitor public agencies' performance and to better understand London's biggest challenges. GLA invested in the London Data Store primarily to improve transparency and facilitate the Mayor's and GLA's decision making. However, GLA soon noticed that opening the city's data could positively impact transparency and co-production of public services. Therefore, GLA expanded the data available on the London Data Store. In 2010, London Data Store published 500 open datasets. In 2020, this reached 6000 datasets and 60,000 users each month[5]. The London Data Store met two of the criteria for a suitable case study. The most significant limitation was the lack of documentation about the case and the impossibility of accessing additional data sources such as through interviews with the politicians and managers who had developed the London Data Store initiative. Nevertheless, through the study of this case, it emerged that the data primarily responsible for enabling co-production of public services on a large scale comes from TfL.

TfL's journey into the ICTs-mediated co-production started in 2007 when TfL released a widget for travel news and journey planners that could be adopted for different websites. In 2010, in line with the Mayor of London's and UK Government's policies about the release of open data, TfL started to open its travel data (such as for the London Underground train location or the Journey Planner APIs) under an open licence. For the 2012 London Olympic and Paralympic Games, the bus departure API

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[5] https://smartlondon.medium.com/10-years-of-the-london-datastore-thinking-on-city-data-for-the-next-decade-b634ae62dc3c

was launched, which soon became the most popular TfL data among developers (Hogge, 2016). In 2013, more than 5,000 developers registered in the TfL's developers' area and published more than 30 APIs which power hundreds of apps, such as City Mapper and Google Maps. The decision to open public service production helped TfL to offer a better information service, especially during strikes or weather events that could cause public transportation disruption. In fact, currently, the information service is offered through TfL internal channels (TfL personnel, website, SMS service, screens, email etc.) and through more than 700 smartphone applications that, in 2012, were downloaded approximately 4 million times (Deloitte, 2013). Access to the TfL case was facilitated thanks to the availability of many official documents and those written by third parties, and the possibility to interview some of the senior managers who had led the Open Data initiative. TfL met all the criteria to be a valuable case study to answer the PhD research question. TfL's data collection and analysis helped to better understand ICTs-mediated co-production and to access many practitioners' views about this topic.

Preliminary study of the TfL revealed that its ICTs system that mediates the information service's co-production met a digital platform's characteristics. Thanks to its API platform, TfL also acts as a platform organisation, enabling different modes of production and co-production. In May 2016, during a seminar at LSE the researcher presented the preliminary findings about the TfL case. Among the participants of the seminar, there was one of the authors of the paper of Brown et al. (2017) "Appraising the impact and role of platform models and Government as a Platform (GaaP) in UK Government public service reform: Towards a Platform Assessment Framework (PAF)" who provided an interesting feedback and shared the preliminary version of their paper. The paper offered an alternative theoretical framework that induced the researcher to evaluate another research focus and to study ICTs-mediated co-production at the public administration level instead of at public agency's level. After a period of reflection based on the TfL case's preliminary data and on the GaaP's concept, the researcher decided to adopt the above theoretical framework and change the research question to study the entire public administration as a platform and its impact on the public value creation. The researcher developed an alternative research question: *How does GaaP mediated co-production impact on the public value creation?* This new research question changed the research proposition and moved the unit of analysis from the process of ICTs configuration to the GaaP's organisational and technical characteristics. The expected research output was the explanation of how GaaP technical and organisational characteristics mediate public

agencies' operational capabilities, enabling how they configure the production process and how they create public value. The new research goal led the researcher to also reflect on the difference between digital platforms and infrastructure and how differently mediate co-production.

Table 3 The second case selection criteria

THE SECOND CASE SELECTION CRITERIA		
Criteria	British public administration	Italian public administration
1. Location	YES	YES
2. Digital platforms and ecosystems	NO	YES
3. Abundant availability of documentation	YES	YES
4. Possibility to interview main stakeholders	NO	YES

One of the cases evaluated by the researcher was the British public administration which conceptualised its e-government architecture according to the GaaP principles (Brown *et al.*, 2017). The Government Digital Service (GDS), the British Government's public agency in charge of digitalising the British public administration, has repeatedly stated that the GaaP principles of Tim O'Reilly inspired and profoundly influenced the development of the British e-government architecture. However, except for the identity verifying program that has enabled an ecosystem of identity providers to co-produce identity verifications services, the rest of the digital platforms did not mediate public services' co-production. The majority of digital platforms, such as GOV.UK pay, were developed to avoid duplications of e-government systems and to facilitate interoperability. Therefore, GDS developed a "digital platforms for the government" (Brown *et al.*, 2017), and not to enable co-production of public service. The lack of intention to co-produce services made the British public administration not suitable to answer the research question.

Another Government case seeking to develop an e-government architecture according to the GaaP principles which the researcher considered was the Italian public administration. Through its digital government agency AgID (Agenzia per l'Italia Digitale) and a specialised temporary team called "Digital Transformation Team", the Italian Government developed the 2017–2019 three-year plan for ICTs in public administration (herein the Italian GaaP reform) (Mergel, 2019). Following the GDS example, the AgID and Digital Transformation Team planned and developed an e-government architecture constituted by many digital platforms managed and owned by different public agencies. Differently from the British architecture, the Italian e-government architecture was designed not only to facilitate the interoperability among public administration and to avoid

duplications, but also to support the development of ecosystems of services co-produced by third parties. Thanks to the availability of documentation and the researcher's access to the public managers and politicians that conceptualised the three-year plan, the Italian public administration case met all the criteria for a suitable case study.

The next section presents firstly, the data collection and analysis of the TfL case, and then, of the Italian public administration. For each case, a table that links examples of data sources, the analytical findings, and the papers' theoretical claims is provided.

1.4. The case of Transport for London (TfL)
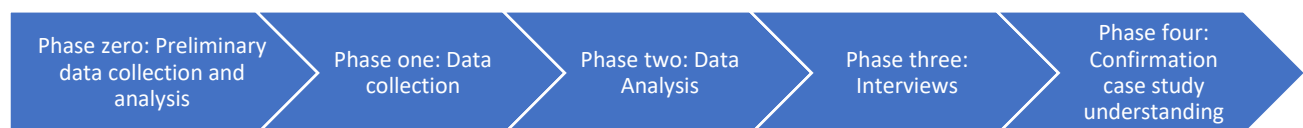
Figure 1 The five phases of the TfL study

Data collection and analysis of the TfL case can be divided into five phases. Phase zero indicates the case selection phase conducted during the last months of the first year of PhD, in parallel to the MPhil examination preparation. During phase zero, the researcher collected and analysed a restricted number of documents about the TfL Open Data initiative and interviewed the TfL manager who granted access to the case and provided final feedback on the case study's understanding. After phase zero, the researcher set as a research goal to explain through Moore's strategic triangle how TfL configured its ICTs system to enable the co-production of 700 additional options of information service proposition. The primary assumption was that TfL was creating value for the public because it offers a big value proposition of information service, resulting in increased likelihood of satisfying all citizens' individual needs and then creating more value for the public. Therefore, by explaining how TfL configured its ICTS system to enable co-production and create public value, the researcher could have drawn a framework capable of indicating how public agencies configure an e-government system to create public value.

Table 4 The five phases of TfL case in details

Phase Zero Jan 2016-Apr 2016	Preliminary data collection and analysis for the case selection
Phase One Jan 2017	Data collection
34	TfL Digital Blogs articles

11	TfL slides presentation
25	TfL articles
2	Catapult UK reports
1	Open Data Institute reports
5	Central and Local Government reports
10	Private companies reports
13	NGOs reports
Phase Two Feb 2017	**Data analysis: Thematic Analysis through NVivo of all the collected documents**
Phase Three March 2017	**Interviews with High Level Managers**
2	Senior manager from Online at TfL (first in charge of the developer community and later in charge of developing partnerships)
2	Senior Manager from Online at TfL (in charge of managing external channels)
1	Senior Manager from Online at TfL (in charge of technical management of TfL API platform)
1	Senior Manager from Online at TfL (in charge of managing the Online TfL digital strategy)
1	Senior Manager from Online at TfL (in charge of architecture management)
1-Answered by email	GLA director (main supporter of the TfL Open Data initiative)
1	Interview with CityMapper manager
1	Interview with Moovit Manager for EU
Phase Four	**Confirmation of case study understanding**
1 May 2017	TfL manager provided feedback about the research outcome
1 Jan 2018	Presentation at Catapult UK

1.4.1 Data collection

The researcher dedicated phases one and three to data collection. After phase zero, the researcher accessed the field with a priori insight constituted of the research question, a theoretical framework, and preliminary knowledge of the case. The researcher collected empirical qualitative data from several public sources through documents and interviews conducted with high-level TfL managers from June 2016 to March 2017. Documents were the primary source of qualitative data. They represent a rich source of information, especially for studies in the public sector field, where public officials or politicians might be reticent to provide more information than that already officially available (Natow, 2020).

Moreover, documents can be retrieved and potentially accessed by others, increasing the research findings' transparency and objectivity (Bowen, 2009; Yin, 2009). However, not all documents are

precise or provide a complete recording of the events (Bowen, 2009). Therefore, the researcher conducted a systematic review of the documentation, guaranteeing a sufficient number of different documentary sources to triangulate information about the case. The documentation was first selected based on the sources' reliability, credibility and accuracy, and by preferring official sources such as Government or TfL. A second screening of the documentation ensured that the content fit the focus of the research question.

The primary source of documents comes from TfL, and especially from Online at TfL's department, which manages the TfL Open Data initiatives. The first source of internal documents about the Open Data initiative was the TfL digital blog[6]. Online at TfL's managers are the authors of the blog's articles and provide extensive and rich information about how the Open Data platform works, as well as news and updates about the release of new TfL's APIs and features. The blog articles are beneficial to understand the TfL digital platform's organisational and technical functioning, which mediate the information service's co-production. All the available TfL's public slide presentations which discuss the strategy and the production configuration behind the Open Data initiative were the second source of internal information. TfL's organisational policies or reports that refer to open data initiatives represented the third source of internal data. All these internal data sources describe the TfL's internal and shared view about the Open Data initiative.

Documents produced by the local and central Government represented another essential source of information because they illustrate the political context/authorising environment where TfL operates. A particularly helpful document is the "Market Assessment of Public Sector Information" published by the Department for Business Innovation & Skills in 2013 that provides a good overview of the political context, expectations and visions about Open Data and insights about the TfL's case[7]. "The Smart London Plan" of 2013 produced by the Mayor of London shows how London's local Government considered open data critical for the economy[8].

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[6] https://blog.tfl.gov.uk/
[7] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/198905/bis-13-743-market-assessment-of-public-sector-information.pdf
[8] https://www.london.gov.uk/sites/default/files/smart_london_plan.pdf

Other sources of documents about the TfL case came from civil society. The 2013[9] "Shakespeare review" is an independent study that deeply influenced the national and local governments' perception about Open Data. Public managers, politicians, NGOs and companies that contributed to the study agree that open data could enable transparency and co-production on a large scale. Another important source is offered by the blog "Lesson from the London Datastore" written by a former GLA director which offered (especially in chapter 4) insights about how TfL started opening its data to the public[10]. Researchers from different NGOs or companies wrote additional reports about TfL after reviewing the available documents and interviewing TfL managers online. These studies represent an interpretation of the TfL case and helped the researcher to have a more precise overview of the case. For example, GOVLAB's researchers published in 2016 a complete study about the impact of the Open Data initiative, which helped the researcher to comprehend the evolution and the results of the Open Data initiative[11]. Finally, many companies discussed the TfL case in depth. In 2015, Accenture presented its study about TfL Open Data initiative. In 2017, Deloitte presented a detailed report. The report describes the TfL Open Data initiative's journey, evolution and the impact of TfL's open data on the information service' production. Later, Deloitte's report was also officially shared by TfL to show the value of its Open Data initiative[12]. Moreover, TfL's suppliers such as Amazon presented studies of how their technologies or services enabled the Open Data initiative. Thanks to the triangulation of internal and external documents, the researcher could triangulate the correct case understanding.

At the end of data collection, the researcher began phase two. During phase two, the researcher started the document analysis that provided an in-depth knowledge of the case, which was propaedeutic to conduct interviews during phase three. In total, the researcher collected seven interviews with TfL managers who had configured the ICTs system to co-produce the information service. The interviews' goal was to triangulate the understanding of the case that emerged from the documentary data (Merriam, 1998). Five recorded interviews, which lasted on average 60 minutes, were conducted at the TfL's office in London. The TfL manager who had allowed access to the case was interviewed twice in separate meetings outside the TfL office. Another Senior Manager in charge of the developer community and partnerships was interviewed twice in two separate

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[9] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/198752/13-744-shakespeare-review-of-public-sector-information.pdf
[10] https://beyondtransparency.org/part-1/lessons-from-the-london-datastore/
[11] https://odimpact.org/files/case-studies-transport-for-london.pdf
[12] http://content.tfl.gov.uk/deloitte-report-tfl-open-data.pdf

meetings at TfL's office. At the suggestion of a few interviewees, the researcher interviewed a former GLA director involved in the TfL Open Data initiative. The director answered interview questions by email. The researcher also interviewed senior managers of two mobile applications (Moovit and City Mapper) that use TfL's APIs, in order to better understand how developers used TfL's data rather than to comprehend the TfL's internal view about the case. Excluding these last three interviews, all the managers interviewed were from Online at TfL and were in charge of dealing with all different parts of the Open Data initiative. All the managers interviewed could be categorised as "elite". Considering the small number of top managers in all organisations, the limited number of interviews with high-level managers does not represent a limitation for this study (Benbasat, Goldstein and Mead, 1987; Parry, 1998). TfL's high managers hold positions of command. Therefore, they have a privileged and broader view about the Open Data initiative and its configuration, as opposed to other personnel such as software developers, administrators or legal professionals, who have specialised and siloed view on specific aspects only (Natow, 2020).

A limitation related to interviewing public managers such as TfL' managers is that they are often in a politically sensitive position and, consequently, might be reticent to say more than what is officially public (Davies, 2001).High-level managers or politicians also tend to provide contradictory information due to misrepresentations, elusiveness, self-servicing statements, or faulty memories (Martin, 2013; Todd, 2014). In order to mitigate against the above limitations, the researcher conducted semi-structured interviews and used the interviews mainly to confirm the understanding of the case that emerged from review of documents. The researcher used the results of document analysis to develop an interview guide to direct the discussion on specific aspects of the case, leaving interviewees the possibility to add comments or reflections (Longhurst, 2003; Adams, 2015). The first section of the interview guide aimed to provide the research goal and common background of discussion and terminology through a summary of the case analysis (Adams, 2015). A set of open-ended questions about the three main steps of the public value creation process constituted the second section: public value definition, authorising environment, and operational capabilities. The researcher designed the open-ended questions to allow the interviewees to add additional information, offer reactions or conduct common brainstorming. During the interviews, the researcher took notes about the possible divergences or additional information or ideas that could emerge. However, most of the inputs received during the interviews confirmed the understanding of the case that came from the documents and did not add additional significant information.

Similarly to other studies that involve interviews with the "elite", the researcher used the interviews to triangulate the understanding of the case and to seek clarifications when needed (Davies, 2001). The process of triangulation was also useful from a social constructivist point of view. The combination of documentary and interview data helped the researcher to interpret the common views which actors involved in the Open Data Initiative at TfL have about the research topic (Vanhala and Hestbaek, 2016).

Finally, once the research was completed, the researcher started the last phase (phase four), which consisted in collecting additional feedback to ensure research findings' validity and reliability (Yin, 2009). The researcher discussed the case and the main research findings with one of the TfL managers who was also involved in the interviews. The manager confirmed the understanding of the case and manifested agreement for the research findings. The researcher also publicly presented his study in a conference organised by Catapult UK, attended by TfL managers who confirmed the case's understanding and provided positive feedback on the research's overall contribution[13].

1.4.2 Data analysis

Phase two of the research focused on analysis of relevant documents. As part of the document analysis procedure, the researcher read and interpreted the documents produced by TfL and third parties. In fact, these documents do not list only a series of facts and events but also present views of different authors about how the Open Data initiative works (Daly, Kellehear and Gliksman, 1997; Corbin and Strauss, 2008). The researcher adopted thematic analysis to capture shared views about the case embedded in these documents (Braun and Clarke, 2006). The researcher's decision to use thematic analysis also reinforced internal validity (Yin, 2009) because it helped to logically compare empirical data with the themes predicted from the theoretical framework (Eisenhardt, 1989; Denzin and Lincoln, 1994). As part of thematic analysis, the researcher started separating pertinent and not pertinent data (Corbin and Strauss, 2008). Then the researcher labelled and organised data, according to "patterns" or "themes" which describe a common phenomenon or the characteristics of a phenomenon (Boyatzis, 1998; Xu and Zammit, 2020).

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[13] 13 https://futurecities.catapult.org.uk/event/lunchtime-lecture-google-transport-london/

Given that no previous studies have applied Moore's Strategic Triangle according to the sociotechnical perspective, the researcher followed the paths of other explanatory e-government studies' approach that similarly lacked a consolidated theoretical framework (e.g. Mergel 2019). Therefore, the researcher decided to keep the thematic analysis open to the different perspectives that could emerge from documentary and interview data (Hudson and Ozanne, 1988; Xu and Zammit, 2020). In fact, relying exclusively on top-down thematic analysis based on the theoretical framework risked inducing the researcher to miss essential factors that could explain the process of configuration of the ICTs systems that enable co-production of the information service (Braun and Clarke, 2006). Thus, the researcher opted for the hybrid approach of thematic analysis, which combines the deductive approach typical of top-down thematic analysis with the inductive one of bottom-up thematic analysis (Fereday and Muir-Cochrane, 2006). Before accessing the TfL case, the researcher used the theoretical framework to define a set of categories in the template (or codebook) (Crabtree and Miller, 1999). The researcher entered the documents in the NVivo data management program, and then started to systematically code and categorise the themes.

The researcher conducted document analysis by applying the six-steps framework for thematic analysis suggested by Braun & Carke (2006). During the first step, the researcher aimed to become familiar with the entire data corpus, making notes of interesting aspects even if they did not appear immediately related to the research focus. The researcher reviewed several times the most important and rich documents such as the TfL blog articles and TfL slide presentation before starting the coding step. The second step involved generating initial codes, which helped to reduce lots of data into small chunks. During the third step, the researcher categorised the codes under the most suitable themes. If a code satisfied the meaning of two themes, the researcher allocated the code under both themes.

Most of the themes came from the theoretical framework. During phase zero, the researcher only had four macro themes: *authorising environment, operational capability, technology, and public value.* During phase two, the researcher added some sub-themes under the operational capabilities themes, such as *human resources, technology, skills,* and *finance*. Some themes also emerged during this phase, such as *reasons for adopting ICTs-mediated co-production or change of production perspective*. The fourth step involved revising the themes. The researcher read all the data associated with each theme and verified if the data really met its meaning and the research question

perimeter (Clarke and Braun, 2014). During the fifth step, the researcher looked at how the themes relate together, reviewing the entire configuration of the TfL's system for Open Data. Once the final step was reached, the researcher read all the data analysed and wrote a summary that provided an overview of the case's understanding through the theoretical framework lens.

Once the summary was completed, the researcher - inspired by GaaP literature - started reflecting on the differences between the concepts of platforms, infrastructure, and how they enable co-production. The analysis was conducted outside the main research path that led the TfL case analysis, and had the goal of using empirical data to better clarify the difference between platform and infrastructure. The researcher remembered specific data from the documents analysed conducted through NVivo. Driven by the need to understand this new research issue and without a precise research project, the researcher manually took notes about the data he remembered and derived four different themes. The researcher discussed his findings with a TfL manager to ensure the interpretation was correct. The findings categorised in the themes were not added to any paper. However, they helped to build the research proposition of paper 3, because they show that a public agency that mediates co-production of public services through a digital platform can control co-production and also the public value creation process.

Table 5 Description of the themes

Themes about the process of ICTs-mediated co-production configuration	Description
Authorising Environment	The political context where TfL was situated and that allowed TfL to embrace the Open Data initiative
Third-party analysis about authorising environment (emerged)	Third parties', NGOs', or research centres' point of view about the reforms that led TfL and other public agencies to embrace Open Data and co-production
Reasons for adopting ICTs-mediated co-production (emerged)	The reasons that led TfL to consider ICTs-mediated co-production
Operational capability	A general overview of the capabilities required to co-produce services through Open Data
Human resources	TfL's human resources for the new production configuration
Skills	TfL's organisational skills necessary to support the new production configuration

Technology	TfL's ICTs system which enables co-production
Change of production perspective (emerged)	TfL's logic of production
Public Value	The value TfL seeks to deliver to the public
TfL passengers' needs (emerged)	Citizens' expectations, as perceived by TfL
Themes about infrastructure, platform and co-production	These themes are not directly related to the previous research question and aimed to clarify the differences between how digital infrastructure and platform mediate co-production
Infrastructure and co-production (emerged)	Explanation of how infrastructure mediates co-production
Platform and co-production (emerged)	Explanation of how digital platform mediates co-production
Ex Ante co-production governance (emerged)	How TfL configures co-production of public services to create public value
Ex Post co-production governance (emerged)	How TfL steers the co-production process to avoid the create of negative public value

Table 6 Themes, Analytical findings and theoretical claims

Themes	Sample of data collected	Interview outcomes	Analytical Findings	Theoretical claims- PAPER
Authorising environment	*Transport for London (TfL) has signed up to the transparency agenda and provides a wide range of information to users and re-users - principally through its website but also through other channels. In so doing, it builds on the 2010 Mayor's Transport Strategy, which included among its commitments "improving the provision of real-time and other journey planning information, including upgrading the TfL web-based journey planner, allowing further improvements to its real-time performance, accuracy and personalisation." TfL writes that through transparency it hopes to: "Enable our stakeholders to hold TfL to account; Deliver better value for money; and enable businesses and non-profit organisations to develop innovative applications using our data."[14]*	The interviewees confirmed that TfL Open Data Initiative's objective was to improve transparency, create economic opportunities, and deliver more value to citizens.	Political reforms tend to drive the adoption of new technologies.	This finding confirmed previous e-government studies (e.g. Cordella and Iannacci 2010; Schellong 2007) which show how political decisions shape e-government systems configuration. This theoretical claim is presented in papers 2 and 3.
Third-party analysis about authorising environment	*Through its Open Data Policy, the (UK) Government has committed itself to making more of its data freely available to use and re-distribute. This commitment was made with a view to becoming one of the most open and transparent governments in the world. The 2012 Open Data White Paper noted that this would generate savings, promote innovation and support social and economic growth.[15]*	The interviewees confirmed that TfL started the Open Data Initiative as part of changes in the political context at national and local levels.	Public agencies do not act in isolation but are influenced by the environments in which they are situated.	This finding confirms previous public value studies (e.g. Chatfield and Reddick 2018; Moore 1995) which discuss how different political actors in the same environment interact to build a shared political view. This theoretical claim is presented in papers 2 and 3.
Reasons for adopting ICTs-mediated co-production	*Third Party applications, web services and tools can help customers make their journeys even better and this reflects well also on the actual public transport service providers….. to choose the tools that most suit their personal needs, often enabling them to 'personalise'*	The interviewees confirmed the view that more possibilities to satisfy citizens' needs results in a bigger value proposition.	Public value is created only through the satisfaction of one public need at a time. Therefore, more options of a single service help	This finding confirmed Moore's (1995) view of public value creation, which considers public value as the equivalent of corporate value in the private sector. The PhD research in papers 2 and 3 have instead adopted the Bozeman

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[14] Page 196 Market Assessment of Public Sector Information written by Deloitte for the Department for Business Innovation & Skills in 2013
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/198905/bis-13-743-market-assessment-of-public-sector-information.pdf
[15] Page 2 Open data or
closed doors? Written by Centre for Cities in 2013 https://www.centreforcities.org/wp-content/uploads/2014/08/13-12-10-Open-data-or-closed-doors1.pdf

	information even when using mass transit with millions of others. This 'personalisation' helps increase customer satisfaction with transport services and allows operators to present a more 'human' face.[16]		to create more value for the public. The more, the better.	(2007) view, which claims that public value is created when public agencies meet a set of public values simultaneously.
Operational Capabilities	*We defined five key data capability groups for intelligent mobility, focused on:* • *Raw data creation, collection and curation* • *Dataset handling and manipulation* • *Computational and statistical analyses* • *Human intelligence and use of data insights* • *Software and technology development.* *These led us to three key requirements for building capability and capacity for intelligent mobility:* • *Skilled technical talent capable of handling and analysing very large datasets compiled from multiple sources.* • *Organisational capability that ensures business leaders understand new analytical processes and business models in outline and can use actionable insights for strategic decision-making.* • *Technological investment to ensure access to requisite data storage capacity and computational processing power, for example, through the use of cloud-hosted servers.*[17]	The interviewees confirmed that the adoption of Open Data implied several organisational changes at a technological and organisational level which require years and many efforts.	The ICTs-mediated co-production requires dedicated operational capabilities.	This finding confirmed that different production configurations require different operational capabilities. This theoretical claim is presented in Papers 1 and 2.
Human resources	*At the beginning of 2012, TfL's Digital Team numbered 40 people. By 2015, the original team had almost doubled in size, but this is seen as just an interim step (with further expansion likely) as the organisation sees new opportunities to exploit the cloud platform to develop more of its own apps and services, and to more fully support third-party developers, in order to meet its*	The interviewees confirmed that TfL started hiring human resources from tech companies and start-ups. All the interviewees expressed their passion for Open Source movement.	ICTs-mediated co-production requires changes of human resources.	This finding did not lead to any particular theoretical claim except the need to adapt human resources when changing to a new production configuration.

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[16] page 5 Action Points Advancing Public Transport April 2014-Report no longer available online at http://www.uitp.org/

[17] Page 9 The Transport Data Revolution written by Catapult UK https://ts.catapult.org.uk/wp-content/uploads/2016/04/The-Transport-Data-Revolution.pdf

	customers' growing expectations for digital channel engagement.[18]			
Skills	*No specific data about TfL.*	The main organisational skill was the adoption of the Agile mindset.	New work practices are adopted to support the new production process mediated by the TfL's ICTs system.	This finding did not lead to any theoretical claim.
Technology	*This will enable registered application developers to freely access the same journey solutions that are available to customers on the TfL website and mobile site. The API is intended to enable developers to create solutions on a variety of platforms and increase the reach of reliable travel information in London.*[19]	During the interviews, it emerged that the same API could power the internal digital information services and the apps co-produced by third parties. Moreover, it also emerged that the ICTs system that enables the Open Data initiative was defined as Open Data platform. From the interviews, it also emerged that the Cloud made co-production possible. The demand for data is not fixed. For example in rainy days the demand for information increases.	Digital platforms enable co-production of services. Digital platforms can support different modes of production simultaneously.	Thanks to ICTs systems like digital platforms, a public agency can combine multiple modes of production to produce a service. This analytical finding supports the theoretical claim presented in Paper 1. The second analytical finding is that the ICTs system that enables co-production is a digital platform. This finding has opened the need to understand the difference between digital platforms and infrastructures and how they enable co-production.
Finance	*No specific data about TfL.*	The payment of Cloud service could not be predicted. Therefore TfL had to change its financial procedures.	The adoption of co-production also implies changes in internal financial routines.	This finding did not lead to any theoretical claim.
Change of production perspective	*Partnership with Developers:* *As explained, TfL is not producing any Smartphone' Apps'.* *So, who is the client in this new model? TfL*	The interviewees confirmed that the production became more open and that developers	Co-production implies the diffusion of an open logic of production, as an	Public agencies can produce services following two production logics: manufacturing logic and service logic.

[18] Pag 5 report *Transport for London creates an open data ecosystem with Amazon* written by MWD advisors https://d0.awsstatic.com/analyst-reports/MWD_AWS_TFL_Case_Study_Sept_2015.pdf

[19] page 4 official TfL Journey Planner API documentation http://content.tfl.gov.uk/journey-planner-api-documentation.pdf

	engaged some of the developers of existing Smartphone apps and worked with them on the design of the API , allowed them access to early versions, and worked in a constructive partnership with them to exploit the possibilities that the data provided. As a result, the release of the data played a part, albeit a small one, in the continuing development of the UK's digital economy.[20]	were considered as partners and not as competitors.	alternative to the close logic of production supported by bureaucratic organisations.	This finding supports the theoretical claim presented in Paper 1.
Public Value	*Deloitte study estimated £15m-£58m per annum benefits from customer time saved in apps powered by TfL open data.* • *Usage has since doubled – bringing the estimate to £30m-£116m per annum.* • *Significant investment from app development firms has attracted hundreds of millions of pounds in technology investment in London and elsewhere off the back of our data* • *Over 1,000 jobs estimated to be enabled by our open data ecosystem* • *Around 175,000 people are now employed in the digital technology industry in London, in 45,000 companies with £30bn annual turnover*[21]	The interviewees confirmed the KPIs in the documents. They also added that an additional KPI to measure the Open Data's initiative success is the drastic reduction of citizens' complaints about poor transportation information.	Organisations that adopt an open logic of production tend to value economic performance but also the user's overall satisfaction.	The finding confirmed the shift of focus from output to outcome promoted by the public value management approach (Stephen Osborne, Radnor, and Nasi 2013; S. P. Osborne 2018). This theoretical claim is presented in papers 2 and 3.
TfL passengers' needs	*Accurate real-time arrival predictions are now the most basic of passenger expectations, but this and published performance information has to feel relevant to the passenger. It is not enough to approximate. Information must reflect the passengers' experience of the network and therefore become 'trusted'. Information has to be expressed in ways that the customer can understand and it must enable the service to be benchmarked against other services.*[22]	The interviewees confirmed that TfL always monitors clients' satisfaction and needs, and develop services accordingly.	This finding confirmed that citizens' needs evolve and therefore, public agencies need to adapt the production of their services to constantly keep creating value.	Public organizations have to continually change their service production to meet fast-changing citizens' needs and expectations (Zuboff and Maxmin, 2002). This theoretical claim is presented in paper 2.

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[20] Page 103 report Transport for London-Using Tools, Analytics and Data to inform passengers written by Simon Reed Head of Technology at TfL https://docplayer.net/158000-Transport-for-london-using-tools-analytics-and-data-to-inform-passengers.html

[21] Slide 26 from the TfL presentation https://nhsproviders.org/media/1940/using-technology-to-transform-engagement-rikesh-shah-informatics-leads-28-april.pdf

[22] Page 96 report Transport for London-Using Tools, Analytics and Data to inform passengers written by Simon Reed Head of Technology at TfL https://docplayer.net/158000-Transport-for-london-using-tools-analytics-and-data-to-inform-passengers.html

Infrastructure, platforms and co-production				
Infrastructure and co-production	*There was quite a heated exchange between the developers and the official while they explained that, as soon as the data went live on TfL's website, they would simply scrape the data and build their apps anyway.*[23]	An interviewee[24] confirmed that it is possible to acquire data from the website through the data scraping practice.	A website acts as a digital infrastructure enabling co-production without any control.	Digital infrastructures offer low control over the co-production process (Hanseth and Lyytinen, 2010; Plantin *et al.*, 2018).This theoretical claim is presented in paper 3.
Platform and co-production	*Open data license terms:* *• License modelled on the UK Open Government License with minimal additions* *• Developers must register with TfL* *• They receive access tokens from our API portal, used to access data* *• This allows us to meter and throttle usage should it reach unacceptable levels beyond our thresholds (which are very high)* *• Developers give attribution to TfL ("powered by TfL") and must not use TfL brand marks or imply they are 'official' TfL products.*[25]	An interviewee confirmed that TfL has complete control of its data and knows that the developers are using its data. If developers do not meet their license terms, TfL will not allow them to use data.	Digital platforms allow public organisations to control the co-production of services.	This finding confirms digital platform literature (De Reuver, Sørensen and Basole, 2018; Jacobides, Cennamo and Gawer, 2018; Plantin *et al.*, 2018) and is presented in the research proposition of paper 3.
Ex Ante Governance	*This data is not published under the OGL, and the licensing terms for developers set by TfL include some restrictions, including branding conditions. The data is, however, available free of charge, and TfL encourages its re-use in innovative ways, subject to licensing conditions. The TfL website contains an extensive guidance system providing contextual information and assistance for each feed, as well as suggestions for its use by developers.*[26]	An interviewee confirmed that data are not completely open due to specific terms and conditions. Moreover, TfL does not open all APIs to the public. For example, Oyster card data contain personal data, credit card numbers, etc. TfL will never open this data to the public to co-produce other services	There are two analytical findings here: 1) the decision to co-produce or not to co-produce a service depends on the level of control required for that specific service; 2)Public agencies consider multiple public interests before choosing the most suitable production configuration.	The first finding supports the theoretical claim of paper 1, which explains that public agencies choose the most suitable production mode, based on the level of control over the final output. The second finding supports the theoretical claim presented in paper 2, which explains that in

[23] Information CHAPTER 4 Lessons from the London Datastore present in the blog written by Emer Coleman
Former Director of Digital Engagement Government Digital Service https://beyondtransparency.org/part-1/lessons-from-the-london-datastore/
[24] Only one TfL manager was interviewed to specifically discuss the issues related to the platforms and infrastructure research path
[25] Slide 15 from the slide presentation of Phil Young Head of Online Transport for London https://www.slideshare.net/Sportandrec/open-data-for-tfl
[26] Pag 196 Market Assessment of Public Sector Information written by Deloitte for the Department for Business Innovation & Skills in 2013
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/198905/bis-13-743-market-assessment-of-public-sector-information.pdf

		because that would risk threatening citizens' privacy.		order to create public value, public agencies choose production configuration after considering multiple public interests which often belong to other policy domains.
Ex-Post governance	*In April 2014, software engineer James Siddle demonstrated how cycle hire use statistics connected to Customer IDs could theoretically be de-anonymised in the presence of "any seemingly innocuous personal signal" (such as a Foursquare check-in, Facebook post, picture, or tweet linking an individual to a cycle hire location), leading to exposure of "a detailed record [of] someone's life in London". TfL said that including Customer IDs in the data had been an administrative error. They have since been removed.[27]*	An interviewee was not aware of this specific case. However, in case of any misuse of its APIs, TfL has the right to turn off the APIs and not allow the developer to use that API anymore.	This finding shows that digital platforms allow public agencies to control the value creation process. The second finding is that co-production can also create negative public value and therefore, requires a higher level of control.	The finding confirms that co-production can also create negative value for the public (Williams, Kang and Johnson, 2016). Public agencies cannot predict the services third parties will co-produce. Therefore, they have to continually govern the co-production and address the ecosystems to the right value creation paths. Differently from digital infrastructure, digital platforms allow public agencies to better control co-production (Eaton *et al.*, 2015) and then to address the public value creation process. The theoretical claim is presented in paper 3.

1.5.The case of the Italian public administration
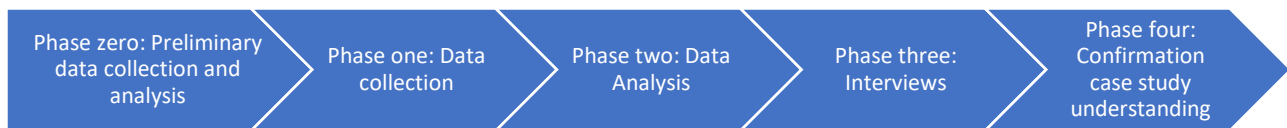
Figure 2 The five phases of the Italian public administration case

The Italian case study can be similarly divided into five phases. Phase zero indicates the stage where the researcher started framing the research question, conceptualising the theoretical framework and selecting the case. This phase began when the researcher reflected on the TfL preliminary data and on the concept of GaaP. After studying the Italian case and meeting the Congressman who granted access to the case, the researcher started phase one.

During phase one, the researcher collected documents from two official sources: AgID and the Digital Transformation team. During phase two, the researcher applied the theoretical framework presented in chapter 4 and in paper 3 to analyse how the organisational and architectural dimension of GaaP mediates the entire Italian public administration's operational capabilities, influencing how public agencies can create public value. After documentary analysis, the researcher summarised the case understanding and started phase three. During phase three, the researcher interviewed the main stakeholders who had conceived the Italian e-government reform to triangulate the understanding of the case and to discuss implication of this architecture in the production of digital services. In phase four, the researcher asked a senior manager from the Digital Transformation team to review the first research draft presented at AOM. Moreover, the researcher had the opportunity to work with public officials from AgID and Digital Transformation team to further develop and present one of the cases discussed during the interviews. This unique opportunity helped to better understand and triangulate the emerging complexities of how GaaP mediated the public value creation process and of the need for public value orchestration.

Table 7 The five phases on the Italian public administration case in details

Phases	Description
Phase Zero Sept- Dec 2016	**Preliminary data collection and analysis**
Phase One Jan-Dec 2017	**Data collection**

Strategy for digital growth (120 pages)[28]	The preliminary document which addresses the vision and the reforms necessary to adopt the platform model in the Italian Public Administration
The Three-Year Plan for information technology in the Public Administration (133 pages)[29]	A detailed plan for the development and the launch of the digital projects necessary to support the platform model of public administration
27 Medium's blog articles by Digital Transformation Team[30]	Articles written by managers from the Digital Transformation team to update and explain their progress and initiatives
28 Medium's blog articles by Italian Digital Agency (AgID) [31]	Articles written by managers from AgID to explain the activities and the projects related to the new digital strategy
40 newspaper articles	Articles from major Italian newspapers that reported interviews and explanations of the new reform
Phase Two Apr-Dec 2017	**Document analysis: Thematic Analysis through NVivo of all the collected documents**
Phase Three Apr-Dec 2017	**Interviews with high-level managers and politicians**
3 Congressmen	The three Congressmen from different political parties coordinated and developed the digital reform of the Italian Public Administration
2 high-level public managers	The two public managers from AgID were in charge of the strategic planning and coordination of national and local actors
3 high-level public managers of Digital Transformation Team	The three public managers of the Digital Transformation team were directly involved in the development of the platforms necessary to provide the core services
1 High Manager form the data protection Authority	The manager was in charge of data protection and contributed to the development of the strategy. The manager studied how the platform configuration can be used to govern data privacy
1 High Manager of Italian Regulatory Authority	The manager was in charge of market regulatory policies and actively contributed to the development of the strategy
Phase Four Feb 2018-May 2019	**Confirmation of case study understanding**

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[28] https://www.agid.gov.it/sites/default/files/repository_files/documentazione/strat_crescita_digit_3marzo_0.pdf
[29]
https://pianotriennaleict.italia.it/assets/pdf/Piano_Triennale_per_l_informatica_nella_Pubblica_Amministrazione.pdf
[30] https://medium.com/team-per-la-trasformazione-digitale
[31] https://medium.com/@AgidGov

Feb 2018 Senior Manager Digital transformation team	The manager reviewed a draft of the first version of the third paper
Sept 2018 Presentation at the mobility week organised by Rome municipality[32]	The mobility case discussed during the interviews was presented during the mobility week conference and discussed with the managers of mobility companies that attended the event
Sept 2018 Presentation at the Ministry of Transportation	The researcher presented the case of mobility as a service platform based on SPID, CIE, PagoPA and Open Trasporti
May 2019 Presentation at the Rome Municipality	Together with Poligrafico dello Stato and Digital Transformation team, and managers from ATAC, the researcher discussed and presented the project to the Mobility Commission President of Rome Municipality and managers of the local transportation company ATAC

1.5.1 Data collection

Phases one and three were dedicated to data collection. The researcher started data collection with a preliminary knowledge of the case, a research question and a theoretical framework which drove the data collection (Hudson and Ozanne, 1988). The researcher collected data through documents and interviews with public official and politicians from April to December 2017. Politicians' or public managers' general reticence to add more information than what was already officially declared led the researcher to rely mainly on official documents (Natow, 2020). Therefore, also in the Italian case, documents remained an essential source of information (Bowen, 2009; Yin, 2009). In fact, documents provide precise and objective information and can be accessed and consulted by everybody (Bowen, 2009; Yin, 2009). Nevertheless, documents are not perfect and can often also be imprecise (Bowen, 2009). Therefore, the researcher selected relevant documentation according to the reliability, credibility and accuracy of the sources and also to guarantee a certain grade of heterogeneity to allow a first stage triangulation.

The researcher collected 56 official documents from the two agencies and 40 from newspapers. The primary sources of official documents were AgID, the Italian agency for digitalisation, and the Digital Transformation, which produced two key documents. The first document is "Strategy for the Digital Growth"[33], written by AgID to provide a high-level strategy planning of the Italian public

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[32] https://romamobilita.it/sites/default/files/pdf/MobilityWeek2018/Andrea_Paletti.pdf
[33] http://www.governo.it/sites/governo.it/files/strategia_crescita_digitale.pdf

administration's digital strategy. The document's goal is to give a general and preliminary vision of what the Government and AgID intended to pursue to solve the problem of interoperability and to relaunch shared digital platforms. "Three-Year Plan for ICTs in Public Administration 2017–2019"[34], written by AgID and Digital Transformation team, is a detailed plan to digitalise the Italian public administration. The document is complete and provides references, tables, and figures to explain the e-government architecture and the organisation's functioning in details. The details and the clarity of this document were crucial to understand the organisational and architectural dimension of the Italian e-government system for the public administration. The researcher also collected official documents from the Medium blog of AgID [35]and the Digital Transformation team[36]. Both agencies' managers wrote several articles to complement the Three-Year plan's explanation and to provide operational insights or updates. These blog articles represented an important source to triangulate the shared understanding public managers have about the case. Moreover, the researcher collected data from newspaper articles, which discussed the plan or included interviews of some of the main stakeholders.

The collection of documents continued in parallel with data analysis in phase two. In fact, managers from AgID and Digital Transformation continued to post articles, especially on Medium, to clarify the projects included in the Three-year plan or to provide updates. Therefore, the researcher kept collecting and analysing documents until reaching the saturation point (Yin, 2009). The continuous collection and analysis of data also helped the researcher to better prepare for the interviews in phase three. The researcher interviewed the group of public managers and politicians who conceived the reform in the Parliament or in the office of AgID. The interviews lasted 30-70 minutes and were conducted in the Parliament or at AgID's headquarter. The first person interviewed was a Congressman who actively contributed to drawing the public administration digitalisation reform. He suggested and put the researcher in touch with others to interview to understand the collective view about the digitalisation plan and to clarify specific topics. The researcher contacted and met two other Congressmen from different political parties who had conceived the reform. In two separate meetings, the researcher interviewed two high-level managers from AgID: the head of AgID and another senior manager in charge of the payment architecture. The head of AgID confirmed the

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[34] https://pianotriennaleict.italia.it/assets/pdf/Piano_Triennale_per_l_informatica_nella_Pubblica_Amministrazione.pdf
[35] https://medium.com/@AgidGov
[36] https://medium.com/team-per-la-trasformazione-digitale

case understanding of the researcher and filled some background gaps about the origin of reform and the connection with other previous e-government projects such as E015. The meeting with the second senior manager was focused mainly on pagoPA and its functioning. Interviews were also conducted with other senior managers of the Digital Transformation team who provided insights about the evolution of the e-government architecture and the functioning of the Interoperability model. The researcher interviewed two other high public managers involved in the development of the reform: the head of the Italian Regulatory Authority for Communication and one member of the Italian Data protection authority.

As in the case of TfL, all the managers interviewed in the Italian case could be categorised as "elite". As for the TfL case, the limited number of people interviewed does not represent a limitation for this study (Benbasat, Goldstein and Mead, 1987; Parry, 1998). In fact, except for the head of Digital Transformation team and two other managers from the Digital Transformation team, the researcher interviewed all the top managers and politicians who had discussed and conceived the reform. As high-level public managers and politicians involved in the reform, they had a privileged and unique view on the case, unlike other bureaucrats, Congressmen or managers who did not work on the reform (Natow, 2020). Although the reform was a highly sensitive topic because it influenced the Italian Government's digital services procurement for the next decade, the interviewees did not avoid discussing it (Davies, 2001). Generally, they all tended to be very open, helpful and collaborative.

The Congressman who had helped the researcher to reach the other participants made the researcher aware that, although all the people involved knew very well the entire reform process, they typically had contributed to the development of only the reform's aspect under their domain. Therefore, the researcher had to avoid asking misleading questions that could lead to misunderstanding about the reform (Phellas, Bloch and Seale, 2011) or to receive contradictory or incorrect information on other related topics (Martin 2013; Todd 2014). To mitigate this problem, the researcher used semi-structured interviews which helped to set a common background, and at the same time left interviewees free to express their opinion on the topic of their specialisation (Longhurst, 2003; Adams, 2015).

Before conducting the interviews, the researcher prepared and studied in-depth the entire case and the specific domains managed by each interviewee (Adams, 2015). Analysis of the documents had helped the researcher to prepare an interview guide. The first part of the guide summarised the case study's understanding and set a common terminology for the discussion. A set of open-ended questions constituted the second section. The researcher tailored this second section's questions to receive specialised feedback or additional information on each interviewee's area of specialisation. The final and third part of the interview guide was dedicated to discussing two hypothetical examples related to the healthcare and mobility service. This part was very important to understand how the e-government system mediates the production and co-production processes. During the interviews, the researcher took notes about possible divergences from the researcher's understanding of the case.

Interviews with the people who conceived and implemented the reform offered an important source of triangulation to understand the case and to seek clarifications (Davies, 2001). This triangulation process was essential to ensure that the interviewer's subjective interpretation of the case corresponded to the collective perspective of all the stakeholders involved in the reforms (Vanhala and Hestbaek, 2016). To further ensure the validity of the findings, the researcher asked a Digital Transformation team senior manager to review the draft of the third paper . His feedback was positive. Moreover, the researcher continued to interact with the Digital Transformation team and AgID to further develop the mobility case discussed during the interviews. The researcher worked together with AgID and Digital Transformation to propose Mobility as a Service (MaaS) platform, based on the digital platforms pagoPA, SPID, and CIE. The result of the initial proposal was presented and discussed at the Mobility Week organised by Rome municipality[37]. After the conference, the group reviewed and discussed the project with the Ministry of Transportation that hypothesized the adoption of its API platform (Open Trasporti) as an additional layer for the Maas platform. The project was also discussed in four additional technical meetings with ATAC, the transportation company owned my Rome Municipality, which considered the proposal to reconfigure the MaaS initiative using their mobility platform instead of OpenTrasporti. Once the project passed the feasibility study of technical managers of ATAC, the researcher presented it to the Mobility Commission of Rome Municipality, in front of all the involved stakeholders and the president of Mobility Commission of the Roman Government.

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[37] https://romamobilita.it/sites/default/files/pdf/MobilityWeek2018/Andrea_Paletti.pdf

1.5.2 Data Analysis

The second phase of research focused on analysis of the documents. The data analysis had a double goal, to understand: 1) the architectural and organisational dimension of the Italian public administration's e-government system, and 2) how the e-government system could mediate the co-production of the service. The collected official documents embedded the view of the Government and public officials of AgID and Digital Transformation team who had discussed and collectively drew up the reform (Daly, Kellehear and Gliksman, 1997). The researcher adopted thematic analysis to capture and interpret the Italian Government's general view represented by the two agencies (Braun and Clarke, 2006). As in the TfL case, the researcher adopted a hybrid approach of thematic analysis, by mixing deductive and inductive approach (Fereday and Muir-Cochrane, 2006). Hence, before accessing the case, the researcher defined a set of categories based on the theoretical framework in the NVivo's codebook. Given that only a limited number of GaaP studies exists and that this theoretical framework's roots are in the private sector literature about platforms, the researcher decided to keep the thematic analysis open to the emergence of different perspectives. The process of themes' selection followed the six-steps framework for thematic analysis suggested by Braun & Carke (2006).

During the first step, the researcher studied all the corpus of data to familiarise himself with the case. The researcher read the Three-Year Plan for ICTs in Public Administration 2017–2019 and other available documents to gain an overview about the case. At the second stage, the researcher started coding the documents to reduce the data's complexity into small chunks of code. At the third stage, the researcher categorised the code according to four macro themes which were derived from the theoretical framework: *Representation of the public administration as a platform, GaaP architectural dimension, GaaP organisational dimension, Ecosystem structure and management.* During analysis, one additional theme emerged: *open source*. The theme contained all the data that refer to the Government's will to build platforms according to the open-source principles. However, once the researcher reached the fourth stage of the data analysis process, which is dedicated to reviewing the consistency between the themes and the research question, he decided to delete this emergent theme because the data about open source were not pertinent to the research scope. During this phase, the researcher also checked that the data were correctly associated with the right themes (Clarke and Braun, 2014). During the fifth stage, the researcher printed the Three-Year Plan's chart that illustrates the Italian GaaP e-government architecture and

started to link the information provided in the themes to the architecture components presented in the chart. This exercise was necessary to ensure that the researcher had all the necessary information to understand all the technical and organisational characteristics of the Italian GaaP e-government system. Once the final step was reached, the researcher wrote a summary of the case which was presented during the interviews and then re-used for the first draft of the third paper.

Table 8 Description of the themes

Themes	Description
Public administration as a platform	Consistent representations of public administration as a platform
GaaP architecture dimension	The themes collected information to explain the relationship between material (Cloud, data centres etc.) and immaterial infrastructures (ANPR, SPID etc.), Data and Analytics Framework (DAF)
GaaP organisational dimension	The organisational elements of the platform such as core services, building blocks, and modularity
Ecosystem structure and management	The organisational and technical elements which indicate the existence, functioning and dynamics of ecosystems where external actors can co-produce services

Table 9 Themes, analytical findings and theoretical claims

Themes	Sample of data collected	Interview outcomes	Analytical Findings	Theoretical claims- PAPER
Representation of the public administration conceived as a GaaP	*The Plan's objective is to guide and support the Public Administration in implementing the technological vision of the operating system for the Country. It sets the foundation for the construction of a number of key components upon which public administrations can deliver simpler and more effective services for citizens and businesses by adopting flexible methods, a mobile-first approach, architectures that are secure, interoperable, scalable, highly reliable, and based on clearly defined application programming interfaces (APIs).[38]*	The interviewees confirmed that the vision of an operating system corresponds to the one of GaaP and that in the Italian context, the GaaP concept refers to an e-government system constituted by different platforms.	GaaP is a platform of platforms which enables different ecosystems of services.	GaaP e-government system is constituted not by a single platform but by a bundle of platforms. The theoretical claim is presented in Paper 3.
GaaP architecture dimension	*Data and Analytics Framework (DAF) is the tool that the PA will use to maximize the value of public information assets, break down the barriers inhibiting data and information exchange, improve and simplify the interoperability of public data between Public Administrations, and standardize and promote the diffusion of Open Data. The DAF introduces a new way of operating and processing the data needed to create intelligent applications for the PA, citizens and businesses. That's not all. The reduction of barriers in data exchange is also an enabling factor for possible developments of the once-only principle.[39]*	The interviewees confirmed that the architecture's goal is to facilitate - through APIs - the interoperability among public agencies and the co-production of service with third parties. Thanks to the DAF, public agencies can also govern data and decide who and under what conditions can access its data. This architecture enables public agencies to pursue their interests but also to avoid threatening other public interests.	The GaaP architecture enables co-production on a large scale and at the same time also offers public agencies the means to govern their data and create public value.	Public agencies need to configure the production or co-production of services, after taking into account different public interest to avoid creating negative value for the public. The theoretical claim is presented in Paper 2. The process of production configuration to meet all the different public interests is considered in paper 3 as ex-ante public value orchestration.
GaaP organisational dimension	*The "operating system" of the country: a series of fundamental blocks upon which Services for citizens,*	An interviewee confirmed the GaaP modular structure based	The GaaP allows public agencies to assemble	GaaP organisation allows public agencies and companies to assemble

[38] https://medium.com/team-per-la-trasformazione-digitale/three-year-digital-transformation-plan-italian-public-administration-guidelines-design-development-8bdb440f940d

[39] https://medium.com/team-per-la-trasformazione-digitale/three-year-plan-italy-digital-transformation-public-administration-european-digital-agenda-59adc0e232cc

	the Public Administration, and enterprises are built with modern digital products.[40]	on multiple platforms helps public agencies and companies configure their digital services. For example, a bank can adopt CIE or SPID platform instead of other identity systems to identify its clients.	different public and private platforms to configure their services.	and disassemble their service configurations as Lego bricks to better meet citizens' needs. The theoretical claim is presented in paper 3.
Ecosystem structure and management	Each ecosystem identifies a thematic sector with characteristics of homogeneity. It includes public bodies and may also include private individuals, such as associations, that, for various reasons, carry out important functions within the ecosystem. For example, the public finance ecosystem includes public entities, such as the Ministry of the Economy and Finance, the Ministry of the Interior, the Revenue Agency, the Regions, the Guardia di Finanza (Fiscal Police), as well as private entities such as accountant, CAF (fiscal assistance centres), and fiscal practitioners.[41]	The interviewee confirmed the existence of multiple ecosystems. Each ecosystem represents specific policy domains that public agencies govern according to their competencies. However, from the mobility and healthcare cases' discussion, it has emerged that the control of the ecosystems is challenging because it is difficult to predict how third parties co-produce services. When the production configuration involves multiple ecosystems governed by different public agencies, the control becomes even more difficult.	Public agencies need to continually reconfigure the production of public service to meet emerging needs or to avoid the creation of negative value. The public value orchestration becomes more complicated when the production configuration involves multiple platforms and ecosystems owned and governed by other public agencies.	This finding supports two theoretical claims of paper 3: 1)The process of public value orchestration is necessary also ex-post public services production and the co-production configuration to avoid the creation of negative value for the public; 2)GaaP as a platform of platforms exercises more control than an infrastructure, but less than a platform (Hanseth and Lyytinen, 2008).

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[40] https:/medium.com/team-per-la-trasformazione-digitale/new-operating-system-country-technological-competence-plans-11b50a750ea7
[41] Pag 62 Chapter 6 "Ecosystems" from the Three-Year Plan for ICTs in Public Administration 2017–2019

CHAPTER 2 The creation of value in public management literature

Public administration is a large administrative apparatus composed of several public agencies which are in charge of pursuing various political goals and creating value for society. In public management literature, perceptions of what is valuable for society and of what is the best model of organisation for public administration to enable the production of public services have evolved over time (Bryson, Crosby and Bloomberg, 2014). Traditional public administration had focused on serving values typical of democratic regimes and had adopted bureaucratic model of organisation. The New Public Management (NPM) tradition has focused on economic efficiency to create value for society and has embraced a typical market-oriented and corporate model (Dunleavy and Hood, 1994; Hood, 1995). The joined-up-government (JUG) approach has also focused on efficiency, but it has promoted a more collaborative model of public administration to avoid duplications and to deliver more value to citizens (Kavanagh and Richards, 2001; Pollitt, 2003; Hodges, 2012). The New Public Governance (NPG) management approach has similarly focused on efficiency and has suggested a more open model of public administration to enable a networked production of public services, which combines synergies between public and private actors to co-produce public services and to create more value for citizens at lower costs (Eriksson, 2012; Wiesel and Modell, 2014). The most recent public value tradition has instead focused on fulfilling values that society collectively perceives as belonging to the public sphere (Bryson, Crosby and Bloomberg, 2014). The public value perspective has similarly supported a more networked and open model of organisation for public administration. This chapter seeks to provide relevant background for the whole thesis by reviewing characteristics of all five public management approaches and by discussing how their models of organisation for public administration impact the creation of what they think is valuable for citizens.

2.1. Bureaucracy and the traditional model of public administration

2.1.1 Traditional public administration and the creation of value for the public

Traditional public administration is often identified according to the bureaucratic paradigm. Separation between political and administrative power is at the core of this perspective (Barzelay, 1992). The traditional form of public administration is characterised by a strong emphasis on controlling and dictating procedures and regulations to address social and economic activities (Osborne and Gaebler, 1992). This focus is linked to the perception that citizens are passive

consumers of services and that only public agencies can create value for society by executing political goals according to the principles of impartiality and homogeneity (Lynn, 2001).

The key organisational features of bureaucratic organisation aim to pursue principles of impartiality and homogeneity of administrative action (Weber, 1968; Kallinikos, 2006b). In the first place, bureaucracies are based on a *formal and explicit hierarchical structure of authority*. Secondly, bureaucracies organise the production of public services according to *a rationalised division of labour*. Thirdly, a set of *stable and impersonal rules and detailed procedures* governs bureaucracies and ensures a neutral and objective decision making. This system of rules guarantees that public officials enforce procedures '*sine ira et studio'*, that is, without passion or prejudice (Newman, 2005; Olsen, 2006). This is necessary to ensure that every citizen is treated impartially, equally, and fairly while interacting with public administration. Moreover, to enhance administrative action functions' impersonality, administrative roles are separated by the person that occupies them (du Gay, 2005). Complete ownership of the means of production helps public agencies to reinforce separation between private and administrative spheres and to make public agencies more independent from individual discretion (Persson and Goldkuhl, 2010).

The impartiality and homogeneity of administrative action also require centralised communication and a control system that ensure consistent application and enforcement of political decisions. Centralisation of decision making is critical to reduce discretional power of 'street-level public officials' that might lead to inconsistent applications of rules and might generate inequalities (Lipsky, 1971; Kelly, 1994; Bovens and Zouridis, 2002).

Characteristics of bureaucratic organisation that make the action of public agencies homogenous and impartial are also critical to serve values typical of democratic regimes, such as efficiency, impartiality, homogeneity, fairness, equality, legality, transparency, accountability and objectivity (Bryson, Crosby, & Bloomberg, 2014). In fact, for many western countries, bureaucracy has represented the most suitable configuration to create value for society by serving democratic values within the boundaries of a determined territory (Olsen, 2006; Guillamón, Bastida and Benito, 2011).

Institutionalised rules and regulations that make procedures impartial and homogeneous are also critical to maximising efficiency of bureaucratic organisations because they prompt employees to perform their duties according to a standardised and optimal technical process (Beetham, 1987; Kiser and Schneider, 1994; Adler and Borys, 1996; Gajduschek, 2003; Kallinikos, 2004b; Antonio, 2006; Cordella, 2007; Cordella and Tempini, 2011).

Bureaucratic organisational configuration also has an impact on fairness, that is, non-discriminatory enforcement of rules. Bureaucracy ensures fair decisions, due to its system of rules which guarantees that public officials process administrative cases according to impersonal rules rather than their own preferences (Newman, 2005; Olsen, 2006).

The complete impersonality of decision making also helps to create more objective administrative actions that are not influenced by personal factors. Public officials' impersonality is at the core of the ethics of public services and it guarantees an objective and equal treatment of all citizens (Seidman, 1987), which is, for example, fundamental in judicial services (Newman, 2005; Wettergren and Bergman Blix, 2016). In fact, politicians can defend interests of certain parties, but bureaucrats can only execute political orders even if they do not correspond to their personal convictions (du Gay, 2005).

Minimising public officials' discretion also helps to generate equality in the relationship between citizens and public administration. In fact, the presence of a system of rules, together with the certainty that decision-making processes are executed impersonally, lead to more predictable outcomes (Gajduschek, 2003) that guarantee a fair and equal treatment of all citizens who are encompassed by certain typical administrative cases (Lipsky, 1971; Kelly, 1994; du Gay, 2005; Persson and Goldkuhl, 2010). This is especially important for public officers such as policemen, welfare workers or doctors, who are often in direct contact with citizens and who might be tempted to treat individual citizens differently due to their personal convictions.

The system of rules that addresses and constrains the power of public officers is also fundamental to pursuing legality, which refers to the importance of behaving according to abstract and impersonal rules applicable to everybody. By clearly indicating which actions are legal and which are not, regulations delimitate the sphere of competence of each public officer (Rothstein, 2003). Moreover, a career system based on meritocracy or seniority, rather than on discretionary decisions, reinforces legality because it limits forms of corruption such as nepotism (Dahlström, Lapuente and Teorell, 2012). Officials are not elected, but instead appointed due to their merit and their technical qualifications (Kiser and Schneider, 1994). Due to this system, the position of public officials is legitimised because it is regulated by abstract regulations rather than by individual discretion (Cassel, 2000; du Gay, 2005).

The same rules and procedures which help to improve legality also enhance transparency of administrative decisions. All decisions, procedures, and rules are based on written documents which are stored in archives. Written documents help to improve both transparency and accountability

because it is possible to assess ex-post the formal responsibility of public officials as well as the reasons behind certain administrative decisions (Drewry, Greve and Tanquerel, 2005; Persson and Goldkuhl, 2010). Transparency of administrative decisions is critical to legitimise public administration actions and to legitimise the elected government (Guillamón, Bastida and Benito, 2011).

More transparent decision making also helps to improve accountability of administrative actions. Accountability refers to the possibility of understanding who is the public officer responsible for an administrative action because there are precise hierarchical structures (Rothstein, 2003) and rules that define the sphere of personnel competence (Mulgan, 1997). Moreover, each role has specific duties and obligations that make public officials accountable for their actions, and also enable and constrain their actions (Kelly, 1994).

2.1.2 Bureaucratic rationale of value creation

Although the relationship between public administration and bureaucracy seems symbiotic, bureaucratic model of organisation is also used to support non-democratic regimes and to pursue unethical goals. The reason for this ambivalence of bureaucratic configuration can be explained by looking at rationality that drives administrative actions.

According to Weber, social action is rational if it is driven by goals or by values and if the means used to reach these goals are suitable (Parsons 1947, p.16; Weber 1968). Value-driven rationale describes people's actions as meant to satisfy what is valuable according to their personal convictions. On the contrary, instrumental rationale describes actions that are driven by specific goals, and involves the selection of the most effective means to reach objectives.

Instrumental rationale drives administrative actions of bureaucratic organisations. This rationale has influenced the design of the system of rules and procedures which guarantees impersonal and standardised administrative actions. It regulates public administration offices, mediates the relationship between citizens and public administration, and thus regulates how civil servants provide services. As a result of its pervasiveness in bureaucratic organisation, all administrative procedures are rationally designed to influence and address actions of the numerous public servants providing services to citizens (Merton, 1957; Antonio, 2006).

Weber (1968) postulates that instrumental rationale is the result of a cultural phenomenon typical of western society. The mathematisation of science, chemistry, historiography and the development of the doctrine of the state based on abstract concepts, as well as the rationalisation of art and

architecture are all examples of how rationalisation was deeply embedded within western society when bureaucracy was conceptualised.

This type of rationalisation affected both the private and public sectors, as evident, for example, if we compare Ford's assembly lines and the bureaucratic model of public administration (Osborne, Radnor and Nasi, 2013). In fact, traces of the instrumental rationale described by Weber can be found in Taylor's scientific management that inspired industrial assembly line as well as the production configuration of many public administrations (Maier, 1970). Similar to the bureaucratic model of organisational, Taylor's scientific management suggested standardisation of work, division of labour, specialisation of personnel, promotion of impersonality, and subordination of strict rules to increase efficiency of the final output.

The overlap between the rationale of large manufacturing corporations like Ford and the rationale of large public administration apparatus clearly emerged between 1920 and the early 1970s, when public administrations, especially in the US, became responsible for leading the war industry and rebuilding post-war economies (for example, through the administration of the New Deal) (Bryson, Crosby and Bloomberg, 2014). During this period, the role of public administration in the economy was omnipresent. Public agencies were put in charge of planning, organising, staffing, directing and coordinating 'mass production' of welfare services and of rebuilding infrastructures such as dams, highways or power grids. The rationale of bureaucratic configuration was then extended to entire public administration to respond to new organisational challenges.

According to Weber (1968), the universal expansion of bureaucracy is related to its technical superiority over other forms of organisation. Bureaucracy has become widely diffused also due to its cultural power based on rational deliberation and calculation, which address social action and provide legitimacy and objectivity to the results. Finally, bureaucratic organisations are the most suitable configurations that guarantee ability to control and to correct the enforcement of political decisions.

2.1.3 The limitations of bureaucracy

As predicted by Weber, bureaucracy is highly diffused, especially in the public sector. However, the same rational system that guarantees impartiality has also generated several dysfunctionalities that have contributed to the creation of negative sentiment about bureaucracy (Kallinikos, 2004b; du Gay, 2005; Persson and Goldkuhl, 2010).

Bureaucratic configuration can be described as a Janus-faced organisation. On the one hand, it has been able to rationalise public service and to deliver efficiency, fairness, equality and other positive

values (Adler and Borys, 1996). On the other hand, it is irrational and it creates conditions enabling corruption, injustice and other types of negative outcomes (Clegg *et al.*, 2016).

In fact, as argued by Weber (1968), the same systems of rules that can contribute to controlling and coordinating a public agency can also become an 'iron cage' that constrains the freedom of public employees and makes public agencies unable to serve society effectively. The same rules that guarantee fairness and objectivity alienate bureaucrats who tend to act only according to the rules and to their sphere of authority (DeHart-Davis and Pandey, 2005). Rules and procedures might, in fact, become so oppressive that individuals forget to pursue organisational goals and only concentrate on executing procedures and protocols (Bonjean and Grimes, 1970; Adler and Borys, 1996; Gregory, 1998). This habit may cause *'systemic failure'* that induces public agencies to fail to meet their purpose even if all the right procedures have been followed correctly (Gregory, 1998). Acting according to a system of rules and procedures may, in fact, have a negative impact on communication, information sharing and teamwork, and may cause dysfunctional group dynamics or inconsistent and contradictory decisions (Hood, Lodge and Clifford, 2002).

Moreover, often, the abundance of rules, procedures and competencies typical of *'red tape bureaucracy'* is redundant and might generate not only alienation but also delays and more complexities (Bozeman, 1993). Increased complexity of procedure might become an obstacle to transparency, and might paradoxically increase the discretional power of public officers that opens new opportunities for corruption (Hope, 1985). In fact, public officers often request bribes (speed money) to speed up administrative procedures or to reduce the rigidity of applicable rules (Guriev, 2004; Fredriksson, 2014).

Furthermore, the culture of rules promoted by bureaucratic organisations tends to reduce organisational change and might also generate a chronical inability to respond to citizens' new needs (Burns & Stalker 1961). According to Crozier (1964), public agencies are incredibly inefficient because *'a bureaucratic organisation is an organisation that cannot correct its behaviour by learning from its errors'* (p 187). Merton (1957) similarly agrees on how the structure of rules typical of bureaucratic organisation might cause an inability to adapt and evolve. Rules and procedures are designed and applied to work under specific circumstances, but when these circumstances change, bureaucratic procedures become obsolete and may create negative effects. Merton (1957) clarifies his critique of bureaucratic organisation with an example of a farm where there are chickens trained to interpret the sound of a bell as a signal for food. Every day, when chickens hear the sound of the bell, they assemble to eat. However, one day the same sound is used to assemble the chicken to kill

them. The incapability of bureaucratic organisations to adapt and improve their configuration illustrated by the above example has been confirmed by later studies in the public management (e.g. Hoggett, 1991; Lynn Jr., 2003; Simonet, 2015) and e-government field (e.g. Cordella and Tempini, 2011; Margetts and Dunleavy, 2013) which similarly consider these dysfunctionalities to be the major cause of inefficiencies embedded within/caused by the traditional model of public administration.

As also described in Kafka's novels, such as *The Castle* or *The Trial*, these dysfunctionalities have always affected bureaucratic organisation (Clegg *et al.*, 2016), but they have become unsustainable only when public administration apparatus expanded under the pressure of welfare services that have increased the scope of public administration in multiple domains. The negative impact of bureaucratic organisations caused democratic disaffection (Bonina and Cordella, 2009; Margetts and Dunleavy, 2013) and a substantial rise in public expenditure (Dunleavy, 2005). The chronic inability of bureaucratic configuration to adapt to new needs, the rise of neoliberalism, and the diffusion of an economic-oriented conceptualisation of value had led to a drastic reform of the traditional model of public administration.

During the 1970s and 1980s, a wave of neoliberalist policies spearheaded in the UK by Margaret Thatcher and in the US by Ronald Reagan reformed the bureaucratic model of public administration according to the New Public Management (NPM) approach, which promoted a more central role of the market in the production of public services. The primary result of these reforms was the removal of bureaucratic ethos and its replacement by economic ethos that elevates the importance of management and internal procedures above all other aspects of society (Clegg, Johnston and Shearer, 2016; Bishop and Connors, 2018). The next section critically reviews literature on the alternative management approach and organisational configuration proposed by these reforms and explores/critiques the rationale behind them.

2.2. New Public Management and the corporate model of public administration

2.2.1 The NPM and efficiency as a value

The advent of the New Public Management was a reaction to the perceived weaknesses of traditional public administration based on the bureaucratic model (Stoker, 2006; O'Flynn, 2007). The dysfunctionalities of bureaucracy were associated with the state's incapability to address economic stagnation and growing public debt. For decades, welfare policies rooted in Keynes' economic theories promoted a dominant and pervasive role of the state in each sphere of the economy, based on massive public investments for the creation of public and private services. The

economic crisis of the 70s made urgent the need for an alternative model of the economy as well as of public administration. The USA and the UK responded to the economic crisis with strong neoliberal reforms based on Hayek's theorisation of the economy, which promoted a minimal presence of the state to leave more space to the market in the provision of public services. At the core of this paradigmatic change lies the conviction that the only way public administration can create value for citizens is by opening the provision of public services to the market and by decreasing their costs.

Under growing pressure to cut taxes by reducing public expenditure, the pursuit of efficiency became the paramount objective of public administration reforms to create value for citizens. In line with neoliberal policies, the NPM approach sought to correct bureaucratic dysfunctionalities through the promotion of a new model of public administration based on privatisation, outsourcing and the adoption of corporate management approaches (Dunleavy and Hood, 1994; Hood, 1995). As a result, the NPM dismantled the monolithic, vast, hierarchical structure of bureaucratic public administration and promoted the disaggregation of public administration into leaner and more autonomous units organised as companies with precise goals and often in competition with each other (Stoker, 2006). The NPM introduced the typical corporate model of organisation to public administration in order to increase managerial quality and efficiency of production processes. Public agencies adopted corporate practices such as centralised planning of budget and goals, performance monitoring and central auditing. Contracts substituted bureaucratic regulations and protocols, and became a tool to govern the relationship among public agencies and between public agencies and private companies (Walsh, 1995; Hughes, 2003). In this new organisational model that tends to equalise public and private management, public managers adopted a more entrepreneurial approach focused on results rather than on procedures (O'Flynn, 2007). Citizens remained passive consumers of services, but according to the NPM, they should be treated as clients with individual needs that must be satisfied to create value in their personal sphere.

A close analysis of NPM's characteristics can clarify how these reforms have changed public administration to improve the efficiency of public service production and thus to create value for citizens. Although NPM reforms started in the 70s, it was not until the 90s that Hood (1991) attempted to summarise NPM characteristics and to explain how public agencies deliver more value to citizens by increasing efficiency of public services. The first NPM characteristic is the substitution of bureaucratic control with professional management. Professional management means that the decision making of top public managers is not constrained by 'the iron cage'. Hence, they can

discretionally find the most efficient production configuration to reach their organisational targets and to deliver more value to citizens. More freedom to manage is also favoured by the establishment of informal relationships which facilitate communication and coordination, especially within the same public agency. The second characteristic is relying on explicit standards and measures of performance, which consists of clearly defined goals, targets and standards, and success indicators that public agencies need to follow to ensure an efficient provision of public services. Definition of goals and indicators, expressed in quantitative terms, is important to address scope of administrative action, monitor cost per output, and make public agencies more accountable for reaching results and following procedures. The third characteristic is the emphasis on output controls over procedures. Public agencies should pay attention to results and to their ability to deliver value to society. They need to continuously measure internal and external performances to ensure that public agencies, as well as contractors, meet the standards defined in contracts and do not waste public financing (Kaboolian, 1998). The measurement of outputs is often related to customer satisfaction and to providing the most efficient solution to satisfy their personal needs (Barzelay and Kaboolian, 1990; Osborne and Gaebler, 1992). To guarantee a more efficient ability to respond to citizens' needs, the NPM has favoured the disaggregation of public administration into units, which promotes more decentralised and flexible management. More decentralised production of services reduces the complexity of production, simplifies control of performances, and streamlines/clarifies each public agency's contribution. The disaggregation of public administration also reinforces the division between policymaking and service delivery (Thompson and Miller, 2004). This system of division generates greater efficiency because it favours greater competition in the public sector (Rimmer, 1994; Walsh and O'Flynn, 2000). More competition leads to less expensive public services and thus more value for citizens. In fact, market dynamics incentivise service providers to find the most efficient production solution and propose it to policymakers (Savas, 1982). In a market-oriented and decentralised provision of public services, contracts become an important way to guarantee efficient provision of public services and to facilitate better monitoring of public expenditure. Public agencies use contracts as a tool to address entire markets, set performance standards, and choose actors that should deliver public services on behalf of the state (Kelly, 1998). Another characteristic of the NPM is the import of private sector styles of management practice into the administration of public agencies. Public agencies adopted corporate management practices such as Total Quality Management (TQM) and Business Process Reengineering (BPR) to redesign the production process and improve the efficiency of the

production of public services. The adoption of these management methodologies has greatly helped public agencies to reduce public expenditure without affecting the effectiveness of public services (O'Flynn, 2007; Osborne, Radnor and Nasi, 2013; Osborne, 2018). Another common characteristic of NPM reforms is increased discipline and parsimony in resource use. In line with the need to reduce public expenditure, public agencies were invited to 'do more with less' by using fewer resources while leaving the offer of public services unchanged. Therefore, many public agencies promoted cost-cutting projects that have favoured re-utilisation of existing resources, which has reduced public expenditure without affecting public service provision. All these organisational characteristics have helped public agencies to configure a more efficient production of public service and thereby to provide more value for citizens at lesser costs (Osborne, 2018).

2.2.2 The NPM rationale of value creation

The imperative of reducing public expenditure and increasing efficiency to deliver more value to society has been supported by diffusion of the economic rationale as an alternative to the instrumental rationale typical of bureaucracy. According to the economic rationale theorised by Adam Smith and embedded in NPM reforms, citizens, as well as public managers, are *homo economicus*. Therefore, their actions are driven by the pursuit of their personal interests and not the goals set by the organisation. If citizens are homo economicus, value is created only when they are able to pursue their interests and to maximise their personal gain. The consumption of public service is the result of an economic transaction that happens between a public agency and a citizen. Citizens pay taxes to receive public services that satisfy their needs. However, if the taxes to access to a public service are higher than the gain of using a service, then value created for citizens is low. Therefore, public agencies can create value for the public by maximising the output of public service production without increasing public expenditure and hence taxation of citizens.

The economic rationale embedded in the NPM similarly drives the logic behind private sector production, which also seeks efficiency to create more economic value for clients. The major industrial example is Ford's production chains, inspired by Taylor's scientific management (Osborne, Radnor and Nasi, 2013). Ford planned the production of its Model T to maximise available resources and deliver more value to clients at lower cost. Ford's success facilitated the diffusion of this type of rationale to other industries. Following the same rationale, Toyota developed the Lean production approach, aimed at increasing efficiency by reducing waste of the production process. Due to the economic rationale, the manufacturing principles and strategies developed by Ford and

then by Toyota became fundamental in the private sector and then also in public administration to improve the efficiency of public services. In fact, the economic rationale embedded in the NPM eliminated organisational differences between public agencies and companies. Hence, universities, hospitals and police stations became companies, driven by the same economic rationale as Ford or Toyota.

Because public agencies are like companies, there is no distinction between private and public managers. Thus, public managers do not only pursue the public good, but as homo economicus, they are also driven by the economic rationale. Public managers, in fact, manage the production of public services to serve their personal interest and to maximise their gain. Therefore, the dysfunctionalities of bureaucracy can be explained and then corrected by the NPM using the theory of public choice, principal-agent, and transaction costs theories (Self, 1993).

Public choice considers politicians and public managers to be rational actors driven by personal interests (Hood, 1991; Gruening, 2001). Politicians are elected to represent citizens' personal interests and to compete to protect their position of power. Instead, public managers are driven by personal interests and act to maximise their prestige, power, fiscal benefits, and personal wealth. The principal-agent theory complements the public choice theory. Furthermore, it explains how public managers and politicians can potentially act against the interests of citizens. Public managers as agents are able to make decisions on behalf of a citizen, who acts as the principal (Gruening, 2001). The problem is that the interests of the principal and of the agent might diverge. This type of relationship can create moral hazard that occurs when public managers act to pursue their own interests, and these interests are contrary to those of citizens. Moral hazard is possible because there is asymmetry of information between public managers and citizens. An increase in asymmetry of information also has an impact on transaction costs (Hood, 1991; Gruening, 2001). In fact, the adoption of the economic rationale tends to consider the consumption of public services as an economic transaction between a public agency and the citizens who consume the service passively (Cordella, 2007). Coase's (1937) firm hypothesis postulates that the higher the asymmetry of information between sellers and buyers, the higher the transaction cost for the buyer. In the case of bureaucracy, the asymmetry of information between citizens and public agencies increases searching costs because citizens do not know where they can find the most suitable public service to satisfy their needs (Bozeman, 1993). Contracting costs are high because regulation and administrative complexities make access to public services complicated (Hope, 1985). Enforcement

costs are also high because bureaucracy tends to be slow in public service delivery and can result in discrimination, delays and even theft (Guriev, 2004; Fredriksson, 2014). These three theories complement each other and explain why the dysfunctionalities of bureaucracy make the traditional model of public administration inefficient. However, these theories also help explain how NPM characteristics make public agencies more efficient. First of all, public agencies pass from being single producers of public services to being supervisors of public services provision. As a result of this changed role, public agencies mainly monitor the actions of public managers and contractors in order to ensure that those who provide public services on behalf of the government meet certain goals and quality standards. The asymmetry of information and the opportunistic behaviour of public managers can be limited through contracts described by the principal-agent and public choice theories (Althaus, 1997; Kelly, 1998; Alford and O'Flynn, 2009). Contracts set incentives which align the personal interests of public managers with the interests of citizens.

Lower information asymmetry due to contracts, combined with a bigger market for public service provision, can also reduce transaction costs. Search costs decrease because market competition increases offers of service, and thus it becomes easier to find the most suitable service for citizens. Contracting and enforcement costs decrease due to constant surveillance of service providers' performance, which ensures that certain quality standards are reached by everybody (Savas, 1982). Because of the reduction of asymmetry of information between public agencies and citizens, and the reduction of the opportunistic behaviour of public managers, citizens can better maximise their gain without the risk of being exploited or being charged excessively for public service.

2.2.3 The limitations of the NPM

The NPM characteristics have helped public agencies to increase the efficiency of the production of public services, and have helped national governments to reduce public expenditure (Osborne, Radnor and Strokosch, 2016). The shift from input to output controls, together with the constant need to measure cost efficiency of public services, have helped public agencies to be more conscious about the impact of their choices on production costs (Freiberg, 2005). However, the NPM and the widespread drive to pursue efficiency have also had a negative impact on society, and have also paradoxically created inefficiencies (Diefenbach, 2009).

First, the NPM has caused lack of coordination among public agencies because it has disaggregated public administration in an archipelago of public agencies in competition with each other. This lack of coordination creates duplications, overlaps and redundancy of services (Schuettinger, 1973). Although redundancy is desirable to create failsafe systems and increase the reliability of public

services (Perrow, 1984; Laporte and Consolini, 1991), it is also true that redundant systems are economically inefficient.

The fragmentation of public administration and the opening of the market have increased the number of service providers, but have also reduced accountability - especially for complex public services such as healthcare or transportation, where multiple actors are involved in the provision of services (Diefenbach, 2009). Public agencies became organised as units and accountable only for their tasks and not for the overall services. This accentuated siloization and pillarization of public administration, by creating single-purpose public agencies, specialised in specific services and unable to collaborate (Boston and Eichbaum, 2014).

The decentralisation and fragmentation of public administration through privatisation, outsourcing, and semi-privatisation created a dispersed state (Newman and Clarke, 1997). The establishment of a dispersed and minimal state decreases direct control of the production of public service (Hoggett, 1996) and increases opportunities for local manipulation (Hood, 1982; Poggi, 1990). Therefore, public agencies also need to review performances, control quality standards, plan inspections and conduct audits, in order to retain some control of the decentralised provision of public services (Clarke and Clegg, 1999). These new duties and tasks represent an increase in the workload of public agencies that harms the efficiency of public service production (Kirkpatrick, Ackroyd and Walker, 2005).

Moreover, the market is not always the ideal solution because of the presence of market failures. In certain fields, there are only one or a few companies able to compete for the provision of public services. Hence, often the monopoly of the state in the production of public services is transferred to the monopoly or oligopoly of some private companies (Cordella and Willcocks, 2012). This means that the state loses control and the capability to produce certain services without increasing efficiency. In addition, the focus on decentralisation, privatisation and outsourcing of the production of public service to reduce costs in the short term has exacerbated bureaucratic organisations' typical incapability to innovate. Outsourcing production also means losing operational capabilities; hence, it negatively affects the capability of public agencies to innovate and adapt the production of public services according to citizens' needs (Considine and Painter, 1997; Cordella and Willcocks, 2010, 2012)

Another fundamental problem is that public managers act as private managers and pursue only siloed performance goals, without caring about citizens' multiple needs and expectations. Public

managers are in fact only accountable for the performances and standards agreed to pursuant to the contract. However, contracts are not always able to address the behaviour of public managers and to reduce their opportunistic behaviour. There is empirical evidence that suggests how strategic changes necessary to reach these agreed performances are often used by public managers to advance the career prospects and salaries of public managers (Diefenbach, 2005a). Moreover, performances are measured according to quantitative and technical parameters concentrated on only a few areas, and they do not include any intangible and qualitative values (Pollitt, 2000). This partial view of the impact of public services can lead to a misalignment between public agencies and citizens. Public agencies might assume and demonstrate through their parameters that they are performing well even if citizens are dissatisfied with the service.

Furthermore, because service provision is fragmented and public agencies have a siloed perspective, they tend to measure only the efficiency of the service they produce. However, the efficiency of a single public service might correspond to major costs for services offered by other public agencies (Haque, 2007). For example, declining social expenditure in developing countries has caused increases in poverty and corruption (Batley and Larbi, 2004). Therefore, a reduction in education expenditure might increase the cost for policing services and lessen efficiency.

Performance measurement promoted by the NPM invites public agency to focus on short term efficiency without considering the costs incurred in the long terms. If, for example, healthcare agencies reduce public expenditure for public health prevention programs, they can increase their efficiency in the short term. However, in the long term, they might have more patients and hence higher costs for medical treatments in the future (O'Riordan and Fitzpatrick, 2015).

Therefore, the NPM emphasis on the short term and siloed mentality have created inefficiencies across the entire public administration. In order to mitigate the dysfunctionalities of the NPM and to create more value for citizens, some countries have promoted joined-up-government (JUG) reforms which aim to increase the coordination among public agencies. Increased collaboration should help public agencies to better coordinate the production of services and to avoid duplications and wasting of resources.

2.3.The Joined-Up Government and the collaborative model of public administration

2.3.1 The JUG and value creation

As a response to the perceived dysfunctionalities of the NPM, governments reformed public administration's organisation according to the JUG. The JUG approach does not question the economic rationale of the NPM, but it emphasises a more collaborative model of public administration, pursuant to which public agencies can reduce public expenditure and deliver more value to citizens. The JUG approach aims to increase horizontal and vertical coordination across the entire public administration to improve the overall system efficiency. Cooperation among public agencies is led according to top-down or bottom-up initiatives (Martinson, 1999; Ryan *et al.*, 2008). Top-down integration initiatives usually come from the political level, and they impose greater coordination among public agencies to reduce the costs of public service provision (Carey, Crammond and Riley, 2014). Bottom-up integration initiatives come from public agencies which notice potential synergies within the public administration that can help them to better achieve their efficiency targets. Integration initiatives can happen at the macro, meso or micro level. Macro-level integration involves coordination at the ministry level to develop shared strategies and policies. The meso level involves the collaboration among public agencies in the same region or city which decide to offer some services such as garbage collection or healthcare provision together to reduce their expenditures. Micro-level integration is the result of the coordination of different units of the same public agency that, for example, decide to share some administrative services to reduce costs (Kodner and Spreeuwenberg, 2002; Keast, 2011).

The JUG, similarly to the NPM, seeks to create value for citizens by improving the efficiency of public service provision. According to Pollitt (2003), the JUG has four main goals to increase efficiency. The first goal is to eliminate contradictions between public service deliveries. The single view perspective promoted by the NPM incentivises public agencies to only evaluate the impact of their public service production on their policy domain, and they do not consider the possible negative effects on other public agency domains. For example, reducing the education budget for summer school programs might increase criminality among young people and hence increase police costs. The second goal is to optimise the use of resources across public administration to avoid duplications or overlaps of services. For example, school buildings can be used during the weekends to host community activities or social services activities, and thus help public agencies that offer these services to reduce public expenditure. The third goal is to improve cooperation between public agencies and to develop standard solutions to problems that cut across different policy

domains. Pollution is a typical cross-cutting problem that requires a collective solution among all the main stakeholders such as public transportation agencies, schools, hospitals and local authorities. The fourth goal is to consider citizens' perspective and produce a more integrated set of services. For example, the realisation of a single portal to pay all tax obligations would simplify citizens' experience and reduce the cost of maintenance and management of multiple websites and applications to pay taxes.

The JUG goals aimed at creating a modern public administration also became objects of political attraction of the UK's New Labour Administration (Kavanagh and Richards, 2001; Pollitt, 2003; Hodges, 2012). The New Labour encouraged reforms based on the JUG approach to support more integrated policies and programs at the local and national levels, and to enhance coordination within public administration after years of NPM reforms (Ling, 2002). The JUG reforms were especially needed in the UK, New Zealand, and Australia, because of their earlier enthusiastic and widespread adoption of the NPM (Pollitt, 2003; Halligan, 2007; Ryan *et al.*, 2008; Keast, 2011). However, many western countries also promoted the JUG reforms at different levels of government to increase coordination within their public administration and to better improve efficiency (Peters, 1998; Christensen and Lægreid, 2006). Examples of JUG reforms can be found also at an international scale to stimulate cooperation among different national public administrations. For example, the European structural funds which provide economic incentives to realise cross-sector and cross-country partnerships exemplify JUG reforms on the international scale (Nelson and Zadek, 2000).

Although examples of JUG reforms can be found in different types of policies, they all share similar characteristics which promote a more unified and cooperative public administration model to increase the overall efficiency of public service provision. The first organisational characteristic of public agencies involved in JUG initiatives is the selection of shared goals. Common goals aim to promote cross-agency projects, reduce the overlap of similar services, share resources, and realise economies of scale (Rhodes, 1997; Pollitt, 2003). The selection of shared goals and the creation of a common vision can help public agencies to find synergies to avoid overlaps and waste, and to deliver more value to citizens at lower costs. The second characteristic is the creation of shared accountability over the outcomes of JUG initiatives (Barling, Lang and Caraher, 2002; Considine, 2002). Once public agencies agree on reaching shared goals, it is essential for them to also decide on different responsibilities related to the production of services and the measurements of their

performance and costs. Clear accountabilities are important to ensure efficient utilisation of resources. The third characteristic is the existence of solid alliances among public agencies. To be durable, partnerships among public agencies require trust, and common norms and values (Davies, 2002). Shared teams are fundamental to building solid alliances (Christensen, Fimreite and Lægreid, 2014). They facilitate management of partnerships by negotiating agreements, managing shared budgets, reducing tensions and facilitating the exchange of information. In fact, successful JUG initiatives need effective organisational management to reduce production costs and to deliver more value to citizens (Ling, 2002). However, shared teams are not enough to guarantee durable partnerships. JUG initiatives require public agencies to acquire specific coordination skills necessary to manage cross-agency projects (Carey and Crammond, 2015). Public agencies need to become active problem-solvers, negotiators and coordinators of projects in order to effectively manage relationships with other partners and to protect agency interests. Moreover, each agency has its own culture and hierarchy, which might conflict with the ones of the other partners. Less hierarchical organisations tend to favour intra-agency communication and collaboration. All these characteristics help to overcome NPM problems and to build effective partnerships among public agencies which reduce the costs of production of public services.

Although some authors perceive the JUG as a post-NPM-initiative (Christensen, Fimreite and Lægreid, 2014), the same economic rationale that drives the NPM also drives the JUG (Newman, 2001; Keast, 2011). According to the JUG perspective, lesser public expenditure for public service provision corresponds to greater value for citizens. Fewer taxes for citizens are necessary to sustain the production of public services and to create more value for them. In fact, JUG initiatives promote greater coordination among public agencies to reduce costs and decrease public expenditure. The production process is always driven by the economic rationale typical of manufacturing companies, but the production inputs come from different public agencies (Osborne, Radnor and Nasi, 2013). The output of the production process is the result of collaboration among different public agencies that perform specific production tasks according to their competences. The division of labour at the public administration level enables public agencies to share their resources and capabilities to produce a single output for lesser production costs. As in the NPM, public agencies then remain driven by the same economic rationale as companies, which makes cross-agency collaboration not easy and sometimes inefficient (Keast, 2011; Carey and Crammond, 2015). JUG problems can be then explained according to public choice, principal-agent, and transaction costs theories.

2.3.2 The limitations of the JUG

There are only a few examples of successful joined-up initiatives because a collaborative model of public administration based on inter-agency partnerships is difficult to achieve after years of reforms that have disaggregated the public administration (Christensen, Fimreite and Lægreid, 2014). The main obstacle to the JUG model of public administration is related to the mismatch between strategies and goals of public agencies caused by the lack of supportive architecture (Keast, 2011). Supportive architecture is usually constituted by organisational incentives which prompt public agencies to agree on common goals and realise joint projects (O'Flynn *et al.*, 2011). According to the public choice theory, public managers that lead public agencies tend to maximise their personal interests and positions of power. The JUG initiatives require innovations and changes that 'break the rules' and create alternative incentives, reward structures, and new responsibilities for the management (Parston and Timmins, 1998). Therefore, JUG initiatives fail if they threaten or do not meet public managers' interests. Shared teams or task forces are often charged with understanding these interests and creating a common architecture of incentives, shared powers and goals. However, sometimes they complicate collaboration mainly because they are hybrid bodies with no formal authority (Keast, 2011; O'Flynn *et al.*, 2011). Also, the selection of leaders for JUG initiatives is difficult because public agencies do not accept outsider leaders imposed by politicians or leaders with public administration background who might favour their own public agency interests (Lips, O'Neill and Eppel, 2011; Christensen, Fimreite and Lægreid, 2014).

The protection of public managers' interests and of public agency interests also explains why it is challenging to create shared accountability across public administration. The risk for public agencies is to share resources without taking credit for the final output of the production process. The unclear accountability in cases of success or failure also has an impact on the performance measurement. This is usually the case of police operations where different police forces collaborate to solve complex criminal cases. Sometimes in such cases it is difficult to distinguish merit and responsibilities and to measure performances of each public agency.

Moreover, although JUG initiatives can create value for citizens, sometimes diverse cultures and norms of each public agency can represent an obstacle for collaboration (Giddens, 1984; Davies, 2002). Public agencies generally tend to develop closed organisational cultures to protect their own interests, which according to the principal-agent theory might not be aligned with the interests of citizens. Conversely, JUG initiatives mean opening the boundaries of public agencies, and reducing the asymmetry of information among public agencies and between public agencies and citizens. The

asymmetry of information that public agencies want to protect to retain their power position and avoid criticisms can also generate lack of trust among public agencies (Rommel and Christiaens, 2009). Trust is fundamental for collaboration, especially when public agencies need to exchange sensitive information such as medical or personal data which can be misused by other public agencies. The lack of trust among partners represents the main weakness of the collaborative model of public administration because it presents an obstacle to the sharing of information and resources within public administration (Lips, O'Neill and Eppel, 2011). The asymmetry of information that causes a lack of trust can also cause production inefficiencies because it limits potential inter-agency synergies necessary to reduce public expenditures (Das and Teng, 2001). Furthermore, the more actors are involved in the JUG initiatives, the higher the asymmetry of information, which causes higher transaction, coordination, and decision-making costs (Exworthy and Hunter, 2011). Search costs are higher because it is more difficult to find more suitable partners to produce public services together. Contracting costs are also higher because lack of information about other partners makes it difficult to understand if they have the capabilities and the resources to produce the service. Enforcement costs are also high because lack of information about the credibility of each agency fails to ensure that the partners will deliver what they have promised. Higher transaction costs also have an impact on coordination costs because it is difficult to favour collaboration among public agencies that do not trust each other and that have difficulty in exchanging resources. Difficulties in exchanging resources and information can also increase decision-making costs because it becomes more difficult to find agreements and exchange information among all the actors involved (Kickert, Klijn and Koppenjan, 1997). More difficulties in coordinating all the partners can increase the costs of production, waste resources, and thus create less value for citizens.

Another interesting limitation is that some of the literature about the JUG initiative (Carey, Crammond and Riley, 2014; Christensen, Fimreite and Lægreid, 2014; Carey and Crammond, 2015) limits collaboration in the production of public services only to public actors. Conversely, some JUG literature posits that cooperation and coordination go beyond public administration boundaries and can also be extended to non-public actors (Pollitt, 2003; Bovaird, 2005; Dunleavy, 2010). The involvement of voluntary associations, NGOs and companies in the co-production of services can in fact help to further increase the efficiency of public services (O'Flynn *et al.*, 2011). The next section critically discusses how a networked production enables public agencies to co-produce public services with external actors, and how it can create more value for citizens.

2.4.The New Public Governance and the networked model of public administration

2.4.1Networked production and co-production of public services

In the recent two decades, the diffusion of the Internet and social networks has reduced coordination costs and has favoured a more diffused networked production that involves also actors outside the boundaries of the organisation (Benkler, 2007; Kallinikos, 2011). The diffusion of these new ways to produce public services challenges previous models of public administration. Public agencies are now able to easily collaborate not only with other public agencies, but also with external actors such as citizens, NGOs and companies (Linders, 2012; Fishenden and Thompson, 2013; Zuiderwijk and Janssen, 2014; Toots *et al.*, 2017). The adoption of a more networked production of public services represents a change in the traditional value creation process of the public sector that has been historically grounded in industrial economy assumptions typical of Fordism (Ramirez and Normann, 1993; Patrício *et al.*, 2011). According to this perspective, only companies and their suppliers could provide inputs in the value chain, and external actors could only consume service and destroy value. This perspective is strongly rooted in Adam Smith's (Smith, 1776) distinction between productive and unproductive work, which implies that some actors do not produce value and instead, only consume it. The networked production contradicts this economic thought and implies a more open model of production where potentially all actors can contribute to the creation of value (Zuboff and Maxmin, 2002; Mazzucato, 2011). Public agencies together with a 'constellation of actors' provide input to produce public services and to create value for the public (Ramirez and Normann, 1993). In a networked production perspective, actors that used to be considered peripheral or 'invaders' of the production process turned out to be the key drivers in the value creation process.

The networked production is partially or totally situated outside the boundaries of the organisation. It is open, less sequential and more interactive than the typical manufacturing production (Ramirez and Normann, 1993). Differently from regular suppliers or partners, external actors provide inputs at different stages of the production process, and sometimes their contribution cannot be predicted or planned. Public agencies that open the production process to third parties do not have full control of the inputs they provide. Therefore, public agencies have a limited control over the output because they do not know precisely who is contributing, the moment of the contribution, and its amount.

This type of unplanned and multidirectional participation in the production process is known as co-production. The concept of co-production was originally developed by Ostrom (1972) in her study

of the Chicago Police, and defined as *'the process through which inputs used to produce a good or service are contributed by individuals who are not in the same organisation'* (Ostrom, 1972: p.1073). In her study, she showed how collaboration between the police and a network of citizens helped to improve the safety of their neighbours without additional costs for the police. Citizens' eyes provided an important input in the production of the patrolling service offered by the police, which resulted in monitoring criminality in the neighbourhoods without the need to involve more police officers (Ostrom, 1972). Co-production has been usually related to citizens' participation in the production of public services (Alford, 2002; Bovaird and Loeffler, 2012; Vamstad, 2012; Verschuere, Brandsen and Pestoff, 2012; Parrado *et al.*, 2013; Voorberg, Bekkers and Tummers, 2015). However, other external actors like NGOs or volunteering organisations that belong to the third sector can also co-produce public services in different contexts (Brandsen and Pestoff, 2006; Pestoff, Brandsen and Verschuere, 2013).

The boundaries of the third sector (which is variously labelled as civil society, non-profit, or voluntary sectors) are today more liquid and can also include companies (Voorberg, Bekkers and Tummers, 2015; Best *et al.*, 2018). Companies which are often considered profit-oriented organisations can co-produce public services and have a social impact (Alford, 2009a; Best *et al.*, 2018). For example, companies can help to produce environmentally friendly products that reduce pollution or offer cheaper solutions for the delivery of public services such as medical treatments or public transportation (Porter and Kramer, 2006; Alford, 2009a).

The involvement of external actors in the co-production of public services is especially fundamental in those areas left orphaned by public administration action such as welfare services or in policy areas that require considerable resources, such as environmental protection or disaster management (Best *et al.*, 2018). Co-production is often discussed as a solution to compensate for the lack of services generated by the cuts to public expenditure during NPM reforms (Brandsen and Pestoff, 2006; Palumbo, 2016). External actors have played a critical role in the construction of the post-war welfare state, and countries like the UK have filled the public service gap caused by privatisation and outsourcing of public service production. Public management literature has usually underestimated the role of co-production in the creation of value for society, but its impact has been in many cases tangible (Margetts and Dunleavy, 2013). For example, non-profit social housing has decreased rent levels and has made the housing market more affordable to citizens (Kemeny, 1995).

Cases of co-production can be found at all stages of the production process and can be summarised in three categories: co-governance, co-management, and co-production. The type of co-production depends on the nature of the public service. Co-governance refers to the involvement of external actors in designing how service should be delivered. Home-care services are often shaped by health professionals together with family members (Lindahl, Lidén and Lindblad, 2011; Palumbo, 2016). Co-management refers to the active involvement of external actors in the management of public services in collaboration with the state. For example, after the disruption caused by the 2010 earthquake in Haiti, the local government co-managed the disaster relief operation with different actors - NGOs, companies, and international aid initiatives (Morrow, N Mock, *et al.*, 2011; Hou and Shi, 2012). Co-production, in the restricted use of this term, means the involvement of external actors in the material production of the service, such as patrolling the neighbourhood, collecting garbage, or reporting crime (Linders, 2012).

Co-production is also enacted according to three different forms of organisation: self-service, person-to-person, and public agency mediated co-production (Voorberg, Bekkers and Tummers, 2015). The typical self-service co-production is when citizens self-organise to produce a public service that they need which is not offered by public agencies. Therefore, in the self-service co-production, citizens simultaneously cover the two roles of producer and consumer of the service. For example, in Scandinavia, groups of parents self-organise additional childcare services where parents participate as volunteers or by donating money. The childcare service offered by these parents extends the time of the childcare service offered by schools, and helps schools to provide more value to citizens without increasing the public expenditure (Vamstad, 2012). The person-to-person co-production happens when companies, NGOs or citizens offer a service which is not directly provided by public agencies. For example, Transport for London (TfL) does not provide an app to plan journeys. However, there are many citizens, companies, and NGOs that created more than 600 apps like CityMapper or Google Maps that offer this journey planner service directly to citizens. Due to the contribution of all these apps developed by third parties, TfL has been able to offer value to citizens and to save in total more than £15m-£42m (Hogge, 2016). Under the third type, the co-production mediated by public agencies, public agencies can ask external actors to provide specific input in the production of a service, which is often a task. NASA, for example, created a crowdsourcing platform and involved more than 85,000 volunteers in analysing satellite imagery that computers could not read (Shirky, 2010). The involvement of volunteers helped NASA

to create more value for society because it was able to produce its service without increasing public expenditure.

The involvement of external actors as part of a more networked production of public services can then help public agencies to create more economic value for citizens without the need to increase taxes or to use public resources.

2.4.2 The NPG and the creation of value

The diffusion of co-production in the public sector and the rise of a more networked model of production of public services are at the basis of the New Public Governance (NPG) management approach. The NPG overcomes the limits of the JUG management approach and promotes a more networked and open model of public administration where public agencies and external actors such as citizens, companies or NGOs can actively collaborate to create more value for citizens (Lindsay, Osbrone, & Bond, 2014). According to the NPG approach, the effective coordination among public and private actors can generate more value for society because it increases the output of public service production without the need to increase public expenditure and taxes for citizens.

The pluralistic model of production promoted by the NPG also emerges as a way to optimise the decentralised structure created by the NPM that would be difficult to merge and integrate into single and vast bureaucratic organisations (Jessop, 2003). The role of public agencies is to mobilise this constellation of public and private actors to collectively deliver public services or reach public goals that public administration alone is unable to achieve (Bevir and Rhodes, 2006; Osborne, 2010). Therefore, contrary to the NPM, the NPG approaches public administration as having an important role of mobilising and coordinating public and private actors to produce service or solve societal problems (Rhodes 2007). In fact, the state can no longer leave markets to self-govern themselves, and public administration needs to actively govern markets and civil society to reach common goals or produce public service, while avoiding duplication or negative externalities (Newman, 2004). The case of Energiewende in Germany represents an example of the NPG. The German government has set the goal to reduce carbon emissions and has developed a set of policies and regulations to address the German industry and the civil society to reach this societal goal. Hence, the adoption of the NPG management approach does not mean a boundary-less and liquid model of public administration, but a public administration able to configure and re-configure public and private resources to produce public services or reach specific goals. Public agencies need to organise, enable and govern networks of actors, which are also defined as constellations (Ramirez and Normann, 1993) or ecosystems (Ciborra, 1996).

The concept of public administration as a coordinator of a networked production of public services has also been discussed in different terms in the economic field (Mazzucato, 2018) and in public management literature (Stoker, 2006; Margetts and Dunleavy, 2013). However, the three main characteristics of the model of public administration proposed by NPG are commonly shared across different kinds of literature (Osborne, 2010) and explain how public agencies can produce more services for fewer costs and then deliver more value to citizens than under the previous models of public administration. The first organisational characteristic of the NPG is the openness of public administration, which includes a plurality of interdependent actors that are constantly engaged in the process of policymaking and production of public services across all the policy domains (Osborne, 2010). The output of the production process is then the result of different public and private contributions (Easton, 1965). Citizens, as well as other private actors, are considered to be potential co-producers of public services rather than merely passive consumers of services. More networked production means more value for taxpayers because public agencies can offer more output for fewer production costs. The existence of a collaborative governance is also an essential part of the NPG model of public administration. The NPG is characterised by a constant dialogue with public and private actors to mobilise resources efficiently and to produce services for fewer costs. The NPG reinforces the need to overcome competition and to favour major collaboration among all the actors (Torfing and Triantafillou, 2013). Public agencies need to govern networks of actors that are not fixed, but instead constantly negotiate and renegotiate their role, positions and interests. Centralised control is then not suitable to govern vast network of actors that do not belong to the same organizations (Marinetto, 2003). Hence, public administration needs to create soft policy instruments that do not focus on imposing decisions but rather, on nudging actors of the network to perform specific tasks (Holliday, 2000; Skelcher, 2000).

A collaborative governance is able to build a shared consensus which aligns all the different actors' interests (Bryson, Crosby, & Bloomberg, 2014). A shared consensus and common goals are necessary to coordinate all the actors' contributions, and favour a more effective co-production of public services (Salamon, 2002). In fact, collaborative governance enables public agencies to govern the different actors' contributions (Dean, 1999) and avoid duplications or conflicts that might create inefficiencies or disruptions (Chatfield and Reddick, 2018). Another essential characteristic of the NPG is the management of multiple accountabilities. Although actors can agree to pursue certain goals, they still act according to their agencies' interests. Therefore, in the networked production configuration, each actor performs different tasks according to its competences, and remains

accountable only for their single contribution and not for the overall output of the networked process. Hence, public agency will need to find NGOs, citizens and companies which have similar interests or that belong to the same policy field to increase the number of co-producers and produce a more efficient public services (Dickinson, 2016).

Nevertheless, the NPG is still widespread because there are several hidden organisational and coordination costs that hinder the collaboration among actors that belong to some network.

4.3 The limitations of co-production and NPG

Similarly to both the NPM and the JUG, the NPG is mainly driven by the economic rationale. According to this rationale, the co-production of public services helps to create more economic value for taxpayers who pay fewer taxes and obtain more value in exchange (Warren and Rosentraub, 1982; Eriksson, 2012; Wiesel and Modell, 2014). However, the same coordination problems of the JUG also represent a limitation for the NPG. According to the public choice theory, public agencies as well as all the actors act to pursue their own interests, and if they are not aligned with the ones of the other members of the network, they will not collaborate (Hefetz and Warner, 2004). Another critical factor is that asymmetry of information is higher in the model of public administration proposed by the NPG than in the JUG because the number of actors that co-produce services can be incredibly high. The asymmetry of information causes a lack of trust among the actors as well as high coordination costs, which represent an obstacle for the adoption of public services (Bovaird and Loeffler, 2012). The risks for public agencies to be involved in the co-production of public services are then higher because a more decentralised production means lesser control. Many public agencies are not willing to lose control over the production of public services because they cannot control the quality of the output (Shakespeare, 2000). Moreover, the difficulty of trying to control the inputs of external actors might also create problems for public agencies and produce negative effects for society in other policy domains (Williams, Kang and Johnson, 2016). For example, police can patrol neighbourhoods with citizens and offer more hours of policing services at lesser cost. However, citizens are not trained for patrolling, and they might for example report problems wrongly or use force incorrectly according to their discretion. It is then clear that more efficiency does not mean more value for citizens because it might also negatively affect other values such as safety or justice (Williams, Kang and Johnson, 2016).

As also discussed by NPG literature (e.g. Stoker, 2006; Bryson, Crosby and Bloomberg, 2014), the focus on efficiency is then not sufficient to create value for the society because co-production and production of public services have an impact also on other values. The economic rationale that

drives the NPM, the JUG and a significant portion of the NPG literature, together with the conceptualisation of citizens as homo economicus, has reduced value creation to the simple achievement of efficiency. However, citizens are not homo economicus but rather *homo politicus* because they consider not only economic convenience but also other values such as fairness, equality, justice, or safety (Dibben, Wood and Roper, 2004).

Hence, the economic rationale that drives the NPM and JUG reforms and that also drives the NPG is unable to fully meet citizens' needs.

The public value paradigm presented in the following sections of this chapter overcomes the focus on efficiency driven by the economic rationale, and proposes an alternative paradigm to create value for citizens. The next section critically reviews literature about public value and the characteristics of public value management, and it explains the public value creation process.

2.5. The Public value tradition and value creation

2.5.1 Public Value management characteristics

The public value management approach, rooted in the public value paradigm introduced by Moore (1995) and similar to the NPG, promotes the idea of a public administration as coordinator of networks. The public value paradigm shares the public administration organisational characteristics presented by the NPG about the importance of promoting more networked governance and production of public services. However, according to the public value paradigm, public administration coordinates networks of public and private actors not only to pursue efficiency, but also to achieve other societal values such as transparency, fairness, public health, or safety (O'Flynn, 2007; Alford and Hughes, 2008). Public administration is not then merely market regulator or efficiency seeker, but more a coordinator of collective action to serve all societal values. As coordinator, public administration pragmatically covers different roles that are necessary to effectively address the action of public and private actors and to create public value for citizens (Alford and Hughes, 2008; West and Davis, 2011).

Nevertheless, public value creation is not as straightforward as it might appear. In order to understand the complexity of public value creation it is necessary to discuss the public value concept. The opaque theoretical foundations of public value theory have caused different tensions in the literature (Morrell, 2009) and have generated two main conceptualisations (Alford and O'Flynn, 2009; Dahl and Soss, 2014). The first perspective is grounded in Moore's understanding of public value as the equivalent of corporate value in the private sector. Bozeman (2007) proposes

an alternative perspective, which considers the entire public realm and claims that public value is created when a set of public values are simultaneously met. The difference between the two concepts lies in that according to Moore, public agencies create public value when they solve a societal problem by improving the effectiveness and efficiency of public services (Hartley *et al.*, 2017; Mintrom and Luetjens, 2017) while in Bozeman's tradition, a public agency needs to simultaneously meet different public values to satisfy citizens to create public value (Alford and O'Flynn, 2009). For example, increasing the number of CCTVs in a city can help the police to improve public safety but could also decrease citizens' privacy, which is another collective expectation that should be simultaneously met. Therefore, according to Bozeman, the public agency of this example can create public value by finding the most suitable production configuration to increase public safety and simultaneously protect citizens' privacy.

This thesis is based on Bozeman's perspective; however, both traditions agree with the organisational characteristics that enable the entire public administration to create public value. The first characteristic is that public agencies need to actively search and explore all the public values that are involved in the service production process (Moore, 1995; Broussine, 2003; Stoker, 2006; Hartley *et al.*, 2015; Crosby, 't Hart and Torfing, 2017). Public agencies are in fact, *'explorers commissioned by society to search for public value. In undertaking the search, managers are expected to use their initiative and imagination. But they are also expected to be responsive to more or less constant political guidance and feedback'* (Moore, 1995, p. 299). Public value is collectively built and defined during political elections and through other forms of political participation like referenda or e-participation that allow citizens to express their collective needs and aspirations (Moore, 1995; Prebble, 2012). However, public values are varied and in order to satisfy all these expectations the entire public administration has to respond to political and citizens' feedback to adjust public value objectives (Jessop, 2000; Stoker, 2006; Rhodes and Wanna, 2009; Wallis and Gregory, 2009). As a searcher of public value, public agencies must consult all the stakeholders, companies, and citizens involved to analyse mutual or conflictual public interests (Bryson *et al.*, 2017). Public agencies become coordinators of collaborative networks to reach specific societal goals. After careful analysis of the collective expectations involved, they need to build a shared public value vision, with specific goals that can consistently address the entire network composed of other public agencies and stakeholders such as NGOs, companies or groups of citizens, in order to produce specific outcome (Moore, 1995; Luke, 1998; Domberger and Fernandez, 1999; Entwistle and Martin, 2005; Prebble, 2012).

As Alford and Hughes (2008) highlight *'It is not who produces it that makes value public. Rather, it is a matter of who consumes it'* (p. 131). Therefore, non-public actors such as companies, NGOs and citizens are not passive actors. They can actively contribute to defining and creating public value by producing or co-producing services that positively impact societal problems (Moore, 1995; Stoker, 2006; Bryson, Crosby and Bloomberg, 2014; Page *et al.*, 2015; Alford and Yates, 2016; Bryson *et al.*, 2017). However, public agencies remain public value guardians in charge of coordinating and addressing all the actors to positively solve societal problems and support public value creation (Moore, 1995; Stoker, 2006; Horner and Hutton, 2011; Bryson *et al.*, 2017). Nevertheless, public agencies need to manage complex social problems where multiple interests are involved or that often require significant operational resources. Hence, the creation of public value requires also a high level of pragmatism in selecting the most suitable production configuration to reach societal goals according to the circumstances and the interests involved (Broussine, 2003; O'Flynn, 2007; Alford and Hughes, 2008; Hartley *et al.*, 2015). Furthermore, as part of its pragmatism, public value management focuses on the outcome and not on output (Norman, 2007; Alford and Hughes, 2008; Benington and Moore, 2011a). The control of output does not guarantee citizens' satisfaction because it only focuses on the measurement of the production processes. Conversely, the focus on outcome invites public agencies to be more accountable for the effects generated by the production of public services on citizens' lives. This radical change of focus highlights that the role of public administration is not to produce public services but to ensure that citizens are able to use them to satisfy their needs and expectations.

5.2 The public value creation process: from output to outcome

The shift of focus from output to outcome promoted by the public value management approach corresponds to the adoption of a new value creation logic (Osborne, Radnor and Nasi, 2013; Osborne, 2018). According to this alternative production logic, value is not created as a result of an economic transaction, but instead value-in-use is co-produced by citizens. Therefore, public agencies can create value not by maximising the output of public service production but by enabling citizens to co-create value they need or expect. For example, the police improves public safety not when the number of arrests increases, but when citizens feel safe.

The conceptualisation of value as an output of the production process is strongly rooted in the foundations of the economic tradition (Mazzucato, 2017). In the 1600s, Mercantilism economic tradition postulated that economic value was created only by increasing exports and decreasing imports. In the 1700s, the Physiocratic economic tradition argued that value was created by all the

activities related to land agriculture. In the 1800s, the Classic economic tradition, theorised by famous economists such as Adam Smith, Ricardo, Malthus and Mill, considered value to be the result of the hours of labour. In the 1900s, Neoclassical economic tradition that is still dominant in current economic discussions assumed that value is the result of demand and offer market dynamics. All these theories share four main similarities: value is the output of a production process; value is embedded in goods and services; value is exchanged; and consumers passively consume value.

These four economic beliefs have shaped the good dominant logic of production of goods which for decades has driven the production practices of manufacturing companies like Ford and has since been extended to the public sector. According to this logic, during the production process, public agencies embed value in public goods like roads or public parks and in public services like policing or healthcare services, which are then considered the output of the production process (Grönroos, 2008; Vargo, Maglio and Archpru Akaka, 2008). Public agencies can increase the value of public goods or services by increasing the number of inputs in the production process, in order to have a more valuable output. When public agencies exchange public goods and services with citizens, value is transmitted to them and they passively consume it (Osborne, Radnor and Nasi, 2013; Cordella and Paletti, 2018; Osborne, 2018). In order to deliver the right value to clients or citizens, organisations are assumed to know what clients need. Therefore, the only way to increase value is by focusing on efficiency and then by improving the production processes. The adoption of this type of value creation logic was suitable to serve past generations of citizens and clients that had fixed needs and expectations (Zuboff and Maxmin, 2002). However, the mass production of standardised products is not suitable to satisfy the current generation of citizens, who have more complex and personalised needs. This societal change has made more evident an historical misunderstanding in the good dominant logic about the role of consumer.

The term consumer comes from the Latin word *consumere*, that was originally interpreted as 'to destroy'. This interpretation has influenced the development of the economic theories which have considered for centuries consumers as a destroyer of value. A later review of the meaning concluded that *consumere* means 'to accomplish, complete' (Ramírez, 1999). In fact, value is not exchanged or transmitted to citizens through goods but *'is latent in the subjective experience of each individual, a psychological destination that we call individual space'* and *'is realized in the individual space, rather than created in the organization space'* (Zuboff and Maxmin 2002, p. 11).

This simple change of perspective of the role of clients as well as citizens has drastically changed the logic of how value is created.

The service logic emerges as an alternative of the good dominant logic and explains that value is the outcome of the production process and cannot be simply exchanged or delivered (Normann and Ramírez, 1995; Osborne, Radnor and Strokosch, 2016). As an outcome of the production process, value is created only when citizens use public services or goods to meet their needs (Korkman, 2006; Alford, 2009b; Benington, 2011). In fact, when citizens use public transportation, they use an arrangement of goods (streets, lights, bus) and services (transportation services, cleaning service) that are combined together to offer a value proposition to citizens. The value proposition remains a potential value until citizens enact it to meet their needs. Hence, value is the outcome of a co-production process that happens in the consumer sphere and not within the provider sphere represented by the public agency's boundaries (Alford and O'Flynn, 2009). Although the terms co-production and co-creation have the same meaning and often are used as synonymous (Bendapudi and Leone, 2003; Voorberg, Bekkers and Tummers, 2015), it is important to highlight that co-production in the consumer sphere is always necessary to create value for users, while co-production with external actors in the provider sphere is not fundamental but can help public agencies (the main providers) to improve the value proposition (Vargo and Lusch, 2008; Grönroos, 2011; Grönroos and Voima, 2013). For example, public transportation value proposition is constituted by bus and tube services, typically provided by public agencies, and it can be improved by ridesharing and bikes sharing services, typically provided by non-public actors.

Although the service logic of value creation has been discussed in the private and public sector contexts (Grönroos and Voima, 2013; Osborne, Radnor and Nasi, 2013), it is necessary to specify that companies' aim is to create private value, while public administration's goal is to create public value. Moore (1995, p. 47) clarifies that public value is created '*partly in terms of the satisfaction of individuals who [enjoy desirable outcomes], … and partly in terms of the satisfactions of citizens who have seen a collective need, fashioned a public response to that need, and thereby participated in the construction of a community*….' Therefore, public value is created when public services enable citizens to co-create positive outcome for them as individuals and as members of a community with shared collective needs and expectations (Bovaird and Loeffler, 2012).

Public agencies can make a public value proposition that is different from a normal value proposition because it takes into account the different public values involved. Hence, public agency has to assemble different tangible (goods) and intangible (knowledge) resources to produce

a public value proposition to citizens (Osborne, Radnor and Nasi, 2013). For example, in the offer of public transportation service, the public value proposition must meet the values of efficiency, safety and environmental sustainability. If the public value proposition does not meet all citizens' needs, then the risk is that citizens would not use the service or would co-create negative value for themselves, and the entire process would result in a negative outcome (Osborne, Radnor and Strokosch, 2016). For example, if the bus is not on time, citizens cannot use the bus to reach their destination, and they would be unable to co-create value.

Public agencies then need to reassemble the public value proposition to propose a new configuration of the public service until it enables citizens to co-produce value for themselves and for the collectivity (Grönroos, 2011). The role of public agencies is then that of the facilitator of public value creation. They can only create a public value proposition because public value is created in the subjective experience of each citizen as a member of the community (Chandler and Vargo, 2011).

The problem is that the role of the facilitator is not easy because public agencies need to serve many needs and expectations. The production of a public value proposition that can potentially meet all citizens' needs and expectations can become a challenge. This is the reason why it is so difficult to create public value.

2.5.3 The limitations of Public Value

The management of the public value creation process represents a challenge for public agencies for two main reasons. The first reason is that public value creation is uncertain because '*the nature of public value is not fixed*' (Moore, 1995, p. 55), and can evolve and change rapidly. Citizens' aspirations and needs are highly mutable. Even governments within a few years of having been elected might not anymore represent people's needs and expectations (Zuboff and Maxmin, 2002; Moore and Khagram, 2004; Bruijin and Dicke, 2006). For example, the Fukushima nuclear disaster raised strong political pressures in Germany for the extension of the lifespan of the country's 17 reactors, and forced Chancellor Angela Merkel to change German energy policy and shut down all the country's nuclear power plants by 2022 (Huenteler *et al.*, 2012). As highlighted by Benington (2007), the instability of the public value definition is also the result of the constant dialogue between citizens and politicians or public managers that reshapes the public value definition and the organisational goal of public agencies. In recent years, citizens, NGOs, and think tanks have participated in the discussion of the public value through referenda, e-participation and policy papers, to contest and to address public values represented by the government. For example, in

Germany, the green movement composed of the Green party and other associations led the German government to create the Energiewende agenda to incentivise the adoption of green energy (Mazzucato, 2018). Hence, the evolving and continuous construction of public value makes public value creation uncertain (Meynhardt, 2009).

The second reason that makes public value creation a challenge is that public values are varied and sometimes conflictual (Moore, 1995; De Graaf, Huberts and Smulders, 2016). Public agencies usually deal with conflicts among public values according to a public interests hierarchy that is not fixed and that can be contested (De Graaf, Huberts and Smulders, 2016). For example, in France, after the terrorist attack at the Bataclan on November 13, 2015, the security of the country became the most critical priority. Hence, the government declared a state of emergency, which suspended fundamental civil rights and freedoms in order to facilitate the work of the police to avoid other possible terrorist attacks. Although in the French case it was easy to predict the impact of the state of emergency on other values such as personal freedom or privacy, sometimes it is difficult for public agencies to recognise a conflict among public values and to be able to predict the impact of a public service on citizens' lives (O'Flynn, 2007; Bryson, Crosby and Bloomberg, 2014; Williams, Kang and Johnson, 2016).

In fact, public agencies have an imperfect knowledge of the different policy domains as a result of the asymmetry of information among all the private and public actors involved in the production of public services (Williams, Kang and Johnson, 2016). Before defining their policy goals, public agencies search for all the possible public interests involved. However, they have limited knowledge of other policy domains. Each public agency is competent in a specific policy area and has specialised knowledge only in that area. Thus, it has a limited capability to predict the potential impact on other policy domains. Discussions with other actors can mitigate the asymmetry of information among the actors; however, the impossibility to individuate all the public interests involved might also limit the involvement of all stakeholders (Alford and Hughes, 2008; Page *et al.*, 2015; Williams, Kang and Johnson, 2016).

The asymmetry of information increases according to the number of actors and interests involved. The bigger is the network or ecosystem of actors involved in the production and co-production of public services, the more difficult it is too coordinate and address actions of the network to reach common goals and generate public value. In fact, the networks managed by each public agency are not siloed but are overlapped or mutually shared among public agencies (Loreau, Mouquet and Holt,

2003). Hence, the complexity of managing different networks and the difficulty of predicting the impact on each policy domain increase the difficulty of creating public value.

Despite similarities shared with the NPG literature, the public value literature (Bryson, Crosby and Bloomberg, 2014; Dahl and Soss, 2014; Osborne, Radnor and Strokosch, 2016; Mintrom and Luetjens, 2017) has not discussed the impact of co-production and a more networked model of public administration on the creation of public value. The NPG literature has explained how co-production and a more open model of public administration can clearly improve efficiency, but it is not clear if this open model of public administration and of public service production can also address the limitations and complexities of public value creation. The diffusion of technology in public administration requires the contextualisation of this issue within e-government literature. The next chapter presents how the different public management traditions have influenced the adoption of e-government systems, and it explains the impact of e-government systems on the creation of value for the public.

CHAPTER 3 The impact of e-government systems on the creation of value for the public

Public administration has adopted Information and communication technologies (ICTs) to support and enhance the production of public services and to create more value for citizens (Bellamy and Taylor, 1998; Fountain, 2001a; Gil-García J. *et al.*, 2005; Cohen and Kamarck, 2007). As explained in the previous chapter, the conceptualisation of how public agencies create value for citizens has changed. This chapter critically reviews e-government literature and discusses how the role of technology has evolved to serve different value creation conceptualisations. The first part describes how, in line with the traditional model of public administration driven by the instrumental rationale, it has adopted ICTs as tools to enhance the impartiality and homogeneity of public service production and to better serve democratic values (Bovens and Zouridis, 2002; Bryson, Crosby and Bloomberg, 2014). The second section explains how the corporate model of public administration driven by the economic rationale of the NPM reforms has focused on the development of e-government systems that could improve the internal efficiency of public agency (Dunleavy *et al.*, 2008; Cordella and Bonina, 2012). The third section explains how the collaborative model of public administration proposed by the JUG reforms has similarly conceived of ICTs systems as tools that can increase efficiency by facilitating coordination among public agencies (Cordella and Iannacci, 2010; Henning, 2018). The fourth section discusses how the networked model of public administration proposed by the NPG has led the adoption of ICTs systems conceived according to the Government as a Platform characteristics which can further improve the efficiency of public service production by enabling a more open production of public services and collaboration among private and public actors (O'Reilly, 2011; Janssen and Estevez, 2013). The final section explains that ICTs systems also have an impact on public value creation and that, although the GaaP system helps to improve public service efficiency more than other e-government systems, its impacts upon public value creation are not clear.

3.1.Bureaucracy and e-government

3.1.1 ICTs, bureaucracy and value creation

The instrumental rationale of bureaucratic organisations that drives the traditional model of public administration has led to the conceptualisation of ICTs as tools to enhance democratic values and to deliver more value to citizens (Bryson, Crosby, & Bloomberg, 2014). Database management

systems, decision support systems, and office automation software are examples of ICTs-mediated solutions to automatise production tasks and support bureaucratic organisations. The deployment of ICTs reinforces the bureaucratic mechanisms which guarantee the impartiality and homogeneity of the bureaucratic production process (Willcocks and Mason, 1987), and which are fundamental to serve democratic values such as transparency, fairness and equality.

The conceptual lens of functional simplification and closure can help to understand how the regulative proprieties of technology have enhanced the impartiality and homogeneity of the production process (Bovens and Zouridis, 2002; Kallinikos, 2005). The concept of functional simplification describes how technology is designed to embed logics of productions, procedures and relational interdependences. ICTs reduce the complexity of a set of operations and produce some specific effects that satisfy determined requirements (Kallinikos, 2006a). Functional closure refers to the isolation of the sequential set of operations from the external interface (Kallinikos, 2006a). Like a black-box, functional closure of ICTs artefacts hides operations behind the interface. For example, when a police officer checks a driving licence on police computer, after a few seconds, it shows information about name of the driver. The driving licence software interface does not show all the operations necessary to check the validity of the driving licence. ICTs thus simplify the complexity of administrative procedures, but they also hide the decision making process from public officials. Public officials are clearly alienated from the execution of certain administrative steps because they can only control data inputs and communicate the data outputs. In bureaucratic organisations, ICTs are designed according to the instrumental rationale, and their role is to better address administrative actions to pursue public agencies' goals. As a result, ICTs further reduce public officials' discretion (Berg, 1998) because personal factors cannot affect the administrative process. The improved neutrality of production mediated by ICTs helps public agencies to deliver more value to citizens because it increases the impartiality and homogeneity of the administrative process.

Public officials and especially 'street-level bureaucrats' cannot manipulate information or product operations because the production of the service is partially and in some cases, entirely, out of their control (Snellen, 1998). ICTs decrease the need for street-level officials to meet citizens because ICTs become the new intermediaries between citizens and public administration (Snellen, 1998; Zuurmond, 1998). The disintermediation of street-level public officials by ICTs help public agencies to create more value for citizens by guaranteeing the homogenous and equal implementation of policies without the risks of misinterpretations or misconduct of public officials (Bovens and

Zouridis, 2002). Software and predefined algorithms partially or fully replace the decision making of front-line officers. Mediation by ICTs ensures that public agencies treat all citizens equally and avoid any discrimination based on subjective factors.

Moreover, public officials are unable to modify the administrative process embedded in e-government systems. This enhances the impersonality of administrative action, and it additionally ensures that public services are lawfully performed according to the protocols. This impossibility that personal factors could influence the output of the administrative processes helps public agencies to create more value because it guarantees an objective treatment of all cases.

Moreover, ICTs can help public agencies to create more value to citizens because they reduce the asymmetry of information between public officials and citizens. Citizens can access to the data, documents and investigate how public officers take decisions. Public officials have access to more information about citizens because they can get more data about individuals. The two-way transparency ensures the fairness of public service production, and it avoids disparate treatment of citizens (Buffat, 2015). E-participation is also an opportunity for public agencies to increase the transparency of the administrative process (Jaeger, 2005). Citizens can use social media to interact with public agencies and to ask for information about past administrative processes or seek clarification about the services public agencies offer (Bonsón *et al.*, 2012). An example is the Freedom of information (FOI) process in the UK that allows citizens to obtain information held by British public agencies. The possibility to access data and to speak directly to decision-makers forces public agencies to improve the accountability of the administrative actions (Pina, Torres and Royo, 2007). More transparency also helps to reduce corruption and increases efficiency because it is possible to better monitor the accountabilities of each public agency (Bertot, Jaeger and Grimes, 2010). In fact, transparent administrative processes help to better understand the responsibilities and the organisational performance of each public agency. Public agencies can then use e-government systems to improve the transparency of the administrative process and to deliver more value to the public.

ICTs do not only enhance control over the production process but also improve the efficiency of public service provision. ICTs help to offer more services for fewer costs and hence improve efficiency (Nohria and Berkley, 1994; Dunleavy, 2005; Cordella, 2007). For example, certain public services such as the booking system for medical appointments are offered 24/7 or wholly automatised. Therefore, public agencies can offer more value to citizens by increasing the public service provision at no additional production costs.

It is then clear that ICTs reinforce the ability of bureaucratic organisations to deliver impartial and homogenous services, and thus enable public agencies to offer more value to the public.

However, public agencies can adopt ICTs to reach different goals and sometimes they can also create negative value for citizens.

3.1.2 The limitations of ICTs in bureaucratic organisations

The instrumental rationale that drives bureaucratic organisations considers ICTs as instruments to pursue certain goals according to the principles of impartiality and homogeneity. ICTs are not neutral tools that can be simply deployed to automatise certain procedures. Rather, they represent a way to enframe different logical sequences of actions to address actors to perform several types of procedures (Ciborra and Hanseth, 1998; Luhmann, 2005). ICTs regulate the way in which processes are performed according to any organisational logic and to reach different organisational aims. Regulative properties of technology enhance the impartiality and homogeneity of the production configuration, but they can also be deployed to pursue non-democratic values.

Moreover, the adoption of e-government systems can also paradoxically increase the discretional power of public officials and favour discrimination and lack of transparency. The switch from street-level to screen-level bureaucracies seems to directly lead to less impartial and homogenous decisions (Buffat, 2015) and then leads public agencies to create less value for citizens. Not all the provision of public services can be automated by e-government systems and street-level bureaucrats such as teachers, nurses, or policemen will probably retain discretional decision-making powers because algorithms cannot substitute their tasks. In addition, the data provided to support their tasks can often provide a partial understanding of administrative cases and can lead to misunderstandings and wrong decisions (Jorna and Wagenaar, 2007). The mediation of ICTs and the artificial reality described by data can also negatively affect the accountability of public agencies: because of the quality of supervision over public officers' actions, it can paradoxically decrease. For example, the introduction of remote control through software to measure the quality of public officials' tasks limits the direct control of supervisors only to what data can capture (number of controls, time per control, etc.) and it can increase discretion of street-level officers regarding the fields not measured by data (Buffat, 2015).

Furthermore, ICTs do not substitute for the decision-making process of street-level bureaucrats, but rather complement it. ICTs are, in fact, not the only one of the elements that shape discretion. The decision-making process still depends on how ICTs are used or interpreted in the production process of public services (Jorna and Wagenaar, 2007). For example, in France, street-level bureaucrats

understood that satellite data on farmers' parcels were incorrect, and corrected their decision accordingly to produce more fair decisions (Buffat, 2015). Therefore, front line public officials can play an essential role in professional bureaucratic processes because they can still oppose automated decisions and use their own judgements (Hansen, Lundberg and Syltevik, 2018). The context and other organisational elements such as the skills of agents or the tasks they need to perform are still able to affect the output of the decision making process that cannot be entirely disintermediated by technologies (Taylor and Kelly, 2006). Thus, ICTs can increase the discretional power of public officials and generate inconsistent or wrong decisions that create negative value for citizens. Moreover, complete automation of certain public services is not suitable to meet all citizens' needs. In fact, usually, citizens who have complex cases tend to avoid the mediation of ICTs, and speak directly to public officials in order to overcome the rigidities of ICTs systems which are often unable to address the complexities of certain administrative cases (Breit and Salomon, 2015). In addition, the excessive automation of administrative procedures can increase the rigidity of the 'iron cage' of bureaucratic organisations (Hansen, Lundberg and Syltevik, 2018). ICTs can freeze the evolution of production configuration and force public officers to perform tasks according to a precise sequence that is difficult to modify. As a consequence, public agencies have difficulty evolving or adapting public services to meet citizens' needs and to create value for them. The inability to change administrative processes can lead to frustration or even alienation of public officers from the goals of the agency because they become mere executors and have no power to adapt or change the process to better serve citizens (Gregory 1998).

Furthermore, the rigidity of ICTs-mediated production process does not always ensure more legality. It is sometimes complicated for developers to embed regulations and laws in algorithms and lines of codes of information systems because the majority of developers do not have competencies to interpret the law (e.g. Gillingham 2015a, 2015b; see also Henman 2010). Therefore, the automation of certain public services might be the result of how developers have interpreted the law, rather than a direct transposition of law and regulations into technology.

The lack of digital skills is also a problem for citizens. Past generations of citizens lack digital skills or do not have the means (internet connections, laptops etc.) to access digital services. The digital divide in the population can represent an indirect discrimination of those citizens who are not able to access public services, and can consequently generate inequality of how citizens are served (Çilan, Bolat and Coşkun, 2009; Helbig, Ramón Gil-García and Ferro, 2009; van Deursen, Courtois and van Dijk, 2014).

The availability of open data and open resources from YouTube, social networks etc can enhance the asymmetry of information because public agencies can manipulate information and only show what is convenient for them. Public officials can decide which data should be open to the public and then modify the perception of how administrative process is performed (Janssen, Charalabidis and Zuiderwijk, 2012). In addition, data can be open to the public according to formats or standards which not all citizens can read and understand. Sometimes data are open but accessibility remains a challenge. Therefore, public agencies might create false transparency, and enhance the asymmetry of information between citizens and public agencies, thus generating negative value for society (Conradie and Choenni, 2014). The abundance of data about citizens can also enable public officials to know more about citizens, and it can potentially increase incidents of discrimination.

Moreover, the automation of public services through the deployment of ICTs can generate more complexities, system inefficiencies, and a consequential rise of public expenditure. For example, the need to fill electronic forms to access public service decreases the discretional power of street-level officers. However, for complex cases, it can increase processing times, favour input mistakes or generate an unnecessary overload of information which increases production costs or, in the worst cases, result in the collapse of the production process (Jorna and Wagenaar, 2007). The expansion of the administrative apparatus under the pressure of welfare policies, together with the attempt at digitalisation of many bureaucratic procedures to better serve democratic values, have dramatically increased production complexities (Malone *et al.*, 1987; Ciborra, 1993). The application of transaction costs theories has shown that the bureaucratic organisation and its conceptualisation of e-government systems are not suitable to address complex and interdependent organisational structures and can cause a rise in public expenditure (Williamson, 1985; Cordella, 2007).

Therefore, the perception of ICTs as instruments to enhance impartiality and homogeneity have limitations because e-government systems cannot always ensure that public agencies meet democratic values and then deliver value to the public (Buffat, 2015). Moreover, according to the economic rationale, the conceptualisation of ICTs in a bureaucratic organisation has caused inefficiencies and has raised public expenditure. The need to control public expenditure is at the core of the NPM reforms which focus on improving efficiency instead of democratic values. The next section explains how the NPM management approach conceives of ICTs as tools to decrease administrative complexities and to create more economic value for citizens because they can reduce the production costs of public services.

3.2.The NPM and e-government systems

3.2.1 The NPM: technology as a tool to increase efficiency

Similarly to the instrumental rationale that drives bureaucratic organisations, the NPM reforms are driven by the economic rationale, which perceives technology as a tool. However, according to the economic rationale, ICTs are not tools to reach agency's goals but to increase production efficiency and to deliver more economic value to citizens for fewer costs (Malone, Yates and Benjamin, 1987; Ciborra, 1993). Following private sector digital practices, public agencies have conceived ICTs as instruments to re-engineer or to rationalise the production of public services (Bekkers and Zouridis, 1999; Dunleavy, 2005). The underlying assumption of the NPM reforms is that public agencies should implement e-government systems to automatise tasks and procedures in order to reduce production costs and deliver more economic value to citizens (Andersen *et al.*, 2010).

E-government systems are also able to reduce transactions costs among actors and thus to increase the economic value of public services for citizens (Cordella, 2007). The bounded rationality of economic agents and the asymmetry of information among 'buyers' and 'sellers' cause high transactions costs and generate inefficiencies in the production of public services. ICTs are able to provide more information and reduce the asymmetry between units of the same public agency. Especially in complex and large scale organisations, ICTs can help to decrease searching costs because they help each organisational unit to know the resources or services that other units have available. Contracting costs are also decreased because it is easier to have information about the services and resources other units offer. Enforcement costs are also decreased because it is possible to have enough information about the responsibilities of each unit in a specific transaction. Due to the reduction of transaction costs, different units can collaborate and work more efficiently and thus offer more value to citizens.

ICTs also decrease transaction costs between citizens and public agencies (Cordella, 2006). ICTs help to reduce searching costs because they help citizens to find the most convenient public service option. Contracting or negotiation costs are also decreased because citizens can access more detailed information about public services provided by public agencies. Also, enforcement costs are reduced because ICTs increase the accountability of public managers and avoid the principal-agent problem (Persson and Goldkuhl, 2010). More symmetric information between public agencies and citizens can also avoid opportunistic behaviour of public managers and potentially also of citizens, who would otherwise defraud public administration and hence increase public expenditure (Bertot, Jaeger and Grimes, 2010).

Moreover, the literature (Dunleavy *et al.*, 2008; Persson and Goldkuhl, 2010; Cordella and Bonina, 2012) shows how ICTs have strengthened the NPM characteristics described by Hood (1995), and have enabled public agencies to be more efficient. The adoption of ICTs systems like CRM (Customer relationship management) and ERP (Enterprise resource planning) typical of private sectors has helped public agencies to facilitate communication and to reduce the typical hierarchical barriers of bureaucratic organisations (Persson and Goldkuhl, 2010).

CRMs have reduced the distance between public officers and citizens, and have facilitated a more customer-centric focus. CRM systems help to follow each administrative case better and enable public agencies to be more responsive to citizens' needs. Usually, CRM systems power websites or interfaces that improve service delivery. However, CRMs are connected with ERP systems which connect different datasets inside public agencies. ERP systems decrease inefficiencies because they favour better vertical integration among the services offered by the different units (Layne and Lee, 2001). ICTs can become a cure to the rigidity of procedures, and instead favour more professional management able to effectively adapt the production of public services to meet citizens' needs (Chen, 2010).

The diffusion of information systems typical of private sectors has also facilitated the diffusion of ICT business standards to measure production performances. For example, many CRM systems also embed standards to measure citizens' satisfaction with e-government services, and to force public agencies to be more customer-oriented when they offer public services (Nambisan and Nambisan, 2013). A stronger focus on customer satisfaction has led CRM and ERP systems to improve control over the output which is necessary to monitor possible inefficiencies and to deliver more economic value to clients. The implementation of eXtensible Business Reporting Language (XBRL) standards typical of corporate organisations in public agencies systems also reinforces attention to efficiency of the production process. The XBRL is a machine-readable data standard that helps public agencies to process big quantities of financial information efficiently and to improve the accountability of public agencies (Chen, 2012).

The NPM has promoted a more decentralised and disaggregated development of ICT systems to overcome the risks of developing large ICT systems across public administration. In fact, the failure to develop large e-government projects across different public agencies has often caused a loss of public funds without improving public services and without creating value for citizens (Fountain, 2001b; Cordella and Willcocks, 2012).

The disaggregation of ICTs' development has reduced risk of failure and has enabled each public agency to develop and to evolve its own ICTs systems according to that agency's needs (Dunleavy *et al.*, 2008). However, public agencies have a shortage of skilled IT staff and do not have enough funding to develop from scratch ICT systems to support the production of public services (Moon *et al.*, 2016). The solution to this problem is the outsourcing of e-government systems. Competition among ICTs providers enables the reduction of costs and provide the best ICT systems that public agencies need (Heeks, 1999). Outsourcing of digital services to experienced vendors able to propose the most suitable digital solution increases public agency efficiency without the need to risk ICT development failure (Chen and Perry, 2003). Many of the ICTs providers sell to public agencies the same ICTs solutions developed for private organisations. Hence, the adoption of ICT systems typical of the private sector is often combined with private management practices and standards which further increases public agency efficiency and the ability of public agencies to deliver value to citizens. For example, when acquiring ERPs, many public agencies also adopt the security practices typical of corporate fields such as the BCP (Business Continuity Process) practice which ensures that companies have a plan for the continuation of production services in case of disruption of the ICTs systems (Pérez-Castillo *et al.*, 2012). BCP is critical for IT security and to ensure the ability of public agencies to produce public service efficiently, without the risk of being affected by possible disruptions.

The collaboration between public agencies and ICT providers in the development of e-government services has also enhanced the diffusion of other private management approaches in the e-government field that similarly purse the realisation of more efficient services. Six Sigma and Business Process reengineering (BPR) methods became common methodologies for developing e-government services (Pande, Neuman and Cavanagh, 2000; Mansar, 2006). Total Quality management also became a widespread practice for the development of customer-driven services, especially in the fields of healthcare or education which require particular attention to the quality of public services (Teicher, Hughes and Dow, 2002; Pagliari, 2007). Lean methodologies have also become common in the development of sophisticated, complex e-government service, which often requires substantial public investments (Janssen and Estevez, 2013). These development methodologies enhance the ICT capability of public agencies and enable them to deliver more value to citizens by offering more services for lower production costs.

The above characteristics explain how technology has helped public agencies to improve public service delivery and deliver more value to citizens. However, the influence of the NPM in e-government projects has also had negative impacts on public service provision, which have contributed to the creation of negative value for society.

3.2.2 The limitations of the NPM reforms in e-government

The economic rationale embedded in NPM reforms has prompted public agencies to invest in e-government services as a way to reduce economic costs and to deliver more value to citizens. However, many e-government projects have failed (Fountain, 2001b). For example, in 2007 in the UK, IT expenditure reached 14 billion a year with only 30% rate of success (Collins, 2007). E-government projects have failed to reduce public expenditure and failed to deliver value to citizens for several reasons.

The first reason is that the siloed view of public agency has caused the disaggregation of e-government services. Each public agency developed its own ICTs systems to support the production of its services according to different standards. This siloed perspective has become a barrier to collaboration and the exchange of data among public agencies. For example, hospitals developed their Electronic Health Records (EHR) which collect data on patients' health. However, the EHR of each hospital has a different type of data which cannot be easily exchanged with other hospitals (Greenhalgh *et al.*, 2010). The inability to communicate patient data to other hospitals causes delays in medical treatments and duplication of analysis, which correspond to higher costs for healthcare and then less value for citizens (Miller and Sim, 2004). The exchange of data is also necessary across different countries for other kinds of services. For example, in the EU, each member state has different standards for the electronic registry of residents, which impedes the exchange of data and consequently increases the asymmetry of information among different actors and generates inefficiency. Therefore, disaggregation of ICTs development has created isolated systems unable to communicate, which causes several problems of coordination and the duplication of services (Peristeras *et al.*, 2008).

The second reason is due to the competition promoted by NPM reforms. Public agencies have generally tended to look at e-government solutions offered by the market, instead of collaborating with other public agencies and developing shared e-government systems (Cordella, 2007; Margetts and Dunleavy, 2013). However, the outsourcing of many e-government services has caused more inefficiencies and then less value for citizens. The IT market was not mature enough to guarantee competition of large IT projects and only few private suppliers had the operational capabilities to

provide ICTs systems for the public sector and to lower costs to a minimum. Therefore, in many cases, public agencies created monopolies in the market, which increased costs for the state and also damaged the creation of a more competitive market (Cordella and Willcocks, 2010).

Moreover, ICT providers used to develop e-government systems according to proprietary standards which locked in public agencies with specific ICTs systems for decades (Cordella and Willcocks, 2012). Another problem related to outsourcing is the poor strategic vision of public agencies which often outsource their core competencies and lose control over the production of public services (Cordella and Willcocks, 2012; Margetts and Dunleavy, 2013). Problems related to IT outsourcing are mainly related to the lack of public agency skills to write IT contracts and to monitor vendor performance, which can increase the asymmetry of information between public agencies and ICT contractors.

Another important reason that has caused dysfunctionality is that poorly managed ICTs can paradoxically increase the asymmetry of information and generate higher transaction costs within the same public agencies (Cordella, 2006). More information can increase searching costs for the different organisational units of public agencies which might have difficulty to find what they are looking for. An overload of information would also increase contracting costs because it would be more difficult to find out the characteristics of the available services or resources. The same applies to enforcement costs: too much information can conceal the responsibilities and the duties of each unit or department.

More information increases the asymmetry of information between public agencies and citizens, who would have more difficulty in finding public services they are looking for. Contracting and enforcement costs would also increase because more available information does not mean more transparency, but instead may increase complexity for citizens (Janssen, Charalabidis and Zuiderwijk, 2012). An overload of information can also lead to public agencies' not being able to protect their interests, result in corruption and inefficient production, and consequently raise public expenditure (Scholl and Klischewski, 2007).

Moreover, the direct adoption of ICTs systems designed for business-oriented production processes such as e-commerce also imported standards and incentives typical of the private sector (Margetts and Dunleavy, 2013). The adoption of these standards and incentives has improved internal production but it has also reinforced the perspective of citizens as clients. The misleading conceptualisation of citizens as clients has led public agencies to focus only on economic efficiency, without considering the impact on other values or other sectors (Fountain, 2001a; Cordella, 2007).

Underlying the focus on citizens as clients is the idea that public agencies should behave as companies in a market and should focus only on the service they produce and on the immediate economic return. As a consequence, similarly to corporate investment, e-government investment tends to focus on short-term results and on the impact only on their policy domain (Dunleavy, 2010). Moreover, the NPM explains why the deployment of ICTs in bureaucratic organisations does not deliver value according to the transaction costs theoretical framework. According to this framework, the deployment of ICTs can only ensure the creation of economic value, but ICTs can also impact other democratic values. For example, in Chile, the e-procurement platform Chilecompra has helped to reduce public expenditure, but it has also enhanced transparency and accountability of the procurement process, which are typical democratic values served by the traditional model of public administration (Avgerou *et al.*, 2005). Therefore, ICTs can have an impact on different values, and the bureaucratic and the NPM conceptualisation of ICTs do not exclude each other. They only represent different perspectives of what is valuable for citizens and of how ICT can support value creation.

Nevertheless, the focus on economic value and on the transaction-costs theoretical lens promoted by the NPM have remained dominant also in the post-NPM e-government reforms. The next section discusses JUG reforms rooted in the same economic rationale of the NPM. However, the JUG management approach attempts to overcome the siloed and short term view of NPM, in order to avoid systemic inefficiencies and to deliver more economic value to citizens. The JUG reforms also consider ICTs as tools that can create economic value not by automatising production processes and improving internal agency cooperation, but by enabling the coordination among public agencies.

3.3. The JUG and e-government systems

3.3.1 E-government systems as tools to enable coordination

The economic rationale drives JUG reforms which consider ICTs as tools that can help the creation of economic value for citizens by enabling public agencies to collaborate, share resources and eradicate production inefficiencies caused by the siloed organisational structure promoted by NPM reforms. Therefore, both the NPM and JUG aim at creating more economic value for citizens by reducing costs of production, but through different policy approaches and conceptualisations of technology.

An example that can clarify the different role of ICTs in the NPM and JUG is the Criminal Justice system in the UK. The NPM reforms fragmented and separated the investigative functions led by the Police and the prosecutorial functions led by the Crown Prosecution Service (CPS) (Cordella and

Iannacci, 2010). Hence, the Police and the CPS designed their separate ICT systems to increase internal efficiencies of their functions and not to collaborate. However, this separation between public agencies generated delays in the criminal justice service and economic inefficiencies. As part of the JUG reforms, the Criminal Justice Act of 2003 promoted strong inter-agency cooperation among all the actors in the criminal justice system. The policy addressed the development of a new ICTs system to improve collaboration and to eliminate delays, waste, and duplications of the criminal justice service. Hence, the JUG reforms have helped to create more economic value than the NPM reforms because they have promoted the deployment of e-government systems to decrease coordination costs and to enable major collaboration not only within public agencies but also among them.

In fact, ICTs can connect different actors and facilitate the exchange of information (Clemons and Row, 1992; Hengst and Sol, 2002). The more information that becomes available, the lower the transaction costs (Clemons and Row, 1992). Lower transactions costs correspond to lower coordination costs (Becker and Murphy, 1992). More symmetric information among public agencies enhances trust within public administration and facilitates coordination to pursue economic transactions (Becker and Murphy, 1992; Hengst and Sol, 2002). For example, lower contracting costs and enforcement costs can facilitate cooperation between two public agencies that can better understand what they offer and ensure that they are reliable partners to produce public services or exchange resources (Hengst and Sol, 2002). Lower coordination costs result in more opportunities to exchange and collaborate, and thus more opportunities to produce additional services for citizens for fewer costs.

Hence, similarly to the private sector, public administration has started to adopt new ICTs architecture to facilitate collaboration among public agencies to lower coordination costs and deliver more value to citizens for a minor public expenditure (Ramon Gil-Garcia, Chengalur-Smith and Duchessi, 2007; Janssen and Estevez, 2013). Enterprise architecture typical of the corporate field represents a model for many e-government ICT systems that aim at improving the interoperability among several public actors (Janssen, 2012). This type of architecture refers to the organisation of multiple agencies that work together and have an extensive portfolio of applications. Enterprise architecture involves some fundamental technical components such as integration brokers, adapters, inter-application communications and the deployment of messaging middleware, which favour the internal exchange of data (Lam, 2005; Scholta *et al.*, 2019). This

architectural model represents a shift in focus from internal efficiency of a single unit to large scale efficiency (Janssen and Van Veenstra, 2005).

Enterprise architecture is also combined with the diffusion of common standards for interoperability (Otjacques, Hitzelberger and Feltz, 2007; Janssen, 2012; Henning, 2018) because it is critical to technically enable interoperability among public agencies and to guarantee the evolvability of e-government services. Countries like the US, the UK, France and Italy had committed in their past years' frameworks and standards to favour better interoperability among different public agencies (Otjacques, Hitzelberger and Feltz, 2007). The lack of interoperability due to different standards also represents a barrier for collaboration at the international level (Otjacques, Hitzelberger and Feltz, 2007). For example, European countries have had significant differences about technical standards for digital identity, and the European Union launched a framework called eIDAS[42] in 2014 to set common European standards and simplify the interoperability of national identity services across Europe.

The realisation of e-government services for more interoperability within the public administration can be the result of top-down or bottom-up political initiatives. Examples of top-down initiatives are when central governments or national public agencies invest in national ICTs system, frameworks or policies to fill interoperability gaps in e-government services provision. For example, national governments in countries like the UK or Italy have directly invested in shared e-government systems to offer fundamental interoperability services such as digital payments and identification. The platform GOV.UK.Pay[43] is an example of shared ICTs systems that facilitate interoperability because it enables all public agencies to receive payments online without creating their own payment systems. Another example is SPID[44], the ICTs system developed by the Italian government to provide a shared identification system for all e-government services without the need for each public agency to develop its own identification system. Due to these shared e-government systems, public agencies avoid having to invest in similar ICTs systems and hence are able to generate more economic value for citizens.

Local governments and public agencies can lead bottom-up initiatives to promote smaller-scale e-government interoperability projects according to different forms of collaboration which aim at

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[42] https://www.eid.as/home/
[43] https://www.payments.service.gov.uk/
[44] https://www.spid.gov.it/?lang=en-001

helping the public agencies involved to reduce coordination costs and to produce more value for citizens at lesser cost (Ferro and Sorrentino, 2010). The first form of collaboration is the convention, that is, a formal agreement among public agencies which is legally enforceable and allows the offering of e-government service produced by a public agency also to other public agencies. The second one is a framework of agreement, that is, a purchasing contract for digital services shared among different agencies. The third form of collaboration is the creation of a public body that is a new public agency in charge of producing digital services for all the agencies that need that service. A new public agency is usually created when the entire public administration needs to carry out a new service function such as digital payments. A consortium is another form of collaboration by agencies to develop a digital service which they all need to better pursue their administrative functions. Another form of collaboration for the development of digital service is the creation of a limited company owned by all the public agencies that need a service. Unlike a consortium, a limited company acts according to market dynamics and can sell digital services to other public and private actors (Juell-Skielse, Lönn and Päivärinta, 2017).

Top-down and bottom-up interoperability e-government initiatives are fundamental to realising ICT systems that facilitate the exchange of information and decrease the asymmetry of information. Less asymmetry of information increases trust among public agencies and enables shared governance across public administration (Gil-García J. et al., 2005; Luna-Reyes, Gil-Garcia and Cruz, 2007; Karlsson et al., 2017). Therefore, the development of e-government systems that promote interoperability decreases coordination costs and facilitates the establishment of solid alliances based on mutual trust (Scholl and Klischewski, 2007). Shared governance and collaboration are also essential to facilitate public agencies' ability to continually meet multiple stakeholders' interests (Pardo, Gil-Garcia and Burke, 2008; Nakakawa and Namagembe, 2019). Specific governance mechanism embedded in ICTs systems should encourage shared accountability, and the individuation of common goals, roles and responsibilities (Ojo, Janowski and Estevez, 2009), which are all necessary to reduce coordination costs and ensure that partnerships among public agencies endure. The development of ICTs systems for collaboration is often gradual, and accompanied by project leaders that provide a shared vision, goals and needs (Scholl, 2005). Leaders and digital champions have a critical role in e-government interoperability projects because they have to individuate barriers that hinder collaboration within public administration and use ICTs to reduce the asymmetry of information and to improve trust. Leaders of shared e-government projects should also be able to strategically think about the planning and the impact of cross-boundary

projects, and to mitigate incompatibilities and resistance to change (Gil-García J. *et al.*, 2005) in order to lower coordination costs and facilitate interoperability.

However, ICTs systems are not always able to reduce coordination costs. Moreover, sometimes they can increase information asymmetry and increase coordination costs, which generates more inefficiencies and less economic value for the public.

3.3.2 The limitations of the JUG reforms in e-government

The conceptualisation of e-government systems as a tool to reduce coordination costs and to create more economic value for citizens has certain limitations. E-government projects promoted by JUG reforms have not always been successful in enhancing interoperability with public administration, and their failure has increased public expenditure and generated more inefficiencies (Pardo, Nam and Burke, 2012; Fan, 2018). In order to understand why public agencies have failed to reduce coordination costs, it is necessary to reflect on the economic rationale that drives public agencies. Through the theoretical lens of public choice, principal-agent theory, public agencies are seen as economic agents that tend to maximise their economic return and protect their interests (Hood, 1991; Grube, 2012). The asymmetry of information among public agencies and between public agencies and citizens allows public agencies to pursue their interests even if they differ from the ones of other public agencies or citizens. This form of opportunistic behaviour disappears when public agencies start exchanging information with all the actors (Warkentin *et al.*, 2002). In fact, ideally, e-government systems facilitate symmetry of information among all the actors and consequently improve trust (Mpinganjira, 2015).

Nevertheless, ICTs can paradoxically increase the asymmetry of information and decrease trust among actors (Cordella, 2006). First of all, this is because public agencies act strategically and share information with other public agencies according to their own interests (Scholl and Klischewski, 2007). The most crucial information is retained or partially released. Hence, sometimes public agencies are able to meet policy and legal requirements even if the data exchanged are useless. From a strategic point of view, information is power, and many public agencies tend to protect their information to retain power and protect their interests. On the other extreme, too much available data can generate an overload of information, which increases the asymmetry of information. Higher asymmetry of information corresponds to higher transaction costs and coordination costs (Cordella, 2006). Thus, both scarcity and abundance of exchanged information can lead to higher coordination costs and inefficiencies, which results in less economic value for citizens.

Moreover, there are barriers that hinder the interoperability of e-government initiatives and increase coordination costs. The first type are technical barriers. Years of NPM reforms have created an archipelago of closed ICTs systems with different development frameworks, and the use of proprietary technologies, which have generated a high level of complexity and incompatibility of software and hardware components (Ramon Gil-Garcia, Chengalur-Smith and Duchessi, 2007; Pardo, Nam and Burke, 2012). Different types of technical standards of ICTs systems represent an additional technical barrier that is difficult to overcome, especially because many public agencies are locked in with proprietary standards imposed by contractors (Greenhalgh *et al.*, 2010; Cordella and Willcocks, 2012; Henning, 2018). Public agencies are also locked into inflexible legacy systems characterised by archaic programming languages, lack of documentation, ageing filed formats, and deployment of monolithic architectures (Robertson, 1997). Different security models represent another barrier for interoperability and also a critical factor that can negatively influence trust among actors that share information (Warkentin *et al.*, 2002). Applications that have evolved independently rather than as part of the same architectures have different levels of security which are sometimes incompatible or overlap each other (Volchkov, 2001).

Organisational barriers also constrain interoperability. Public agencies have different strategic goals that serve different policy domains (Scholl and Klischewski, 2007), and the combination of multiple interests is challenging. Sometimes public agencies' priorities differ or conflict and there are no apparent benefits for everybody. Moreover, collaboration might represent a cultural shock for public agencies which have to rethink their internal structure and interoperability. Significant diversity in organisational cultures can also cause resistance to collaboration with other public agencies (Lam, 2005). Different organisational cultures and regulations can also generate funding problems for interoperability projects. Public agencies are responsible for their funding and accountable for how their budget is spent. Participation in shared projects where they have partial and indirect control represents a financial risk which limits possible collaboration initiatives. Another risk of interoperability projects is the misuse of shared information (Ramon Gil-Garcia, Chengalur-Smith and Duchessi, 2007). Public agencies prefer to not share data with other public agencies, not only to protect their position but also because of the lack of clarity in privacy or usage policies between specific government agencies (Tillman, 2003).

The lack of multidimensional governance represents a barrier for JUG e-government systems (O'Flynn *et al.*, 2011). JUG initiatives often focus on technical aspects that affect governance of shared e-government systems, and underestimate the political and organisational aspects that

favour intra-agency collaboration (Cordella and Iannacci, 2010; Keast, 2011; Carey, Crammond and Riley, 2014). In fact, common regulations and administrative procedures for data collection, use, dissemination, storage, privacy and security are fundamental for defining and regulating interoperability among different actors (Scholl and Klischewski, 2007). The lack of understanding of the different dimensions that influence cross-agency collaboration has led to setting over-ambitious e-government milestones for public administration collaboration (Lam, 2005), which have often failed (Pardo, Nam and Burke, 2012; Eriksson and Goldkuhl, 2013; Sharma and Panigrahi, 2015). Therefore, the JUG management approach requires us to consider different dimensions to successfully decrease coordination costs among public agencies and to deliver more value to citizens.

Finally, another missed opportunity of the JUG reforms to further deliver more value to citizens is related to the narrow conceptualisation of interoperability (Hodges and Grubnic, 2010; Margetts and Dunleavy, 2013). JUG reforms have restricted the scope of interoperability only to public agencies. However, public agencies could create more value co-producing services with third parties. In fact, the more actors involved in the production of public services, the lower the production costs and public expenditure, and the bigger the value for citizens. The next section discusses how the NPG—following the same economic rationale of the NPM and JUG—conceived e-government systems as a tool to reduce coordination costs not only between public agencies but also between public agencies and third parties. In the NPG, the role of ICTs transforms from being a tool to enable interoperability only within the boundaries of public administration to being a tool to facilitate collaboration with private actors.

3.4. The networked production

3.4.1 ICTs-mediated co-production and the GaaP

The NPG management approach is also driven by the economic rationale, and it considers ICTs as tools which can help to create more value for citizens by enabling both the interoperability among public agencies and the co-production of public services with non-public actors (de-Miguel-Molina, 2009). According to Margetts and Dunleavy (2013), this is possible due to the second wave of government digitalisation, labelled Digital Era Governance 2 (DEG2), which blurs conventional public administration boundaries between public and private sectors. This second wave of digitalisation refers to the diffusion of the internet and social networks which have reduced coordination costs and have favoured the adoption of a more networked model of production (Benkler, 2007; Hodges and Grubnic, 2010; Kallinikos, 2011). Public agencies can now deploy ICTs to involve citizens and

companies to co-produce more services for fewer costs and hence deliver more economic value to citizens (Linders 2012; Zuiderwijk and Janssen 2014; Fishenden and Thompson 2013; Toots et al. 2017). ICTs have drastically reduced the costs of involvement and coordination of third parties not only in the policymaking process (Peristeras *et al.*, 2009; Linders, 2012; Medaglia, 2012; Panagiotopoulos, Bowen and Brooker, 2017) but also in the production process of public services (Linders, 2012; Marjanovic, Fry and Chataway, 2012; Janssen and Estevez, 2013; Panagiotopoulos, Bigdeli and Sams, 2014; Alford and Yates, 2016; Klievink, Bharosa and Tan, 2016; Gascó, 2017; Cordella and Paletti, 2018). Therefore, due to Internet-based technologies, the NPG has become a more supportable management approach for the organisation of the networked model of public administration and the co-production of public services.

ICTs-mediated co-production of public service is the result of top-down or bottom-up initiatives. Public agencies lead top-down co-production initiatives at different levels of government, and aim at involving unknown contributors to perform specific production tasks to reduce costs and deliver more value to citizens. For example, the San Ramon Valley Fire Protection District (SRVFPD) in the USA struggled to offer an effective emergency service to citizens suffering heart attacks (Walravens and Ballon, 2013). An ambulance should arrive in four minutes to save a person having a heart attack; this means that, in order to provide a prompt emergency service, many ambulances and paramedics are needed. The SRVFPS did not have enough internal resources to provide the expected service. Therefore, in 2009, the SRVFPS developed the app PulsePoint[45], which provides a platform to crowdsource first aid service. PulsePoint is a platform that uses a geolocation service to alert citizens who have been trained in cardiopulmonary resuscitation (CPR) about an emergency in the area where they are. Once they receive the emergency call, they can intervene to provide prompt life-saving assistance to victims of sudden cardiac arrest while awaiting the arrival of an ambulance. PulsePoint made the SRVFPS able to provide a more effective emergency service without hiring more paramedics or buying more ambulances (Walravens and Ballon, 2013). Due to ICTs-mediated co-production, SRVFPS has been able to provide more efficient public service without increasing public expenditure.

Networked production can also be the result of bottom-up initiatives led directly by citizens, NGOs or companies that use the potential of ICTs to self-organise and offer public services with the

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[45] https://www.pulsepoint.com/

minimal involvement of public agencies (Linders, 2012). For example, Ushahidi[46] is a platform developed by Kenyan volunteers to crowdsource reports about violence in the aftermath of Kenya's crisis of 2007. The crowdsourcing platform was also used during disaster relief operation in 2010 in Haiti. The platform Ushahidi crowdsourced 3,596 reports, which helped different international public agencies to respond more effectively to the disaster without directly deploying their resources (Gao *et al.*, 2011; Morrow, Nancy Mock, *et al.*, 2011).

The rise of ICTs-mediated co-production of public services encouraged by the NPG is the results of the investment of e-government systems able to sustain a more networked production of public services. ICTs systems that support a more networked model of public administration are not built according to a precise plan such as used in the construction of a cathedral, but instead, like bazaars (Raymond, 2005) open to collective and unplanned contributions of external actors. The platform architecture typical of companies like Apple, Amazon or Google supports and enables this alternative way to develop e-government services, and it represents a model for many e-government systems that aim at co-producing public services with third parties and also at better coordinating with other public agencies (Fishenden and Thompson, 2013). The platform's architecture facilitates interactions between multiple groups of actors (Evans, 2003) that are unplanned and decentralised and which evolve autonomously. All actors can establish a different relationship on the platform and be simultaneously customers and producers of services. O'Reilly's (2011) proposes the concept of Government as a Platform (GaaP) to explain how platform architecture can be beneficial to supporting a more networked model of public administration and production. In his seminal work, he outlines the characteristics that make GaaP in the public sector more efficient than other organisational models.

The platform architecture is based on a modular structure and a system of standards that lower transaction and coordination costs and simplify interoperability (O'Reilly, 2011; Janssen and Estevez, 2013; Brown *et al.*, 2017). Modularity allows private and public actors to integrate new services, improving the offer of public services without the need to increase production costs. Modularity also avoids the need for public agencies to remain locked into inflexible legacy systems or into monolithic architectures (Janssen, Wagenaa and Wagenaar, 2004; O'Reilly, 2011). The modularity of GaaP allows public agencies to easily reconfigure the production of public service by connecting or disconnecting ICTs modules (Heeks, 2003; Janssen, Wagenaa and Wagenaar, 2004;

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[46] https://www.ushahidi.com/

Rabaiah and Vandijct, 2011). Modularity reduces the risk of failure because each module is independent from the rest of the architecture (Rabaiah and Vandijct, 2011). If the development of a module which embeds a new service fails, the failure is limited to that service and not to the entire ICTs system. Hence, a modular structure decreases the risk of wasting public investment more than in monolithic architecture (Heeks, 2003; Rabaiah and Vandijct, 2011). Lower risks of development can also facilitate experimentation and innovation of new e-government services.

Application program interfaces (APIs) are another important technical characteristic of GaaP because they enable e-government systems to replace, connect or develop new modules from scratch. APIs are a set of routines, protocols and development tools which are necessary to enable collaboration among public agencies, which can use them to develop joint services, sometimes without the need to obtain formal permission (Lněnička and Máchová, 2015). Therefore, APIs are fundamental to reducing coordination costs, simplifying collaboration and producing more value for citizens. APIs are organised in catalogues available in data portals, which are essential to disseminate open data according to different standards (Attard *et al.*, 2015). An example is the London Data Store[47], the data portal of London that collects open data about education, transportation and public expenditure which can be accessed by all actors without restriction. However, not all data are open to the public. Some data are only shared among public agencies that are authorised to use them. Moreover, open data can be provided by public agencies as well as by external actors such as NGOs or companies. All these data represent an incredible resource to create more economic value for society because they encourage external actors to develop more options of public services or entirely new services for the public (Attard *et al.*, 2015; Lin, 2015; Chatfield and Reddick, 2017).

The GaaP architecture facilitates the exchange of information among public and private actors and thus reduces the asymmetry of information among public and private actors. Lower asymmetry of information reduces transaction costs and increases trust. Trust among private and public actors is fundamental to enable the networked model of public administration described by the NPG.

3.4.2 The limitations of GaaP e-government systems
The NPG conceptualisation of e-government systems as tools to enable co-production and to create more economic value for the public has certain limitations. The platform architecture reduces

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[47] https://data.london.gov.uk/

coordination and transactions costs and supports an open model of public administration. However, the realisation of platforms cannot directly ensure the creation of more economic value (Hagiu and Yoffie, 2009).

In order to create value, GaaP requires public agencies to exchange data which are necessary to develop services. Although the number of agencies that disclose their data has increased, the publication and consumption of data are still limited. The barrier for interoperability within and beyond public administration boundaries is limited by technical, policy, legal, economic, financial, cultural, and organisational barriers (Conradie and Choenni, 2014; Zuiderwijk and Janssen, 2014). The heterogeneity of data standards, the diversity of data structures and the diversity of tools used to present and visualise data also represent important barriers for interoperability. Public agencies are unwilling to publish their data because it would decrease the asymmetry of information and expose public agencies to critics of their production performances (Attard *et al.*, 2015)

The reluctance of many public agencies to exchange data is a threat to networked production enabled by GaaP and promoted by NPG. The creation of value through GaaP is related to the interaction between platforms and networks of actors that co-produce services. Nevertheless, if the network is small, the platform risks falling into the liquidity trap or central market defense (Clemons and Weber, 1996). According to the liquidity trap, if the network is small, there will be less interaction and the potential to create value will decrease. Hence, if GaaP does not reach critical mass necessary to enable a valuable exchange of data, then other actors will avoid joining the platform (Janssen *et al.*, 2009) and no value for citizens will be created. The failure to build a platform without a valuable network represents a waste of public investment and decreases value for citizens.

The risk for public agencies to invest in platforms that are unable to reach critical mass of actors necessary to generate value for citizens is high because of the diffused decentralisation of e-government policies which has caused the development of similar platforms and the duplication of digital services. For example, in many countries, like Italy or the UK, there is no national Open Data platform, but there are several platforms usually developed autonomously by each city (Attard *et al.*, 2015). The decentralised offering of Open Data has generated more economic inefficiencies because it has increased transaction and coordination costs. Decentralisation increases searching costs because developers have more difficulty in finding the data they need to develop new services. Platforms also have different standards and regulations which increase contracting costs for co-producers. Data provision is also uncertain. Governance of each Open Data platform is siloed, and

sometimes datasets or APIs can be suddenly closed or regulations can change. The uncertainty of data provision increases enforcement costs, especially for complex e-government services based on data coming from different platforms.

The inability of the existing platforms developed by public agencies to reduce transaction costs related to co-production of services has reinforced the success of platforms owned by companies that have bigger networks and are therefore more valuable (Janssen and Estevez, 2013). For example, each country has developed its own identification system for e-government services. The European Union launched a regulation called eIDAS[48] only in 2014 to simplify the interoperability of national identity services across Europe, and it is still not fully effective. Conversely, the identification services of Facebook and Google are already available and diffused worldwide, especially for digital services. This is the reason why companies and users tend to use Facebook or Google identification services rather than national identification services, which are not diffused and are often difficult to implement.

The lack of ownership of platforms like Google or Facebook identification services can appear economically convenient for public agencies because they create value for citizens without the need for any public investments in the development and management of the platform. However, the lack of ownership of these platforms can potentially generate inefficiencies. For example, if the Facebook identification service stops working, all the digital services that have adopted it will stop working as well, and the digital economy will be damaged. Because the government does not have any control over private platforms, there will always be an opportunity for both companies and external actors to generate economic inefficiencies for the public.

Relevant literature has explained only how GaaP impacts production efficiency (O'Reilly, 2011; Janssen and Estevez, 2013; Walravens and Ballon, 2013; Brown *et al.*, 2017). However, e-government systems have an impact not only on efficiency, but also on multiple values. It is not clear how GaaP also impacts other values such as transparency, public safety or fairness, which are usually embedded in the concept of public value.

3.5 Public value creation in e-government

A big portion of e-government literature and of GaaP literature has evaluated the impact of ICTs systems by looking at efficiency-driven measures such as cost reduction and cost per unit of output (Moore, 1995). The economic rationale embedded in the NPM, the JUG and the NPG frameworks

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[48] https://www.eid.as/home/

focuses on the deployment of e-government systems like GaaP as tools to improve efficiency. However, the fundamental weakness of this dominant perspective in the e-government field is that ICTs have an impact on multiple values and not only on efficiency (Bannister, 2002).

Technology can serve multiple values because the deployment of ICTs in public administration is not neutral, but is influenced by the organisational, social and political contexts that determine the set of values that public agencies should achieve (Fountain, 2001a; Bekkers and Homburg, 2007). Public agencies can conceive ICTs systems as tools to create value by serving other needs and expectations such as transparency or trust (Avgerou and Walsham, 2000; Fountain, 2001a; Contini and Lanzara, 2008; Twizeyimana and Andersson, 2019). Many studies show how ICTs can positively impact citizens' trust (Avgerou *et al.*, 2005). Other studies have shown how ICTs can help to improve participation and democracy (Avgerou *et al.*, 2005; Jaeger, 2005), transparency (Bertot, Jaeger and Grimes, 2010; Lin, 2015), food security (Nakasone and Torero, 2016), public safety (Silva, Wuwongse and Sharma, 2012; Paletti *et al.*, 2016), public health (Gustafson *et al.*, 2005) or education (Ruiz, Mintzer and Leipzig, 2006).

Even if the above studies do not explicitly refer to public value theory, they are in line with the public value framework because they show how ICTs deployment in public sectors can support different production processes and have an impact not only on efficiency but also on different values. The public value paradigm represents an alternative perspective for analysing how ICTs systems contribute to creating value for citizens. Nevertheless, the adoption of the public value perspective implies several complexities for e-government systems.

The first complexity is that to create public value public agencies need to create e-government systems able to serve multiple needs and expectations which are often conflictual. However, because public agencies serve different policies, domains and groups of citizens (public employees, families, companies, etc), they contain different clusters of interests that might conflict (Pang, Lee and DeLone, 2014). For example, the adoption of facial recognition can help police to efficiently monitor tube stations and improve public safety. However, facial recognition can also present a threat to citizens' privacy (van Zoonen, 2016). The other complexity highlighted by the public value perspective is that it is challenging to predict ex-ante the impact of e-government systems because ICTs can unintentionally impact other related values (Smith, 2011; Karunasena and Deng, 2012). For example, ICTs deployed to improve the efficiency of public services can have a positive impact on public trust (Smith, 2011). As pointed out by Cordella (2007), the adoption of ICTs can improve the efficiency of service, and at the same time, it can negatively impact other values, such as

impartiality and equality. For example, public services available only digitally might discriminate against citizens who have technological or knowledge gaps. In fact, according to the public value perspective, the success of e-government systems depends on how citizens perceive the overall value that is created (Scott, DeLone and Golden, 2016). Hence, secondary and often unintentional impact on other values complicates the public value creation process mediated by e-government systems.

Public value creation adds a layer of complexities in the deployment of ICTs systems. In order to create public value, public agencies need to adapt and evolve the production of services according to different values and various social, legal, political and technical factors to minimise negative externalities and conflicts among policy domains. However, as a result of past e-government reforms, three main barriers have emerged that can impede the creation of public value.

The first barrier is that public agencies struggle to adapt or evolve their e-government systems to serve new needs and expectations. Public agencies often cannot build ICTs systems ex-novo. Some components of e-government systems cannot be changed because they are the result of technological stratification of past organisational or political reforms. These stratifications create technical, legal, political and organisational path dependencies that influence the production configuration of new e-government services (Klievink and Janssen, 2009; Lanzara, 2009; Aanestad *et al.*, 2017). Therefore, the creation of value by certain public agencies is wholly or partially frozen and cannot easily evolve. For this reason, the ICTs-mediated production of public services can become an obstacle to public value creation because public agencies cannot change their production configuration.

The second barrier is that each public agency has focused on customer-oriented development of e-government systems, and has tailored digital services on the basis of supply and demand dynamics and the maximisation of economic value. As a consequence, public agencies produce services only in the forms that are economically convenient for public agencies, and without considering the impact on other values. For example, some public agencies have completely digitalised many public services to reduce public expenditure and to create more economic value. However, they have also discriminated against those citizens who are not familiar with relevant technologies or who cannot access to digital services. The customer-oriented development of ICTs systems has only focused on profit maximisation and has narrowed down the complexity of meeting several values to generate public value.

The third barrier is the lack of interoperability among public agencies. Focus on efficiency has underestimated the importance of interoperability within public administration to meet other public values. Public agencies driven by economic efficiency prefer to not collaborate with public agencies or other external actors if the collaboration does not positively impact economic efficiency. Hence, many e-government systems have remained closed to third parties or partially open only to economically convenient partnerships.

Public value perspective increases the level of complexity of value creation for the public, and the existing barriers currently represent an obstacle for many e-government systems to create public value. The diffusion of co-production enabled by e-government systems based on GaaP characteristics has helped to improve the efficiency of public service production. Nevertheless, it is not clear if the diffusion of co-production enabled by GaaP can help the creation of public value and if GaaP characteristics can solve the above complexities and barriers to public value creation.

The next chapter presents the theoretical framework which explains how this study conceptualises technology, and how the characteristics of GaaP architecture can overcome the above barriers and potentially enable public value creation. Furthermore, it also explores the necessity of a governance mechanism to address GaaP, co-production of public services, and public value complexities.

CHAPTER 4 Theoretical Framework

This chapter presents the theoretical framework of the thesis. The first section briefly summarises different perspectives about the impact of e-government systems on value creation and discusses the socio-technical perspective adopted for this study. The second section describes how the interaction of the organisational and technical dimensions of the GaaP enables public agencies to adapt their production configuration and create value by constantly meeting citizens' new needs. The third section discusses an important limitation of GaaP in the creation of public value. By comparing the differences between digital infrastructures, platforms, and GaaP from a control point of view, it emerges that GaaP might paradoxically constrain public value creation.

4.1. E-government perspectives

Different research philosophies have informed research on e-government. Heeks and Bailur (2007) have clustered them along a continuum where at its extremes, we can find positivism and social constructivism. Clustering literature along this continuum has been a common exercise in information systems literature since it helps to better identify how researchers in the field have framed the role of technology and organisations in shaping the outcome of ICTs-led reforms (Easterby-Smith, R and Lowe, 2002; Guba, 2002). E-government literature, similarly to information systems literature, has been strongly dominated from the beginning by a positivist approach (Meijer and Bekkers, 2015). The positivist approach is driven by the assumption that the nature of the phenomena under investigation is objective. This positivist stance leads researchers to search for precise variables which can help to discover causal rules to predict general patterns that shape any given context (Alkhalifah, 2017). Most often, positivist research holds a realist and objective ontology (Meijer and Bekkers, 2015; Alkhalifah, 2017). In the context of e-government research, this means that a single reality exists and that all the variables in e-government projects such as technology, work procedures, organisational culture, and skills have their own independent existence (Heeks and Bailur, 2007; Aliyu *et al.*, 2014). Therefore, the impact of e-government systems on the creation of value as well as the value experienced by citizens are objective and can be pre-determined a priori by looking at how the different variables interact (Vargo, Maglio and Archpru Akaka, 2008) and shape each other. By identifying the path of interdependences shaping different variables, it is possible to identify patterns that apply to all cases. Hence, generalisation of findings is possible. This leads researchers interested in the study of e-government to identify technological features that shape public sector action and to be able to pre-determine the specific

technological features that will lead to precise outcomes when deployed in public sector organisations. Indeed, the analysis of how specific functionalities designed in the technological artefact shape the outcome of its adoption in organisations and hence, of how organisations get redesigned by ICT systems, is very valuable to appreciate fundamental transformations that are brought about by ICT systems. However, the positivist stance tends to undermine multiple factors which are not objective but rather constructed in the subjective sphere of the individuals involved in e-government projects.

 The investigation of the social involvement in the creation of technology is not new. Some early studies (e.g., Mumford, 1934; L. Winner, 1977) have researched how choices of human agents can affect the development, design or construction of technology social factors. Technology is considered as a social artefact that is subjective to the interpretation of relevant social groups (Pinch and Bijker, 1984; Meikle and Bijker, 1997). However, the social constructivist framework stresses the importance of contextual dynamics in the social shaping of technology, which implies that social factors shape technology in specific and subjective contexts (Kallinikos, 2004a). In fact, the social constructivist approach is based on the subjective interpretation of reality and the meaning given by each individual to a particular material or immaterial variables. Individuals and groups build their subjective interpretation of reality in a specific context. This approach focuses on the identification of a set of variables, relationships and interdependencies which are dependent on interpretation of the actors involved in the construction of the reality and on the interpretation of researchers. The social constructivist stance leads researchers to investigate particular constructions and meanings that an individual or groups of individuals have about variables which describe or explain specific phenomena (Van den Bulck, 1999; Heeks and Bailur, 2007). Frequently, social constructivist study holds a subjective ontology, and hence its findings cannot be generalised to other contexts. In the field of e-government research, this perspective contrasts the positivist stances. The claim is that a single reality does not exist and that all the variables of e-government projects such as ICTs architectures, work procedures, legal procedures, or organisational structure are shaped and interpreted according to the needs and convictions of situated agents. Therefore, the impact of e-government services on value creation cannot be pre-determined because it is influenced by the contextual and subjective choices of the individuals involved in the design, adoption and configuration of ICT systems that shape the production of e-government services (Suchman, 1987; Williams and Edge, 1996; Heath, Knoblauch and Luff, 2000; Orlikowski, 2000).

Moreover, the value created by e-government services cannot be predicted because what is valuable for citizens is not objective and cannot be simply delivered, but instead is constructed in the subjective sphere of each individual when he or she interacts with the e-government service (Osborne, 2018). This leads e-government researchers to assume that the impact of ICTs systems on value delivered to citizens has no objective existence and that generalisation is not possible. Indeed, it is very valuable to study how the interaction of social and technical variables shapes the impact on the value created by fundamental ICTs system transformation through the design or redesign of e-government production configurations. However, the meaning of the variables is ultimately in the subjective sphere and constructed by each of the individuals involved. Therefore, the researcher might seek to investigate what the production configuration means to public servants, what value they aim to create through a specific production configuration, and what they think are the relationships among the variables that affect the production configuration.

Nevertheless, e-government researchers do not usually mention concepts of research philosophies even if it is possible to infer the influence of the above research philosophies from the way in which researchers treat technological and social variables, and from how they conceive technological impact on value creation. Some studies (e.g., Bellamy & Taylor, 1998; Layne & Lee, 2001) under the implicit influence of the positivist approach are inclined to believe that technology has some inherent and objective features which can directly impact production configuration and then the creation of value. The direct association of technology with impacts on value creation is usually considered part of the technological determinist perspective. The technological determinist perspective leads researchers to concentrate their studies mainly on the technical dimension of e-government systems and tends to explain how certain technical and objective characteristics of ICTs systems generate specific value outcomes (Layne and Lee, 2001; Yang, 2003). Accordingly, an analysis of the elements that belong to the technical dimension can explain the failure or success of e-government services in delivering value. Once some causal laws that associate the adoption of specific technology with certain value outcomes are identified, researches can develop models which can explain e-government impact in any context (Layne and Lee, 2001).

Generally, in these models, the more advanced the technology adopted by public agencies, the higher the stage of e-government development and the bigger the value delivered to the public (Gauld, 2009). Models that describe e-government development stages consider citizens' perception of value as generalisable and easily determined and measured by looking at general efficiency parameters of services such as processing time, costs, or number of hours of work (Fleck,

Webster and Williams, 1990; Bellamy and Taylor, 1998). Due to these models, the impact on the value experienced by citizens can be pre-determined a priori by looking at the effects that certain technical arrangements have had in another context (Bellamy and Taylor, 1998). These models are usually used by public agencies to assess their current e-government stage of development (Layne and Lee, 2001; Torres, Pina and Acerete, 2005) and to guide them towards/in the adoption of certain ICTs systems sufficient to reach the desired outcome (Andersen and Henriksen, 2006). However, the focus on the technological aspects of e-government systems represents the main limitation of the technological determinism perspective, which fails to explain how the political, organisational, and administrative dimensions shape a specific technical configuration (Jessop, 1996). By focusing primarily on the technical dimension of e-government initiatives, the technological deterministic perspective risks underestimating the importance of the organisational dimension where political, organisational, and administrative elements interact to define goals and address the development of technical functionalities (Cordella and Iannacci, 2010).

Studies (e.g., Fountain, 2001; Schellong, 2007) that consider political, organisational and administrative elements as the major factors that shape value generated by e-government projects are usually categorised as social determinist, to emphasise the importance of the organisational dimension in e-government systems. These studies claim that the impact of e-government services largely depends on the administrative, political or organisational changes which shape e-government configuration and the creation of value for citizens (Williams and Edge, 1996). Accordingly, the development of e-government services is seen as not driven by an inner technical logic but is instead the result of organisational, political, and administrative choices. These choices, whether they are intentional or not, frame the design of e-government technical functionalities, shape the trajectory of digital transformation in public agencies, and affect the value delivered to citizens (Yang, 2003; Gil-García J. *et al.*, 2005).

The socio deterministic perspective highlights that at every stage of e-government development, the actors involved in the digital transformation have a number of design options available. The available options are not prearranged but socially shaped by the interaction between certain cognitive, cultural, social and institutional variables that belong to the organisational dimension (Fountain, 2001a; Schellong, 2007). Therefore, the outcome of the e-government system cannot be easily predicted a priori because there are no clear e-government development paths. Changes in

the political or social environment imply changes in the organisational dimension of e-governments systems (Fountain, 2001a).

Hence, the failure or success of e-government projects in creating value depends on how the variables within the organisational dimensions interact and lead to the selection and configuration of elements that belong to the technical dimension (Picazo-Vela, Fernandez-Haddad and Luna-Reyes, 2016). It is then possible to explain the impact of e-government services by looking at the interdependences of the variables that belong to the organisational dimensions of e-government systems (Sanjeev and Riggins, 2005; Helbig, Ramón Gil-García and Ferro, 2009). While the socio deterministic approach to studying the impact of e-government deployments on the value created for the public is very valuable to accounting for important cognitive, cultural, social and institutional variables, it also underestimates the power that technical elements have in shaping e-government systems and on e-government services' impact on value creation. To overcome the limitation of the techno-deterministic and the socio-deterministic approaches, scholars have increasingly looked at how both variables, the technological and the organisational, shape e-government deployments and the values they create.

Accordingly, the sociotechnical perspective, which is usually considered a midpoint between the technological and the social determinist perspectives, has gained increasing interest among e-government scholars. Studies that adopt the sociotechnical perspective (e.g., Cordella & Iannacci, 2010; Janssena et al., 2009) explain the impact of e-government system on value creation as a result of the interaction of the organisational and technological dimensions. The interaction between technical and organisational dimensions of e-government services shape e-government configuration and affect the production of public services and the creation of value (Helbig, Ramón Gil-García and Ferro, 2009). Production configuration is then the result of a negotiation between the technical and organisational dimensions that reciprocally shape each other (Luna-Reyes *et al.*, 2005; Heeks and Bailur, 2007; Lanzara, 2009). Organisational factors shape the technological features which in turn may reshape the organisational dimensions. The value delivered by e-government projects is not the outcome of planned and sequential evolutionary phases, but emerges as the result of a complex set of technical and organisational relationship (Cordella and Bonina, 2012). The technical and social dimensions merge into a socio-technical regime that shapes the development of ICTs systems for the public sector (Luna-Reyes *et al.*, 2005; Janssen *et al.*, 2009) . The process of negotiation and mutual shaping is continuous. The value delivered by e-government

initiatives is then the result of the on-going interplay of the organisational and technical dimensions (Cordella and Iannacci, 2010).

Moreover, often public agencies do not configure the production of public service ex-novo or from scratch. E-government services are configured through the mediation of previous production configurations which have their own logic that can enable or constrain how the new production configuration is shaped (Kallinikos, 2004a; Lanzara, 2009). The negotiation with existent technical and organisational configurations can potentially lead to sub-optimal production configurations and an unexpected value outcome (Antonio and Francesco, 2012). Accordingly, the socio-technical perspective suggests that researchers should mainly focus on the interaction between the organisational and technical dimensions of an e-government system to explain how it impacts value creation (Bekkers and Homburg, 2007; Cordella and Bonina, 2012). However, this explanation cannot be generalised because the way in which technical and social variables interact and impact value creation is influenced by the situated context (Heeks and Bailur, 2007). Socio-technical systems exist within their own environments, constituted by variegated needs and expectations (Bostrom and Heinen, 1997). If the political, social or technical environment changes, the system has to adapt to meet emerging needs and to create value. Therefore, the process of adaptation is reciprocal and continuous not only within the e-government system but also between the e-government system and the environment where it is embedded (Janssen *et al.*, 2009).

This study follows that stream of research and explains how the socio-technical regime of the GaaP configuration impacts public value outcomes. Specifically, this work builds on Moore's (1995) strategic triangle for public value creation, to analyse how GaaP configurations impact the way in which public sector's agencies create public value. The strategic triangle is still considered a valid conceptual framework to explain and analyse the peculiarities of the public value creation process, which is composed of three distinctive stages (Moore and Khagram, 2004; Alford and Hughes, 2008). The first stage is the definition and evaluation of citizens' needs and interests that must be satisfied to create public value. The second stage is the assessment of the political, legal, administrative and social factors which constitute the authorising environment that formally or informally authorises the production of services under specific terms and conditions. The third stage is the evaluation and configuration of the operational capabilities necessary to produce the service and to achieve the desired public value outcome.
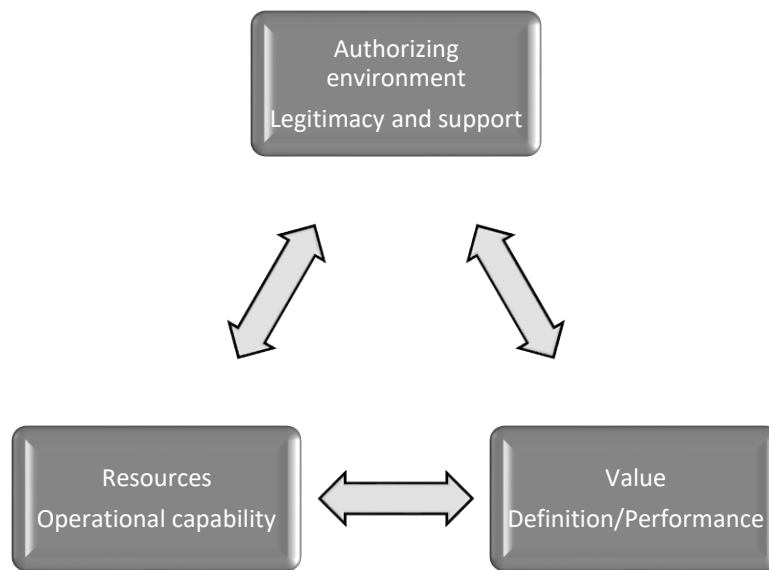
Figure 1 Strategic triangle of public value creation (Moore, 1995)

This strategic triangle is often considered a framework to operationalise public value creation (Moore and Khagram, 2004), but it also represents a change of the value creation paradigm (Meynhardt, 2009). In fact, the public service production configuration that impacts public value is the result of the interaction of multiple organisational, political or technical dimensions that mutually affect each other at different stages of the process. The public value creation process described by the strategic triangle of Moore (1995) shifts where value for the public is defined from public organisations' boundaries to the authorising environment constituted by political, legal, and institutional elements which are often external to public agencies and which represent multiple citizens' needs and expectations (Panagiotopoulos, Klievink and Cordella, 2019). The environment within which public agencies operates then shapes the production configuration (Stoker, 2006). Within the public administration boundaries, there are a set of technical and organisational elements, known in the strategic triangle as operational capabilities, which mutually mediate each other and also shape the impact upon the creation of public value. The impact on public value cannot be predefined because it emerges as part of the process of negotiation between the technical and organisational dimensions of the operational capabilities, and is also mediated through past production configurations (Cordella and Bonina, 2012; Panagiotopoulos, Klievink and Cordella, 2019). The public value outcome of the service produced has an impact on citizens, and can potentially lead to changes to the authorising environment and to the production configuration (O'Flynn, 2007). The process of negotiation within organisational boundaries and between the organisation and the external environment continually shapes the production configuration and the value delivered to the public (Crosby, 't Hart and Torfing, 2017). The operational capabilities that

enable the production configuration of public services are built and then mediated by GaaP characteristics. The GaaP literature (Brown *et al.*, 2017) has already individuated in the IS literature the characteristics of the organisational and technical dimensions of GaaP. The next section describes how GaaP characteristics enable public agencies that constitute public administration to configure the production of public services and to create public value.

4.2. GaaP's characteristics

As already discussed in chapter 3, the GaaP literature (O'Reilly, 2011) considers the platform architecture typical of companies like Google or Amazon as a valid alternative for public administration to overcome its monolithic structure and to create more value for citizens by supporting a more networked and adaptable production of public services. Indeed, GaaP has a direct impact on the operational capabilities of the entire public administration because it enables public agencies to configure the production of public services and to create public value. In order to understand how GaaP can change the way in which public agencies produce public services and create public value, it is necessary to understand the organisational and technical characteristics of GaaP.

Differently from previous studies (O'Reilly, 2011; Janssen and Estevez, 2013; Brown *et al.*, 2017), in this research GaaP is conceived not as a simple large platform but as 'platform of platforms' developed by public agencies autonomously or in partnerships with other public agencies to fill common service gaps (e.g., identification service) or to serve specific policy domains (e.g., electronic medical healthcare records). This architecture of platforms supports a modular structure of interdependent components similar to a LEGO structure, which enables public agencies to assemble and disassemble their production configurations an infinite number of times and to constantly meet citizen's needs (Ciborra, 1996; Cusumano and Gawer, 2002). The platforms that constitute GaaP serve different purposes and can be distinguished within three typologies identified by Gawer and Cusumano (2002) which offers a different level of control over the service production.

The first type of platform are the 'internal platforms' which provide fundamental services that increase the internal efficiency of public agencies or facilitate the coordination among public agencies in the same policy domain. The hospital electronic medical healthcare system is an example of an internal platform that facilitates the exchange of medical data within the department at the same hospital. Modular services such as software for medical data analysis can be plugged into and un-plugged from the platform. This modularity guarantees the evolvability of the production configuration (McGrath, 1995; Meyer and Lehnerd, 1997; Muffatto and Roveda, 2002) which can

adapt rapidly to policy or legal changes without the risk of remaining locked in with previous configurations. The internal platform supports in-house production of public services and offers a high level of control overproduction, which is usually suitable to producing services such as medical or judicial service that deal with sensible data. The second type are the 'supply chain platforms' which offer fundamental services to public agencies of different policy domains. The objective of this type of platform is to avoid duplication of similar platforms and to facilitate the exchange of data across public administration. GOV.UK.Pay is an example of a shared platform that offers public agencies the possibility to accept digital payments without the need to build their own payment infrastructure. Supply chain platforms improve efficiency across the entire public administration because they offer fundamental services like identification or payment services that all public agencies need. The supply chain platforms offer a high level of control but are designed to support joined-up or shared services across public administration. The third type are the 'industry platforms' which are platforms that enable collaboration across public administration and with third parties. The industry platforms serve as a base for third parties to develop additional services or modules. An example of an industry platform in the public sector is the TfL open data platform that enables more than 600 applications like CityMappers or Google Maps, which co-produce complementary services of information about transportation (Cordella and Paletti, 2018). The industry platform offers a low level of control because it is difficult to predict or control which services third parties will develop. Hence, it is suitable for services which do not require a high level of control, such as information about transportation.

Type of platforms	Internal Platforms	Supply Chain Platforms	Industry Platforms
Control	High	Medium	Low
Type of Public Service	Suitable to produce services that need a high level of control over the final outcome like the policing service.	Suitable to produce services that need a high level of control over the final outcome and that facilitate the cooperation among public agencies like payments or identification of citizens	Suitable to produce services that do not need a high level of control and that need many resources to be effective such as the public transportation service

Table 10 Types of platforms and mode of production

Public agencies develop, manage and maintain the platforms to serve policy domains under their competence. However, these platforms are often combined by other public agencies across public administration to offer complex digital services. Therefore, different types of platforms often coexist and interplay within the same production configuration. These platforms constitute GaaP and determine the organisational and technological dimension of the public administration operational capability, which is indeed the '*result of the confluence or intertwining of ICT and organisational features*' (Zammuto *et al.*, 2007, p. 752). Hence, the study of the organisational and technical characteristics of GaaP is necessary to understand how the operational capabilities offered by public administration impact public value creation.

The most important characteristic of the organisational dimension is the existence of a holistic and consistent representation of public administration as a platform in any of its organisational features (Eaton *et al.*, 2015; Brown *et al.*, 2017). The shared view of public administration as a platform ready to evolve and adapt according to political or social changes is inevitably linked to the existence of one or more participatory ecosystems that enable public agencies and third parties to co-produce public services (O'Reilly, 2011; Brown *et al.*, 2017). The success of an ecosystem is mainly affected

by a set of regulations, policies and fundamental services (e.g., identification, payments, fiscal management system) offered by material and immaterial platforms (Baldwin and Woodard, 2008; Olleros, 2008) which constitute the stable and centralised core of GaaP. A strong and efficient centralised core is fundamental to ensure stability of the ecosystems and to support the creation of value (Olleros, 2008; Yoo, Henfridsson and Lyytinen, 2010; Henfridsson and Bygstad, 2013; Eaton *et al.*, 2015).
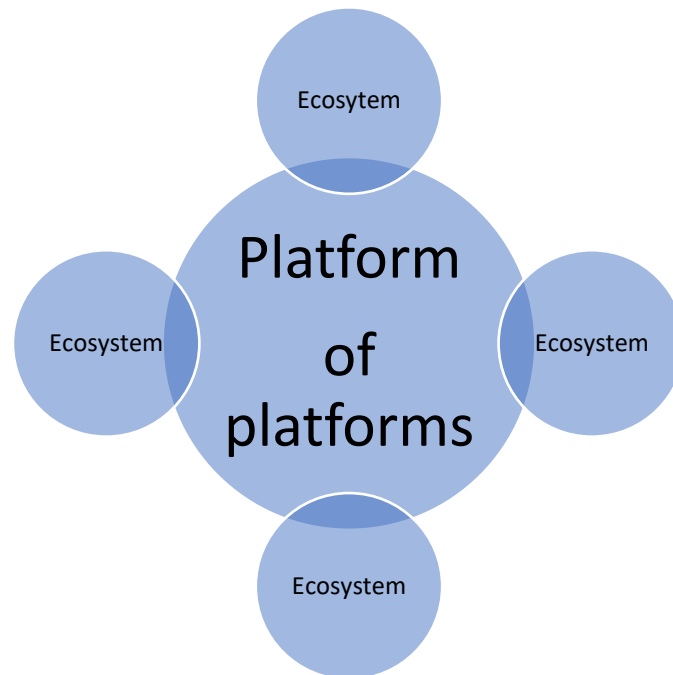
Figure 2 GaaP as implemented platform of platforms

GaaP is organised and perceived as composed of multiple platforms and ecosystems (figure 2) that coexist and interact to offer services, similarly to companies like Apple, Amazon or Google (Baldwin and Woodard, 2008; Boudreau and Lakhani, 2009; Eaton *et al.*, 2015). The multiple ecosystems represent different policy domains such as healthcare, defence or education. Each ecosystem is then regulated ad hoc through boundary resources, which are '*the software tools and regulations that serve as the interface for the arms-length relationship between the platform owner and the application developer'* (Ghazawneh and Henfridsson, 2012, p. 174).

Boundary resources evolve as a result of policymaking activity and are used by public agencies to address and constrain generativity of ecosystems (Ghazawneh and Henfridsson, 2010; Yoo, Henfridsson and Lyytinen, 2010; Henfridsson and Bygstad, 2013; Eaton *et al.*, 2015). Through boundary resources, public agencies can regulate openness of the ecosystem. A closed ecosystem

is usually populated by selected public agencies, contractors and external actors, while an open ecosystem is open to any actor (Olleros, 2008).

All these GaaP organisational features that belong to the organisational dimension are deeply intertwined with the technical dimension. Technical components of the platform make GaaP evolvable, scalable and interoperable (Katz and Shapiro, 1994; Ulrich, 1995; Baldwin and Woodard, 2008; Ghazawneh and Henfridsson, 2012). The architecture of GaaP is based on modules (Cusumano and Gawer, 2002) enabled by a set of material and immaterial platforms and by different ecosystems (Eisenmann, Parker and Alstyne, 2006; Baldwin and Woodard, 2008; Tiwana, Konsynski and Bush, 2010). Modules are material or immaterial components that embed services and, when connected to the platform, add a functionality (Sanchez and Mahoney, 1996; Baldwin and Woodard, 2008). The strength of the modular interlinking among modules creates loose or tight coupling among platform components, which affects the level of modularity of GaaP (Nielsen and Aanestad, 2006) and its ability to evolve or adapt. Ideally, the GaaP modular architecture should enable its components to be changed without affecting the whole function of the system (Tiwana, Konsynski and Bush, 2010). The evolution and interoperability of the modular architecture is controlled through a system of APIs (Application Programming Interfaces) and other standardised interfaces, design rules and interoperability standards (Jin and Robey, 2008; Helmond, 2015) which are fundamental for interoperability (Katz and Shapiro, 1985).

At the core of the GaaP technical dimension lie three main technical characteristics which are necessary to guarantee the adaptability and evolvability of production configuration (Baldwin and Woodard, 2008):

a. *Decomposition*. It should be always possible to decompose and break down hierarchically constituent parts of the platform. Decomposition helps to minimise the complexity of the GaaP architecture and breaks down all the interdependences among the different components.

b. *Modularity*. Each module is standalone and independent from the other modules. Changes in the combination of modules do not affect service offered by the module or its technical characteristics.

c. *Design rules*. A set of protocols, rules and standards which instruct developers during the creation of modules. Design rules are strategic for the generativity and the correct

functionality of the platform. They should be stable but also versatile to not constrain GaaP evolution in the long term.

Organisational dimension

- Consistent representation of PA as a platform (Eaton *et al.*, 2015; Brown *et al.*, 2017)
- Ecosystems to enable coordination and co-production of services (O'Reilly, 2011; Brown *et al.*, 2017)
- Stable and centralised core services and regulations (Baldwin and Woodard, 2008; Olleros, 2008)
- Boundary resources to regulate ecosystems (Ghazawneh and Henfridsson, 2013)

Architectural dimension

- Material and immaterial core infrastructures (Eisenmann, Parker and Alstyne, 2006; Baldwin and Woodard, 2008; Tiwana, Konsynski and Bush, 2010)
- Modular structure (Cusumano and Gawer, 2002)
- Interoperability (Katz and Shapiro, 1994)
- Design rules (Baldwin and Woodard, 2008)

Figure 3 Organisation and technical characteristics of GaaP

From a public value perspective, the operational capability offered by the interaction of GaaP's organisational and technical characteristics enables public agencies to configure public services to create public value. The modularity of the GaaP architecture allows public agencies to assemble an infinite number of production configurations (Ciborra, 1996; Baldwin and Woodard, 2008) to meet citizens' needs and expectations (O'Reilly, 2011; Brown *et al.*, 2017) or to respond to changes in the authorising environment. The possibility to compose and decompose the production configuration like a construction made of LEGO bricks (Baldwin and Clark, 2006; Tiwana, Konsynski and Bush, 2010) into its atomic functionalities allows public agencies to ensure that production configuration produces services which meet all the needs of the public. Moreover, GaaP allows public agencies to govern the generativity of the ecosystems under their competencies through boundary resources (Ghazawneh and Henfridsson, 2010; Eaton *et al.*, 2015) which can ensure that third parties co-produce options of public services that create positive value for their policy domain.

However, the high level of control of public value creation offered to public agencies by the GaaP approach is only apparent. The modularity of GaaP architecture and the generativity of its ecosystems hide a complexity which may also reduce control over the value creation process and may threaten public value creation. These GaaP limitations become more apparent if we look at

GaaP as platform of platforms and not as a single platform. The next section discusses this limitation by looking at different levels of control offered by digital infrastructures, platforms and GaaP.

4.3. From Infrastructure to GaaP: how control has changed

The introduction of platform architecture in the e-government context is a novelty, and it has direct implications on the control that public agencies have over the production of public services. Public agencies have traditionally developed standalone information systems which were not designed to evolve or exchange data with other public agencies, but were intended to only automatise internal procedures and deliver specific values (Cordella and Bonina, 2012; Margetts and Dunleavy, 2013). JUG reforms, driven by the need to overcome the siloed development of e-government services promoted by the NPM approach, led to the realisation of digital infrastructures such as e-health or e-justice systems which were conceived as interconnected systems based on shared standards that involve multiple public and private actors (Braa *et al.*, 2007; Cordella and Iannacci, 2010; Cordella and Willcocks, 2012). The development of digital infrastructures has been extensively discussed in e-government literature (Janssen *et al.*, 2009; Cordella and Willcocks, 2012; Henfridsson and Bygstad, 2013; Klievink, Bharosa and Tan, 2016). Conversely, the adoption of platform thinking is recent, less discussed, and related to the historical pressure on public administration to use technology to 'do more with less' (Janssen and Estevez, 2013). Platform thinking embedded in the concept of GaaP is an alternative to the failure of JUG reforms (Cordella and Bonina, 2012; Margetts and Dunleavy, 2013) to solve three chronical problems that affect the e-government field: the quasi-impossibility to adapt or evolve digital services, the duplication of similar digital infrastructures at national and international levels, and the difficulty to effectively enable external actors to co-produce public services (O'Reilly, 2011; Janssen and Estevez, 2013; Walravens and Ballon, 2013; Brown *et al.*, 2017).

Although the terms 'platform' and 'infrastructure' are sometimes considered synonymous, in the information systems literature, they indicate two different types of architectures (De Reuver, Sørensen and Basole, 2018). The main difference between the two architectures is the level of control that the owner exercises on the creation of value, which is higher in platform than in digital infrastructures (De Reuver, Sørensen and Basole, 2018).

Public administration has historically built and governed physical infrastructures such as railways, highways, and power grids, which have provided fundamental services for society and have contributed to the development of the economy. The recent need to drive and sustain the digital

market has led the state to invest also in digital infrastructures to provide basic facilities such as identification, payment services, or public registries (Janssen *et al.*, 2009) and also more complex infrastructures such as e-health systems (Braa *et al.*, 2007; Aanestad *et al.*, 2017) and e-justice systems (Cordella and Iannacci, 2010). The problem is that building a highway is different from building a digital infrastructure (Plantin *et al.*, 2018). For example, highways can be connected to other highways, and they can form an evolving infrastructure network developed by different local and international actors according to precise plans. Control of how third parties use highways is difficult but not complex, and can be effectuated. Conversely, digital infrastructures often evolve without a precise plan, and they have a low level of control on how third parties use them (Beniger, 1988). The Internet is a typical example of digital infrastructure that enables a big and complex number of interactions which are incredibly difficult for any government to monitor (Hanseth and Lyytinen, 2008).

The complexity of digital infrastructures is the result of multiple and shared systems that make the organisational boundaries difficult to define, and which resemble interconnected coalitions of systems (Sommerville *et al.*, 2012). Digital infrastructures are conceptualised as a collection of technological and human components (Tilson and Lyytinen, 2006; Braa *et al.*, 2007), and their evolution is the result of their interactions (Plantin *et al.*, 2018). Digital infrastructures are in fact sociotechnical, shared and unbounded networks that involve heterogeneous social and technical components at different levels of government which cannot be fully controlled and managed (Hanseth and Lyytinen, 2008). The interaction of a multitude of heterogeneous technical and organisational components that act to reach their own goals generates a high level of complexities which reduces control over the development of the infrastructure (Ciborra *et al.*, 2001; Braa *et al.*, 2007). Infrastructures are sociotechnical systems that initially are centrally designed and controlled by a public agency or a company. Once the infrastructures become diffused, they start changing and designers lose control over their development. Users and developers can in fact modify or extend the infrastructure as they prefer without the need for any permission. This decentralised development is possible due to some interoperability standards that act as gateways which connect physical and digital elements with a potentially infinite number of heterogeneous elements (Egyedi, 2002; Lanzara, 2009).

Interoperability standards are fundamental for the evolution of physical and digital infrastructures (Aanestad *et al.*, 2017; Plantin *et al.*, 2018). Physical infrastructures such as railways, shipping

networks and roads have expanded due to common standards such as International Organization for Standardization (ISO) standard shipping containers which are an example of a gateway. Similarly, expansion of the internet was possible due to its open architecture based on interoperability standards such as Control Protocol/Internet Protocol (TCP/IP), common transaction protocol (HTTP) and naming scheme (URI), which act as gateways that guarantee scalability and interoperability, and enable a decentralised development.

However, the existence of interoperability standards does not imply that the development of infrastructures is always decentralised (Hanseth and Lyytinen, 2010). When infrastructures are initiated, interoperability standards are only used by few actors and therefore there is high control over their development. For example, the internet was developed by a public agency limited to few public agencies and universities. Only after some years, it expanded in a network of heterogeneous computer networks, and the original central control vanished. Integration with heterogeneous and peripheral components generates complex ecologies of actors that continually adapt, evolve, and can specialise in different paths outside the original design (Graham, 2001; van der Vleuten, 2004). The control of infrastructure development become weaker as the result of the complex and decentralised negotiation among numerous actors which often have dissimilar interests (Weill and Broadbent, 1998; Sahay, Aanestad and Monteiro, 2009).

Digital infrastructures grow organically without central coordination (Hanseth and Lyytinen, 2010; Constantinides and Barrett, 2015; Plantin *et al.*, 2018) and are the result of a mix of planned and emergent action (Bygstad and Hanseth, 2016). It is thus difficult to design, implement and manage digital infrastructures both from a technical and an organisational point of view. From a technical point of view, this is because actors that interact during the development of digital infrastructures have different ICT capabilities and resources. From an organisational point of view, this is because there are different actors that use digital infrastructures to pursue different goals. These two elements generate a high level of complexities (Shapiro and Varian, 1998). Because of this complexity, digital infrastructures cannot be built as standalone systems with a complete set of requirements. Digital infrastructures evolve autonomously, and designers can only think about standards, rules and design principles that can nudge and address the self-development of digital infrastructures (Walls, Widmeyer and El Sawy, 1992; Baldwin and Clark, 2000; Markus, Majchrzak and Gasser, 2002). Therefore, digital infrastructures cannot be truly designed, but instead, can only be remotely addressed through standards and design principles (P. Edwards *et al.*, 2007). The

absence of a common development strategy, together with the difficulty of establishing a coordination mechanism, generate parallel pathways of evolution which can foster innovation but also create negative value for society (Ciborra and Hanseth, 1998; Janssen and Estevez, 2013). Lack of control over the development and the usage of infrastructures can potentially generate episodes of social chaos - such as urban blackouts in the case of grid infrastructure or major internet outages in the case on the Web (Graham, 2001; P. Edwards *et al.*, 2007).

Moreover, the lack of control over digital infrastructures is stronger in the public sector because public agencies have developed weak e-government infrastructures (Cordella and Bonina, 2012; Margetts and Dunleavy, 2013). The wave of neoliberal reforms that have inspired the NPM approach has changed the role of public administration from an infrastructure builder to a regulator (Janssen and Estevez, 2013). The NPM framework has also promoted decentralisation of competencies about digital services and has provided public agencies with the option to develop their own infrastructures (Dunleavy, 2005; Janssen *et al.*, 2009). Because of their limited capabilities, public agencies have often outsourced the creation of digital infrastructures (Cordella and Willcocks, 2012) or have collaborated with private organisations to create and manage infrastructures. The results of these reforms can be summarised in three main trends which have made the level of control weaker.

The first trend is that public agencies have shifted their attention to focus on the development of dedicated e-government services that automatise some public services, such as booking medical checks, applying for a passport or enrolling at a university. These digital services are not digital infrastructures, but instead applications with a precise and limited scope clearly determined a priori, for specific user groups (Hanseth and Lyytinen, 2010).

The second trend is that diffusion of competition within public administration has induced public agencies to create numerous and overlapping digital infrastructures at national and international levels (Cordella and Bonina, 2012; Margetts and Dunleavy, 2013; Carey, Crammond and Riley, 2014). As a consequence, there are many e-government national infrastructures that offer identical services and are unable to reach sufficient critical mass to become valuable (Evans and Schmalensee, 2010). For example, in the EU, there are many e-health infrastructures offered by member states such as the UK or Italy to facilitate internal and external exchange of medical data, but none of them is diffused enough to achieve critical mass and become the national or European infrastructure for e-health (Fragidis and Chatzoglou, 2017).

The third trend is that public administration has lost control over some policy domains because some companies have built digital infrastructures that enable many public services. The existence of digital infrastructures that provide public service owned and controlled by private companies limits the possibility for public administration to control the production and co-production of public services (Plantin *et al.*, 2018), and can potentially limit the creation of value for society. For example, in 2004, Google introduced Google Maps that filled a gap in the digital market and soon became an important infrastructure for cartography. In fact, the digital market needed infrastructure for digital cartography which national governments were unable to provide, and the only accessible maps required specialised geographic information systems. Applications like UBER are today built on Google Maps and are part of its ecosystems, which are standardised environments that facilitate control over the production of public service (Brown *et al.*, 2017). Due to Google Maps, in some countries today Google has more power than public administration on mobility services.

The case of Google also shows the important transition from digital infrastructure to platforms architecture, and it clarifies why platforms tend to have more control than digital infrastructures. Google Maps was initially a standalone infrastructure based on Javascript. Because Javascript is an interpretative code, it acted as a gateway and allowed third parties to use Google Maps to develop their services (such as HousingMap.com) without any permission or control from Google (O'Reilly, 2011, p. 31). Consequently, in 2005, Google Maps realised its APIs to enable co-production of services, and also to get control back over how third parties create value on the platform. This novel approach transformed Google Maps into a platform. According to Bogost and Montfort (2009), platforms' essential characteristic is programmability. Programmability permits users to go beyond the original designers' project and to generate more value for clients. The APIs structure enables the modular architecture of platforms to lower the costs of innovation, to favour 'mashups' of two or more data sources (O'Reilly, 2005), and to avoid the development of standalone systems to support a new product (Baldwin and Woodard, 2008). However, programmability through the APIs structure typical of platform architecture also enables organisations to control the development of ecosystems (Bogost and Montfort, 2009; Plantin *et al.*, 2018). APIs are like electrical sockets which allow developers to plug in their programs and exchange data with platforms. APIs also act as gateways, but they create a two-way flow of data. On the one hand, APIs allow developers to easily develop apps and services and seemingly connect them to the open web architecture. On the other hand, APIs lock developers into a limited ecosystem which restricts and controls what developers and users can do. The ecosystems then work as private 'walled gardens' where developers can act

under precise boundaries (Helmond, 2015). In fact, APIs enable programmability and the development of public services, but differently from interoperability standards typical of infrastructures. APIs work as a tap and thus they represent an instrument of control of the data flow. Therefore, organisations that own the platform can decide according to their discretion on how to adjust 'the tap' to regulate the flow of data, and consequently can govern the development of services. As a platform, Google Maps became a programmable ICT architecture that has helped Google to simultaneously boost innovation and increase control over the production of services, while avoiding unauthorised and uncontrolled development of services (Hanseth and Lyytinen, 2010; Plantin *et al.*, 2018).

The success of companies like Google has boosted the 'platformisation' of digital services in the private sector (Helmond, 2015), where developers moved the development of their services from Internet infrastructure to digital platforms like Facebook or Google which provide APIs (Plantin *et al.*, 2018). Looking at companies like Google, Tim O'Reilly (2011) noted in his seminal article how platform architecture can help public administration to solve some chronic problems of inefficiency and to get the control back. The adoption of platform architecture can help public agencies to produce and co-produce more services for less investment and lesser costs, and thereby generate more economic value (Janssen and Estevez, 2013). The ecosystems of services facilitate a two-way exchange of data that favours the collection of data about platforms' users (Plantin *et al.*, 2018). Due to such data, the organisation that owns the platform can decrease the asymmetry of information, and better know what citizens want and need and what services third parties develop. Lower asymmetry of information also corresponds to lower transaction costs and hence more economic value generated by the organisations (Cordella, 2006). Moreover, the possibility to own information and govern production within the ecosystem through APIs enables public agencies to control and address the value creation process and to avoid negative externalities (Ceccagnoli *et al.*, 2012). Hence, platforms are not neutral but can affect how ecosystems evolve and generate value for society (Plantin *et al.*, 2018).

However, the number of platforms in the public sector is increasing and paradoxically, GaaP conceptualised as a platform of platforms undermines public agencies' control over value creation. Public agencies have started investing in platforms to substitute their digital infrastructures and enhance their control over value created for the public. Each platform has its own ecosystem that is used by public agencies to better control how open data are used by third parties (Dawson,

Denford and Desouza, 2016). Moreover, public agencies have also started digitalising physical infrastructures like highways and grids, which are becoming digital platforms (Avital *et al.*, 2019). The platformisation of physical infrastructures allows public agencies to better control activities that third parties develop on top of their material or immaterial platforms. For example, digital highways connected with vehicles can control in real-time the speed of vehicles or the kinds of goods transported by vehicles. Therefore, due to platform structures, each public agency can increase its control over the value creation process within its ecosystem.

The GaaP modular architecture also enables each public agency to assemble (mashup) the data offered by different platforms to configure their public service production. Thus, platform architectural characteristics can help public administration to easily develop public services by simply connecting APIs offered by the available ecosystems (Janssen and Estevez, 2013).

The problem related to the platformisation of digital services is that each public agency governs and addresses its ecosystem according to a siloed perspective to reach its policy goals. Public agencies enable co-production and enhance the number of interactions with heterogeneous actors to create value in their policy domain. However, they have no control over how their data can affect other policy domains. Although the APIs structure can enable them to control their ecosystem, the creation of multiple platforms and ecosystems enhances the asymmetry of information among public agencies, generates more complexity, and paradoxically reduce control over the production of public services (Hanseth and Lyytinen, 2008). For example, the Ministry of Transportation can open the APIs of detailed maps of tube stations to enable third parties to develop better transportation apps. However, because the Ministry of Transportation is managed by experts in transportation who are responsible only for this policy domain, they have limited knowledge and little interest about the possible impacts on other policy domains. In fact, tube station maps can be used to plan terroristic attacks, which negatively affects the defence policy domain. Because the Ministry of Defence has no control over data released by the Ministry of Transportation, they have no control over the value co-created in that ecosystem. In fact, public agencies tend to govern their ecosystems as to reach their policy goals, which can conflict with the policy goals of other ecosystems. These conflicts can co-create negative externalities like terroristic attacks or privacy violations which can generate negative value for society.

Hence, public administration that adopts the GaaP architecture to create value for society faces two important elements of complexity. The first one is that GaaP is not constituted only by one platform,

but by many platforms. Thus, paradoxically, each public agency has low control over value created by third parties across different ecosystems. The second one is that public value is not fixed and public agencies have to meet several public interests to create public value. Therefore, the challenge for public agencies is in finding the most suitable production configuration mediated by GaaP to constantly ensure a suitable level of control over the creation of public value.

CHAPTER 5 Discussion and Conclusions

This chapter discusses the main contributions of the PhD and its implications. The first section summarises the gap in the literature, the main research question and the three related research propositions discussed in the three papers that compose the PhD. The second section presents the contributions of the thesis to public management, e-government and information system literature. The third section presents a future research agenda. The last section presents the study's limitations.

5.1. Research context and gap in the literature

Over the past century, the perception of what is valuable for the public has changed and has led public administrations to evolve public services production configuration to meet citizens' needs. Moore's Strategic Triangle (1995) invites us to envision the production process as a series of activities and resources which are connected together to constitute a public value chain (Benington and Moore, 2011b; Osborne, 2018). The possibility of adapting or changing production configuration to shape the public value chain and create value for the public depends on the operational capabilities that determine what public agencies can or cannot produce (Moore and Khagram, 2004; Benington and Moore, 2011b). More resources correspond to more operational capabilities and consequently, more possibilities to adapt or change public value chains (Moore, 1995; Alford and O'Flynn, 2009; Johnson and Galea, 2009; Benington and Moore, 2011a). Based on available operational capabilities, public agencies can configure the public service production process to create what they perceive as valuable for the public.

During the 19th and 20th centuries, public administration considered citizens' needs and expectations as predictable, stable and objective needs (Zuboff and Maxmin, 2002). Citizens perceived as valuable their access to public welfare (public health, education, safety, etc.), and in certain countries, also the application of fundamental democratic principles of equality, transparency and fairness. Therefore, through conspicuous public investments, public agencies gained the operational capabilities to configure public service production processes capable of meeting standardised needs and creating value for the public. The production process was configured according to the bureaucratic model of production which is particularly suitable to mass produce public services and also to ensure fairness and equality (Zuboff and Maxmin, 2002). In this organisational context, public agencies adopted ICTs systems to reinforce control over production

and guarantee equal services for everybody. Thanks to the regulative properties of technology (Kallinikos, 2005), ICTs systems help public agencies to reduce public officers' discretionary power over the output of the administrative process. However, the same ICTs systems and bureaucratic procedures which reduce the discretionary power of street-level public officers have become an iron cage (Cordella, 2007; Cordella and Tempini, 2011; Margetts and Dunleavy, 2013; Simonet, 2015), which has constrained innovation (Merton, 1957; Crozier, 1964; Burns and Stalker, 1994), caused dysfunctionalities, and increased democratic disaffection (Bonina and Cordella, 2009; Margetts and Dunleavy, 2013) and public expenditure which in many countries became an unsustainable burden (Dunleavy, 2005).

During the 1970s and 1980s, the need to reduce public expenditure and reach economic efficiency became the paramount imperative of public administrations in many western countries that started to associate value for the public with creating economic value for individuals. The supremacy of economic value creation for individuals over the achievement of value for the public reduced the difference between public agencies and private companies to the minimum. De facto, the new organisational model of public administration summarised by the NPM aligned the operational capabilities of public agencies and companies (Stoker, 2006). The operational capabilities typical of the private sectors enable public agencies to configure public service production to create more economic value for clients by offering more outputs for lower costs (Dunleavy and Hood, 1994; Hood, 1995). The introduction of new operational capabilities combined with the principles of private sector led to the reorganisation of the traditional model of public administration as an archipelago of public agencies (Stoker, 2006) in competition with each other to create more economic value (Dunleavy and Hood, 1994; Hood, 1995). Under the influence of NPM principles, public agencies adopted ICTs systems typical of the corporate sector such as CRM and ERP systems, increasing internal production efficiency and delivering more economic value to citizens (Bekkers and Zouridis, 1999; Dunleavy, 2005). However, the adoption of siloed ICTs systems focused on internal efficiency caused duplications and overlaps of services at the public administration level, generating systemic inefficiencies (Pollitt, 2003; Boston and Eichbaum, 2014).

As a response to the inefficiencies caused by NPM reforms, governments reformed public administration, configuring the production of public services according to the JUG. Similarly to the NPM, the JUG approach associates creation of value for the public with the reduction of public expenditure, but is rooted in the idea that economic efficiency can be further improved by

establishing a more collaborative production of services across the entire public administration (Bovaird, 2005; Dunleavy, 2010; Carey, Crammond and Riley, 2014; Christensen, Fimreite and Lægreid, 2014; Carey and Crammond, 2015). The JUG reforms change the operational capabilities promoting the sharing of resources, such as ICTs systems, among public agencies. The will to improve collaboration across entire public administration led to the adoption of e-government systems based on enterprise architecture characteristics usually adopted by multinational companies to coordinate several units in different provinces or countries (Janssen, 2012). Thanks to the diffusion of new Internet-based technologies, it has become possible to extend collaboration outside public administration boundaries and to create more economic value.

According to the NPG management approach, non-public actors' involvement in the co-production of public services can help public agencies gain potentially infinite operational capabilities (Osborne, 2010; Pestoff, Brandsen and Verschuere, 2013; Lindsay, Osbrone and Bond, 2014). The configuration of a more networked production of public services has become possible due to the diffusion of ICTs systems that enable co-production of additional options of services (Benkler, 2007; Hodges and Grubnic, 2010; Kallinikos, 2011). The combination of public and private resources to co-produce public services can create additional economic value for the public by producing more services at lower costs (de-Miguel-Molina, 2009). Nevertheless, the creation of public value is not limited to the satisfaction of economic interests, but also of other public interests such as health, safety, or education(Bozeman, 2007). When citizens use public services, they consider efficiency and other values such as fairness, quality of life, security, justice, freedom, and human dignity (Wilenski, 1988; Pollitt, 1990; Haque, 1999; Diefenbach, 2005b; Kirkpatrick, Ackroyd and Walker, 2005; Michael, 2005). Public agencies have to produce public services that simultaneously meet variegated needs and expectations that often belong to other policy domains to create public value. Therefore, the main research question of this PhD thesis is *how does ICTs-mediated co-production impact the creation of public value?* The research question aims to explain how ICTs-mediated co-production impacts the overall public value process described by Moore (1995).

ICTs systems which enable co-production are often described as digital platforms (Anttiroiko, 2012). Building on the success of digital platforms in the private sector, O'Reilly (2011) introduced the concept of GaaP and explained how the adoption of platform architecture and organisation could help entire public administration to be more efficient. The modularity of the GaaP architecture and organisational model increases the operational capabilities of all public agencies that are part of

public administration to easily change or adapt public service production configuration and to collaborate with public and non-public actors (Fishenden and Thompson, 2013). The GaaP approach can thus be clearly beneficial for the creation of economic value because it helps public administration to avoid duplications or overlaps of services among public agencies and to facilitate co-production of public services on a large scale across the entire public administration (Fishenden and Thompson, 2013; Janssen and Estevez, 2013; Brown *et al.*, 2017).

Upon initial analysis, *the research proposition was that co-production mediated by digital platforms (GaaP) can help public administration improve public services production efficiency and ensure the creation of public value.*

The main research proposition was built on three related research propositions:

- Paper 1. ICTs-mediated modes of co-production (Crowdsourcing and Opensourcing) are the best production configurations to produce public services because they allow public agencies to produce more or better public services
- Paper 2. The adoption of ICTs-mediated co-production can then help public agencies to satisfy all citizens' needs and to create public value
- Paper 3. The entire public administration configured as a platform will provide the operational capabilities that all public agencies need to co-produce services on a large scale and to contribute to the creation of public value

The three research propositions have driven three different and related studies described in the PhD papers. The studies have unveiled several complexities in the co-production of services through ICTs and in the public value creation process which the literature has underestimated. The next section summarises the three PhD papers' main contributions to public management, e-government, and information systems literature.3

5.2.Thesis findings and contributions

The thesis has contributed to advancing knowledge of public management, e-government, and information systems literature. The first finding contributes to e-government literature and explains why ICTs-mediated co-production is not suitable for producing all public services but only for those that require a low level of control. The second finding demonstrates that the level of control over the public value creation process is mediated by ICTs systems, which enable or constrain production configuration and hence, the public value creation process. This finding contributes to public

management literature by adding technology as the fourth dimension of the Strategic Triangle of Moore. The third finding is that public agencies choose the public service production configuration that reaches the most suitable level of control over all the public interests involved in the production process. This third contribution has enriched both e-government and public management literature, explaining that public agencies configure the production process by considering different contextual public interests. The fourth finding explains that GaaP is constituted by several platforms and ecosystems, and this finding contributes to information systems and e-government literature. Based on this finding, GaaP's architecture can help public agencies configure and reconfigure production configuration ad infinitum. However, GaaP's mediation can also increase the difficulty of controlling co-production services.

Literature	Knowledge before the thesis	Thesis findings	Paper
E-government	ICTs-mediated co-production is the most suitable way to produce more public services for lower costs.	ICTs-mediated co-production is not suitable to produce those services which require high level of control over the final outcome.	Paper 1
Public Management	Technology is a neutral operational resource. ICTs systems with more advanced technical characteristics increase the operational capabilities and help to create more public value.	Technology is not neutral. ICTs systems can enable and constrain certain production configurations and then affect the level of control over the creation of public value.	Papers 2 and 3
Information systems and e-government	Public agencies choose ICTs-mediated co-production because it helps to gain more operational capabilities and create more public value.	Public agencies choose ICTs-mediated production as well as other production configurations to ensure a suitable level of control over all public interests involved.	Papers 2 and 3
Information Systems and e-government	GaaP provides all public agencies with the operational capabilities necessary to create public value and, at the same time, also a high level of control over co-production.	As shown by the GaaP case, an architecture constituted by several platforms and ecosystems offers lower control over public value creation than an architecture based on a single platform.	Paper 3
Information Systems and e-government	No specific governance mechanism of GaaP mediated co-production.	The GaaP mediated co-production requires the adoption of specific	Paper 3

		governance mechanism called public value orchestration. Public value orchestration entails finding the right technological and organisational configuration in order to produce public services able to create public value.	

5.2.1 E-government literature contributions

The first contribution of this thesis is to e-government literature, and explains that *ICTs-mediated co-production is not suitable to produce those services which require high level of control over the final outcome.* The initial research proposition was that ICTs-mediated modes of co-production could help public agencies to create more economic value for citizens (Linders 2012; Zuiderwijk and Janssen 2014; Fishenden and Thompson 2013; Toots et al. 2017). Application of the theoretical lens of the two value creation logics discussed by Vargo and Lush (2004) has helped to explain how the different operational capabilities offered by the four production configurations (in-house, joined-up, crowdsourcing and opensourcing) lead to different value creation processes. The more operational capabilities come from external actors, the more open is the value creation process, and the lower is control over the production outcome. The importance of control over the production outcome represents a novelty in the production logics diffused among many public agencies, which have often looked at the input/output ratio to configure the production process and to create economic value.

According to this logic, defined as manufacturing logic because it describes the manufacturing process typical of manufacturing companies like Ford, public agencies assemble and transform a series of inputs (e.g. resources, task, design) into value embedded in goods. Driven by this logic, public agencies' main focus is to improve the value creation process by increasing the number of inputs in the production process to generate a more valuable output (Grönroos, 2008; Vargo, Maglio and Archpru Akaka, 2008). The production process output can be public goods such as public parks or roads or public services such as education or healthcare. When public agencies exchange public goods and services with citizens, value is transmitted to them, and they passively consume it (Osborne, Radnor and Nasi, 2013; Cordella and Paletti, 2018; Osborne, 2018). According to the

manufacturing logic, a more open public service production such as crowdsourcing or open-sourcing would correspond to more value for the public. External actors could add their inputs in the production process and help public agencies to produce a bigger output for lower or same costs. For example, TfL decided to enable third parties to co-produce the information service about public transportation. Thanks to this decision, TfL was able to offer a bigger information service proposition combining its internal channels (TfL personnel, website, SMS service, screens, email etc.) with more than 700 smartphone applications developed by third parties with their resources (Deloitte, 2013). According to Hogge (2016), TfL's decision to enable co-production of third party apps rather than developing them in-house has contributed to saving 15£-42£m of public expenditure.

The main limitation of the manufacturing logic of production derives from the perception, rooted in most economic theories, that public agencies are the creator of value for the public. This value is embedded in public services or goods, which are later delivered to citizens who passively consume them. This perception derives from an incorrect interpretation of the term 'consumer' that comes from the Latin verb *consumere*, which was originally interpreted as 'to destroy'. This interpretation led public agencies to conceive of citizens as passive consumers of the value embedded in products and services, 'destroying' them through their utilisation. Later scholarship concluded that *consumere* means 'to accomplish, complete' (Ramírez, 1999). In fact, value is not produced and then transmitted to citizens through goods, but 'is latent in the subjective experience of each individual, a psychological destination that we call individual space' and 'is realised in the individual space, rather than created in the organisation space' (Zuboff and Maxmin 2002, p. 11). This later view, that is also present in public value literature (e.g. Norman 2007; Kelly, Mulgan, and Muers 2004), invites public agencies to refocus their attention from the output (e.g., number of arrests) to the outcome (e.g., citizens feel safe) (Osborne, Radnor and Nasi, 2013; Osborne, 2018). This change of focus represents a radical transformation because the focus on outcome invites public agencies to be more accountable for the effects generated by the production of public services on citizens' lives.

The service logic of value creation emerges as an alternative to the manufacturing logic (Lusch and Nambisan, 2015; Osborne, 2018). At the base of this alternative logic, value is the outcome and not an output of the production process (Normann and Ramírez, 1995; Osborne, Radnor and Strokosch, 2016). According to this alternative production logic, value is not the sum of inputs of the production process but instead, it is value-in-use co-created by citizens (Chandler and Vargo, 2011). Therefore, public agencies can create value not by maximising the output of public service production, but by

providing citizens the right resources and services to co-create value they need or expect. According to this logic, public agencies can only assemble a public value proposition to citizens that is constituted by public services or goods needed to facilitate the value creation process. Then, citizens would create value for themselves only when they actually use public services or goods to meet their needs (Korkman, 2006; Alford, 2009b; Benington, 2011).

The focus on outcome has led public agencies to not focus exclusively on the improvement of the input/output ratio, but also on the level of control granted over the value proposed to citizens (Norman, 2007; Alford and Hughes, 2008; Benington and Moore, 2011a). Public agencies have to ensure the creation of positive value for the public. Therefore, they have to control how the contributions of public and private actors to the public service proposition impact certain public interests when used by citizens. Not all public interests require the same level of control in all contexts. Often, public interests like public health and safety require a higher level of control over the production process than education or mobility, which are usually co-produced with external actors. In fact, open production configurations (e.g. crowdsourcing and opensourcing) often represent an opportunity for public agencies to increase the value proposition to citizens, but at the same time offer a lower level of control than closed production configurations (in-house, joined-up). Therefore, public agencies tend to choose the production configuration based on the most suitable level of control to achieve particular public interests. For example, TfL opted for an open production configuration to co-produce information service about public transportation. This type of service does not require a high level of control because the risk that third parties co-produce services that provide wrong information about the journey planning was low. TfL decided instead to adopt a closed production configuration to manage and sell Oyster cards directly. In fact, this type of service requires a higher control over the delivery because third parties could use card payments data to defraud citizens.

Hence, the adoption of ICTs-mediated co-production can help public agencies create more economic value. However, it is not always the most suitable mode of public service production to generate a public value proposition that can create public value when used by citizens. Nevertheless, public agencies are not free to decide how to configure the production of public services. As explained by the Strategic Triangle of Moore (1995), public agencies need to consider legal, political and operational aspects that affect the process of production configuration and the level of control over the public value creation process. The next section presents the second thesis

finding that contributed to expanding public management literature about public value, adding technology as an additional contextual dimension that can enable and constrain public production configuration and control over public value creation.

5.2.2 Public management literature contributions

The second contribution of this thesis invites readers to look *at how ICTs-mediated co-production of public services impacts public value creation according to the socio-technical perspective* (Cordella and Iannacci, 2010; Panagiotopoulos, Klievink and Cordella, 2019). Based on this perspective, technology represents the fourth dimension of the Strategic Triangle of Moore (1995) and can influence the process of negotiation of the production configuration and thus, affect the public value creation process. However, a modification of the Strategic Triangle is graphically difficult because technology is not a dimension that can be clearly distinguished from the other three. Technology embeds citizens' needs, political interests and regulations, and is deeply intertwined with all the organisational elements which compose operational capabilities (Lanzara, 2009).

The initial research proposition was that the adoption of ICTs which enable co-production on a large scale would have helped public agencies to acquire all the operational capabilities to produce services necessary to fully meet citizens' needs and create public value (Moore, 1995; Moore and Khagram, 2004; Benington and Moore, 2011a; Bryson *et al.*, 2017). The impact of ICTs on the public service production configuration is often assessed according to a technological deterministic perspective (Bellamy and Taylor, 1998; Layne and Lee, 2001). According to this perspective, public agencies determine the value added by e-governments systems to the production process by looking at their technical features. The adoption of e-government systems with more processing power, a higher speed of communication and greater storage capabilities will automatically improve efficiency and thus, generate more value for citizens. Hence, following this view, the adoption of e-government systems that offer the technical capabilities to enable co-production on a large scale can create more public value. However, e-government studies have revealed that technology is not a passive tool, and its influence on the public service production configuration cannot easily be predicted or generalised (Bonina and Cordella, 2009; Cordella and Willcocks, 2010; Scott, DeLone and Golden, 2016).

Technology embeds citizens' needs, political views, interests and regulations, and is deeply intertwined with all the organisational elements which compose operational capabilities (Lanzara, 2009). For example, SPID is a platform of Italian public administration that enables an ecosystem of selected identity providers to co-produce different identification service options. By adopting SPID, public agencies implicitly start identifying citizens according to the same security, cybersecurity and GDPR guidelines embedded in SPID's configuration. At the same time, thanks to the mediation of SPID, the Ministry of Interior can ensure a high level of control over identification services in all public agencies. In fact, SPID hides from public officials the logics or goals embedded to identify users, and forces them to perform only few specific tasks, leaving no opportunity to manipulate the process (Bovens and Zouridis, 2002; Kallinikos, 2005). Thus, the automatisation of certain steps of the identification process increases both the efficiency (no need to develop an in-house identification service) and the level of control public agencies have over the achievement of certain public value goals (e.g. anti-corruption, transparency, security) because it reduces at the minimum the discretionary power public officials have on the identification process. The level of control is a critical aspect of the public value creation process, because public agencies need to ensure they are creating value for the public (Benington and Moore, 2011a; Panagiotopoulos, Klievink and Cordella, 2019). Nevertheless, control over the public value creation process does not depend only on ICTs systems, but also on how public agencies have configured public service production (Lanzara, 2009; Cordella and Iannacci, 2010).

As became evident from the hypothetical cases of production configuration discussed in the Italian public administration study, the level of control mediated by ICTs over public value creation is not fixed, but depends on continuous interactions between the organisational layer (constituted by regulations, policies, and protocols etc.) and the technological layer (Helbig, Ramón Gil-García and Ferro, 2009). The two layers are deeply intertwined, and any change in one leads to changes in the other, modifying the overall production configuration (Luna-Reyes *et al.*, 2005; Heeks and Bailur, 2007; Lanzara, 2009). The production configuration continuously mutates because the creation of public value is negotiated according to what citizens want, the different interests, the resources available and what e-government systems can support (e.g., Cordella & Iannacci, 2010; Janssena et al., 2009). Based on how public agencies reshape the public service production configuration, control over the production process can change. Therefore, a public agency can adopt identical e-government systems with embedded logics, regulations, etc., but can change the initial production

configuration to pursue other interests. For example, the authorising environment changed after a new hypothetical e-government reform allowed all Italian public agencies to identify citizens through SPID only for highly sensitive public services (e.g. accessing healthcare records) while for other digital services (e.g. renewal of the mobility pass), agencies remained free to develop in-house solutions or to use other identification services offered by companies like Google or Facebook. In this new context, public agencies continue to use the same e-government system SPID but in combination with other identity platforms managed by third parties, which mediate the identification service according to different logics. Therefore, the new production configuration offers lower control over the identification service than the original configuration when the production process of all public services was mediated only by SPID.

Moreover, past public service production configurations can affect the level of control over public value creation. Public agencies usually do not configure the production of public services from a tabula rasa but rather, based on pre-existing regulations, political interests, organisational resources and e-government systems. While production configurations that do not involve technology can be changed, the one mediated by e-government system often might remain frozen in ICTs systems' architecture (Kallinikos, 2004a; Lanzara, 2009). Therefore, an e-government system designed according to past political decisions that no longer respond to citizens' needs can still condition existing production configurations and the level of control over the public value delivered to citizens. The e-health systems of many countries represent a typical and tangible example of how past e-government systems can lock in public service production changes. Most of the existing e-health systems were initially designed as silos. Today, this design represents the main barrier to the configuration of a more centralised and interoperable healthcare service (France, Taroni and Donatini, 2005; Robertson *et al.*, 2011). Therefore, e-government systems are not neutral operational resources, but represent an enabler and constrainer of public services production configuration, which can influence achieving the desired level of control over the public value creation process.

Furthermore, according to Bozeman (2007), public value is created when a set of public values is simultaneously met. Therefore, the level of control mediated by technology to create public value should be suitable to reach all public interests involved. The third contribution of the thesis to public management and e-government literature is that t*o create public value, public agencies should choose the ICTs-mediated production configuration that ensures a suitable level of control over*

values that belong to multiple policy domains. In fact, public agencies usually tend to choose the ICTs-mediated co-production and other production configurations without considering negative externalities on interests served by other public agencies (O'Flynn, 2007; Alford and Hughes, 2008). However, public agencies create public value when they choose a production configuration that ensures a suitable level of control over all the public values that might be involved in public service production (Bozeman, 2007; Alford and O'Flynn, 2009). Public agencies should overcome the siloed view of value creation typical of the corporate field, and should instead guarantee a sufficient level of control over the effects on the policy domains served by other public agencies. For example, suppose SPID's identity providers do not offer a registration mode accessible to people with visual handicaps. In that case, all public agencies that adopt SPID risks provide a safe and efficient value proposition, but also discriminate against a certain category of citizens. Therefore, the adoption of technology is not neutral, and affects the overall public value creation.

Technology represents an enabler, a medium of control, and a constrainer over public value creation (Cordella and Iannacci, 2010). However, not all ICTs systems mediate the production process in the same way. Digital platforms more than other ICTs systems seem to be suitable for creating public value because they allow pubic agencies to easily reconfigure the production process, co-produce public service with third parties, and enact a high level of control (O'Reilly, 2011; Brown *et al.*, 2017). The next section presents the third contribution of the thesis that explains that GaaP is constituted by different platforms rather than by one. Therefore, GaaP risks to decrease the level of control over the public value creation process.

5.2.3 Information systems contribution

The third thesis contribution is that *GaaP's architecture is not constituted only by a single platform, but rather by several platforms and ecosystems.* This finding, which represents a contribution to e-government and information system literature, has unveiled that the existence of multiple platforms and ecosystems decreases control over value creation and potentially increases negative externalities. Looking at GaaP literature (O'Reilly, 2011; Janssen and Estevez, 2013; Brown *et al.*, 2017) and at the preliminary TfL data, the initial research proposition was that GaaP configuration could provide the operational capabilities public agencies require to satisfy citizens' needs and to control the public value creation process. Moreover, based on information systems literature (De Reuver, Sørensen and Basole, 2018; Jacobides, Cennamo and Gawer, 2018; Plantin *et al.*, 2018), GaaP as a digital platform can also better control how third parties co-produce public services and consequently address public value creation.

According to the socio-technical view, digital platforms are not neutral. Their impact on the value creation process cannot be predetermined by looking at their technical characteristics because they are constituted by organisational or technical layers intertwined together (Tilson, Sørensen and Lyytinen, 2012). Each digital platform embeds organisational components such as rules, goals, and business models, which belong to the organisational context where the platform is situated. As a consequence, the process of plugging two or more platforms to configure the production of public service is not straightforward, but the result of socio-technical negotiations. Platforms embed different organisational and technical properties that need to be aligned and combined to interoperate (Tiwana, Konsynski and Bush, 2010; Ghazawneh and Henfridsson, 2015). The process of integration is mediated through some resources, such as APIs and SDKs, defined as boundary resources (Eaton *et al.*, 2015). The platform owner inscribes in APIs and SDKs the rules, goals, and protocols that regulate the interaction with other platforms. Therefore, APIs are not simply technical standards but also an instrument of control about how the platform interoperates with other platforms or ICTs systems. The public agency or company that owns a platform can influence the current and future functioning of other platforms or ICTs connected to its APIs by changing how the platform core service works or by modifying related regulations or technical standards. For example, pagoPA could suddenly decide to change how the payment service works by accepting only debit cards from few selected payment providers to increase its reliability. This decision would also affect the overall production configuration and the public value creation process of public agencies that have adopted pagoPA as a payment platform. They will be unable to accept payments from citizens with debit cards from service providers that pagoPA considers not reliable. Therefore, the GaaP modular architecture helps public agencies to assemble production configuration to produce services able to create public value. Nevertheless, production configuration based on multiple platforms is also dependent on the technical and organisational changes of policies, interest, logic etc. embedded in the platforms. Thus, a production configuration constituted by several platforms can reduce the level of control over the public value creation.

The platform's APIs can also connect and enable modules developed by third parties that add functionalities to the core platform service. To co-produce services, external actors need to adapt and align their modules to the APIs and SDKs technical and organisational requirements; otherwise, they would not be able to connect to the platforms and co-produce products and services (Eaton *et al.*, 2015). Therefore, the platform owner can affect the platform's generativity by modifying

boundary resources (Henfridsson and Bygstad, 2013). If the APIs and SDKs' requirements are too strict and offer only limited access to data, the level of co-production of services will be weak. Differently, more open and less regulated APIs will facilitate co-production of services. Hence, APIs enable public and private organisations to govern a platform's generativity and enact the desired level of control over co-production of services (De Reuver, Sørensen and Basole, 2018; Jacobides, Cennamo and Gawer, 2018; Plantin *et al.*, 2018). The problem is that public agencies have limited control capabilities over wide ecosystems and do not know how third parties could use that data. Properties of data are not fixed but are negotiated and arranged by those actors that use digital platforms (Kallinikos, Aaltonen and Marton, 2010). Within the technical and regulatory boundaries mediated through the platform's APIs, external actors are free to co-produce any service and pursue any goal. For example, as discussed in the Italian case, if the Ministry of Health would release real-time data about public hospitals' waiting lists to enable third parties to co-produce a mobile application, it could indicate where citizens should have a medical check. The inability to predict all the negative effects related to the release of this data induced the Ministry of Health not to adopt a particular restriction. With no particular restrictions, certain private hospitals might use this data to dynamically change prices of their treatments based on public hospitals' waiting lists and to maximise their profits. If few private hospitals were to use this data, the Ministry of Health might be able to find out this harmful use of its data. However, suppose thousands of hospitals use this data to develop a set of different services. It becomes difficult for the Ministry of Health to control such a case if all actors are contributing positively to public value creation.

Therefore, GaaP as a 'platform of platforms' offers valuable operational capabilities to all public agencies to create public value. However, some criticalities might threaten public value creation. The Italian case revealed a mechanism of governance that mitigates the complexities of GaaP and helps public agencies configure production of services to meet all public interests to create public value. The next section discusses this mechanism and presents the overall contribution of the thesis.

5.2.4. Overall thesis contribution
The overall thesis contribution takes a comprehensive view of all the above findings to answer the main PhD research question, explaining that *the GaaP mediated co-production can create public value if public agencies orchestrate the public service production configuration to mitigate the complexities of the GaaP and public value creation.* This PhD research started under the assumption

that ICTs-mediated co-production could provide the operational capabilities public administrations need to create public value. Later, during the research process, the ICTs system that enables co-production was defined as GaaP. The decision of countries such as the UK, Sweden or Italy to develop e-government systems based on the GaaP's characteristics has shown the diffused interests of many public administrations to develop e-government systems based on digital platforms. Hence, the study has mainly focused on how GaaP mediates operational capabilities that public agencies use to configure the production of public services to create public value. Based on literature about platforms (De Reuver, Sørensen and Basole, 2018; Jacobides, Cennamo and Gawer, 2018; Plantin *et al.*, 2018) and on what emerged from the TfL case, the primary assumption was that GaaP could help public agencies to create positive value for the public. However, the Italian public administration study demonstrated that several platforms constitute the GaaP e-government systems.

Therefore, the public service production process is mediated by many platforms combined together. Each digital platform embeds the political interests, logics, values, and regulations that affect the public value creation process (Antonio and Francesco, 2012). The platform's owner can change the platform's design to meet new interests and consequently affect all the other public agencies that have adopted that same platform as part of their production process. Moreover, digital platforms often enable ecosystems populated by services and products developed by third parties. Each public agency tends to govern its ecosystem to ensure that public and private actors serve its policy domains. Thus, the existence of multiple ecosystems governed by different public agencies decreases control over value creation and potentially increases the creation of negative externalities (Hanseth and Lyytinen, 2008). Hence, third parties might intentionally or unintentionally co-produce services that create negative externalities in other policy domains served by other ecosystems.

The possibility to create negative public value depends on the level of control over the final outcome (Moore, 1995; Luke, 1998; Domberger and Fernandez, 1999; Entwistle and Martin, 2005; Prebble, 2012). The adoption of GaaP can cause a reduction of control over the production process and raise the risk for public agencies of creating negative public value. Therefore, GaaP mediated production and co-production can represent a threat to the creation of public value. However, the Italian case demonstrated a governance mechanism defined as public value orchestration. Public value orchestration entails finding the right technological and organisational configuration to produce public services able to ensure a suitable level of control over public value creation. Depending on

how public service production is configured, the mediation of GaaP can reinforce or address some values instead of others. Hence, the level of control offered by the GaaP is not fixed but is variable and is the result of situated negotiations between the technological and organisational layers. Following the process indicated in the Strategic Triangle of Moore (1995), public agencies first set public value goals, then assess all the interests involved, and finally assemble the production process with the available operational resources which, in the case of GaaP, will be likely mediated by digital platforms offered by other public agencies. This process is continuous and leads public agencies to orchestrate public value in two phases: the ex-ante production and ex-post production phases. The process of orchestration is enacted horizontally and vertically in both phases. The horizontal public value orchestration consists of managing the interoperability with other platforms by disassembling and reassembling the public service production configuration to meet all public interests and to create public value. The vertical public value orchestration consists of modifying how public agencies or external actors can use the platform. This last form of orchestration deals mainly with the tension between openness and control of the public value creation process (Boudreau, 2010). The more open the production process, the bigger the public value proposition, but the lower the control over the final outcome.

In the horizontal public value orchestration case, public agencies orchestrate public value by connecting or disconnecting their systems with other platforms' APIs to assemble or disassemble services or functionalities of the production configuration. However, as previously discussed, connection to a platform through an API is not straightforward. If external or public actors do not accept the technical and legal rules of APIs, they would not be able to use the platform and co-produce services (Eaton *et al.*, 2015). Horizontal public value orchestration is enacted ex-ante and ex-post the production process. The mobility example discussed in the Italian case can clarify these two phases. A local mobility agency aims to improve public transportation service by digitalising the entire mobility service according to the principles of Mobility as a Service (MaaS). After reviewing all the interests involved, the ex-ante orchestration starts when the public agency assembles the two platforms to configure the mobility service: OpenTrasporti and pagoPA. The platform Open Trasporti, owned by the Ministry of Transportation, collects data from mobility companies and then provides them to applications like Moovit or CityMapper, which help citizens plan their journeys. Instead, the platform pagoPA, owned by AgID, offers the same payment system for all mobility providers and applications. Thanks to this production configuration, the local mobility agency can

provide a more efficient and integrated mobility service. Citizens can use any mobility app, plan their multimodal journeys and pay a single price for a multimodal trip.

The ex-post phase of public value orchestration emerges when public agencies are already producing a service but need to reconfigure production and then modify the production process to ensure proper control over the achievement of a new public interest. For example, for security reasons, the Ministry of Interior asks all mobility companies to identify their passengers to reduce the risk of a terrorist attack. Therefore, the local mobility agency has to add two additional platforms (CIE and SPID) to the original production configuration to identify citizens when they book a trip through any mobility app. The new configuration meets the new public interest. However, the production will likely be orchestrated again because this production configuration does not allow access to mobility service to those people who cannot have SPID and CIE, such as immigrants or tourists. The rules embedded in the design of CIE and SPID platforms then negatively affect mobility service production, which is not universal anymore by being restricted to Italian citizens only. This new configuration will likely generate negative value for the public and lead to other production configuration changes. In fact, ex-post public value orchestration is continuous because public interests change (e.g. security becomes a priority) and digital platforms mediate their contribution according to logic embedded by their owners (e.g. by law, CIE and SPID are only for Italians).

In the vertical public value orchestration case, public agencies that own a digital platform enact control over public value creation through APIs and SDK, which set the rules and the boundaries of how public agencies or third parties can use a digital platform's core service (Plantin *et al.*, 2018). Once public value goals and all the public interests are identified, public agencies design the APIs and terms and conditions that mediate the services' utilisation. An example of ex-ante vertical public value orchestration is the TfL's API about bus stops. TfL designed this API to provide list of the locations and names of all the bus stops, and combined it with terms and conditions which regulated how third parties have to use the data and the TfL brand. The design and regulations limit the co-production of services within certain boundaries. However, APIs can also be used to enable ex-post vertical public value orchestration. After the API is published and is already used by several actors, public agencies can modify the boundaries within which external actors co-produce services to meet certain public interests and create public value. Ex-post orchestration can consist of modifying the API's design and the terms and conditions or, in the most extreme case, to block APIs' access. For example, in case of a blizzard, the Ministry of Transportation could block the APIs of all scooter

sharing and bike-sharing services in its ecosystems to protect citizens' safety. In this case, the Ministry of Transportation would orchestrate public value by modifying the flux of data that enables the booking of these services to improve public safety, which is considered an interest superior to mobility. However, in this case, public value orchestration is not straightforward because the utilisation of APIs is regulated by formal channels such as contracts or organisational arrangements such as governance commission that can delay or present obstacles to ex-post orchestration. As shown by the Italian case, public value orchestration is also mediated through informal institutional channels. Public agencies can informally ask other public agencies to close or limit certain APIs' access because their interests might be damaged.

Finally, GaaP mediated co-production can create public value if it is combined with the adoption of public value orchestration mechanisms. The public value orchestration mechanism unveils the need of a dedicated model of governance to address the creation of public value mediated by GaaP. Thus, this PhD research opens a gap in literature, showing the need to research a governance model dedicated for GaaP.

5.3. Research Agenda

This PhD research has found that the GaaP technical and organisational arrangement offers the operational capabilities public administration requires to create public value. However, this study has also unveiled that GaaP is a platform of platforms. This configuration generates some complexities that reduce control over the production process and risk to create negative value for the public. It is, therefore, necessary to develop a dedicated governance model to mitigate these complexities and create public value. The term governance etymologically derives from a Greek verb (*kubernao*) and means 'to steer' (Groves, 1844). Any governance model should help the government to address public service production to create public value through an articulation of formal and informal governance structures and mechanisms that influence public and private actors' behaviour (Stoker, 1998; Fukuyama, 2013; Gorwa, 2019). In the Italian case emerged public value orchestration governance mechanism. However, it is not clear if public value orchestration alone is sufficient to govern GaaP complexities and prompt public administration and civil society to create public value.

Following the perspectives of Tiwana, Konsynski, and Bush (2010) about platform' governance, three different and complementary governance aspects should be studied to understand the GaaP governance model: 1) decision rights; 2) control; 3) platforms ownerships.

In an organisation based on multiple platforms and ecosystems is particularly important to individuate who has the right to decide what. Based on the position and power of the actors that make decisions, the governance system can be centralised or decentralised. Centralised GaaP governance would imply the existence of a single authority that decides the evolution and governance of all the platforms (Boudreau and Hagiu, 2008; Tiwana, Konsynski and Bush, 2010). This type of governance is ideal because it ensures high control over all production of public services, but cannot manage a system composed of several platforms and ecosystems. In the Italian case, AgID is the central authority that supervises, coordinates and regulates the process of digitalisation of the country to create public value. Decentralised GaaP governance instead delegates governance to platform owners, who, as discussed in this research, should govern the production process by looking at all the public interests involved. The GaaP governance system will likely be a mixture of both perspectives. All public agencies would continue to govern the platform they own to create public value. But not only AgID but possibly a group of Independent Authorities would centrally monitor the public value creation process. Most of these independent authorities already exist to regulate certain policy domains such as 'market' and 'communication', but today they tend to monitor the non-digital world. However, in recent years, the Italian competition and antitrust authority (AGCM) has also started to regulate digital aspects of its policy domains as indicated by its investigation of Google's market behaviour [49].

Once the actors that govern GaaP are individuated, it is necessary to understand and explain the governance mechanisms they enact to ensure a suitable level of control over public value creation. Based on the Italian case and current literature, the assumption is that public agencies would govern public value creation mediated by GaaP through two main governance mechanisms discussed in literature. The first mechanism is public value orchestration, which has been widely discussed in the previous section and which is enacted by a public agency that acts as the coordinator of the orchestration process (Janssen and Estevez, 2013). The second mechanism of governance is public value choreography. This mechanism is known in information technology literature and refers to a collective, collaborative effort based on a shared process or regulations (zur Muehlen, Nickerson and Swenson, 2005; Singhal, Sakthivel and Raj, 2019). Choreography does not need a central coordinator. Given certain rules, each actor knows exactly how to behave to create value. This

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[49] https://www.agcm.it/media/comunicati-stampa/2020/10/A542

governance mechanism is particularly suitable to create public value when public agencies have no instrument to enact a suitable level of control over public value creation. For example, given the impossibility to control how different organisations manage private data on Internet Infrastructure, the European Union in 2018 provided clear requirements to all organisations about how to process personal data through the GDPR with the threat of enormous penalties for noncompliance. All organisations in the EU gradually started to configure the production of their services according to GDPR rules to behave according to the prescription of the European authorities (Almeida Teixeira, Mira da Silva and Pereira, 2019; Li, Yu and He, 2019).

The third governance aspect is the ownerships of platforms that constitute the GaaP configuration. Platform ownership depends on how the platforms and ecosystems are configured (Boudreau and Hagiu, 2009). The more open is the platform architecture, the higher is the power co-producers have over the platform owner. From the Italian case, it emerged that there are two types of platform ownership: single ownership and shared ownership (Eisenmann, Parker and Alstyne, 2006).

An example of single platform ownership is the ANPR owned and managed by the Ministry of Interior that produces the registry service delegating data entry tasks to a closed ecosystem of registry offices managed by local municipalities. In this case, the Ministry of Interior has high-level control over the production process and can therefore address service production and platform evolution autonomously. However, ownership of platforms like SPID can be more complex and mostly shared with external actors. For example, AgID regulates and officially owns the SPID platform; however, the majority of the identity service production process is co-produced by a restricted ecosystem of identity providers. The high level of involvement of the identity providers in the service production gives them the power to affect SPID governance and its evolution. For example, the pricing list for companies that want to use SPID as an identification system resulted from negotiations between Government and Identity providers. In the last two years, the Italian Government has attempted several times, with no success, to reform SPID governance by moving the majority of SPID production tasks under the complete or partial control of the Government, largely to mitigate against conflict with the CIE, which similarly offers digital identity.

Once the GaaP governance model's three characteristics are clarified, it is necessary to explain how the model of governance impacts public value creation. In the public value creation process described by the three dimensions of Moore's triangle (1995), the GaaP governance model would

mainly affect the authorising environment. However, as found in this research, technology represents an additional dimension that mediates all the dimensions of public value creation. According to the socio-technical perspective, GaaP governance would be embedded in the design of GaaP's platforms and directly affect production configuration (Cordella and Iannacci, 2010). As previously discussed, the design and regulation embedded in APIs and SDKs help public agencies to reach the desired level of control over the production process and to ensure public value creation (Eaton *et al.*, 2015). Nevertheless, once the governance structure is embedded in ICTs systems, it might remain frozen in ICTs' architecture and constrain possible governance changes (Kallinikos, 2004a; Lanzara, 2009). As a result, the governance model is often not created ex-novo but is negotiated within the existing forms of governance embedded in the GaaP's organisational and technical arrangement.

Further studies should explore and compare how other countries have conceptualised and configured GaaP. For example, in Italy, the GaaP architecture is based on platforms owned by public agencies, while countries like China are developing a hybrid architecture of GaaP based on multiple platforms developed by public agencies at different levels of government (Ma, Chung and Thorson, 2005) and on private platforms such as WeChat or Weibo (Medaglia and Zhu, 2017; Yang, 2017). The existence of a hybrid architecture of GaaP might complicate public value creation process because companies will gain control over some policy domains and the generativity of their ecosystems. Therefore, future research should reflect on the existence of different GaaP configurations, which might also imply an alternative governance model for the creation of public value.

The same PhD research question and research agenda can be extended to the corporate field. In fact, similarly to Italian public administration, some companies (e.g. Enel) have started a process of 'platformisation' that aims to build an ICTs architecture based on several platforms and ecosystems. These companies will also become 'platform of platforms' and the main assumption is that they will face the same complexities described in this research about GaaP. Moreover, many companies aim to become sustainable through the achievement of the UN development goals. Therefore, these companies will likely focus on creating economic value for shareholders and, at the same time, public value to meet the UN Development goals and other public interests.

5.4. Limitations

Despite the contributions of this thesis, some limitations remain. The socio-technical view of this study represents a theoretical limitation because it has restricted the research focus to a specific and situated context. The GaaP configuration is studied as a socio-technical system that is the result of the interaction between different and contextual socio, political, administrative and technological variables (Bostrom and Heinen, 1997). According to this perspective, in other countries, the GaaP configuration might be different. In fact, the different administrative, technical and socio-political characteristics of each country inevitably impact not only the configuration of GaaP (Heeks and Bailur, 2007), but also the mechanism of public value creation (O'Flynn, 2007; Crosby, 't Hart and Torfing, 2017). Therefore, the explanation of how GaaP impacts public value creation in Italy cannot be generalised to other contexts because the ways in which technical and social variables interact and impact the creation of public value might differ.

The second limitation is related to the adoption of a single case study approach. This research required the adoption of the single case study approach because the socio-political context of the case could not be detached from the study of the impact of GaaP on public value creation (Yin, 2009). Moreover, compared with other contemporary examples of GaaP (Brown *et al.*, 2017), the Italian case study represents an extreme case of GaaP, which justifies the adoption of the single case study approach but also represents a limitation (Yin, 2009; Baškarada, 2014). In fact, differently from other countries, Italian public administration has found itself in a privileged position to adopt GaaP because some of the fundamental digital platforms and ecosystems were already diffused and formed a clear modular structure for e-government services. The development of multiple ecosystems made evident the willingness of Italian public administration to co-produce services with third parties on a large scale and revealed the complexities related to the existence of various ecosystems. However, as a single case study, the Italian case represents also a limitation because the findings do not have statistical validity and cannot be generalised to the universe. Nevertheless, the findings can be analytically generalised because they represent theoretical propositions (Yin, 2009) which explain the mechanism of the phenomenon and create an opportunity for future research.

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