CONCEPTUALIZING PERFORMANCE MANAGEMENT SYSTEMS IN PUBLIC NETWORKS

Abstract

This study explores the role of Performance Management Systems (PMSs) in public networks by investigating the dynamics of interactions between the network PMS designed to manage and control the whole network and organisational PMSs of network actors already in place before the introduction of the whole system. We carried out a longitudinal case study on a public transport network in in Italy, exploring the relationship between the network PMS and previous practices already in use in individual organisations inside the network. Adopting the theoretical lens of complexity theory, results highlight the difficulties encountered by network actors when using the network PMS and the evolution of this whole system when clashed with organisational PMSs. To overcome the limitations, actors progressively updated their organisational PMS, which in turns influences the whole network PMS. These two systems co-evolved in a self-autonomous manner giving rise to a multi-layered network PMS. This empirical trajectory, triangulated with theoretical insights, supported the conceptualization of PMS for public networks.

1. Introduction

Performance Management Systems (PMSs) has been receiving increasing attention within the field of public network studies (Provan and Milward 2001; Kenis and Provan 2009; Cristofoli *et al.* 2012; Lacey *et al.* 2012). Practitioners and academics (Mandell 1999; Provan *et al.* 2007; McGuire and Agranoff 2011) claim that networks provide a possible answer to what are known as 'wicked' problems (Keast *et al.* 2004), such as environmental and resource governance (Kickert *et al.* 1997), and that they can also result in more joint-up services in sectors suffering from fragmentation, such as transport, health care or cultural heritage (Provan and Milward 1995; Arnaboldi and Spiller 2011; Sørensen and Longva 2011).

With the diffusion of public networks, scholars have been interested in understanding whether networks really work, prompting studies on performance measurement and management (e.g. Provan and Milward 2001; Turrini *et al.* 2010; Bowman and Parsons 2013; Vasavada 2013). These studies acknowledged that the PMS has an important role in supporting network management and evaluation (Provan and Milward 2001; Barretta and Busco 2011; McGuire and Agranoff 2011), by monitoring the ability of networks to achieve intended objectives, and direct the actors' actions accordingly. Most research has been on PMS technical design, with several studies addressing the definition of Key Performance Indicators (KPIs), to measure network effectiveness (e.g. Provan and Milward 2001; Kenis and Provan 2009; Turrini *et al.* 2010). More recent studies have started to concentrate on the use of a PMS, highlighting its contribution in shaping relationships and favouring co-operation between actors in public networks (Carlsson *et al.* 2011; Grafton *et al.* 2011; Marques *et al.* 2011).

These works provide several insights on how to design a network PMS to manage and control the whole network and its impact on actors coordination when turned into operational use. However, both these streams of research threat the network PMS as a standalone entity that is developed from the ground and it is tailored ad hoc to the new organisational arrangement of the network. Yet the implications of this network PMS on the already existent PMSs of organizational network actors has not been explored. This is an important gap in our understanding of public networks given that it is widely recognized that new practices, when implemented, clashed with already existent ones (Di Maggio and Powell 1983).

This work explores network PMS not in isolation, but considering its embeddedness within the network of actors, each of them with its own organisational PMS. The objective of this study is to explore the dynamics of interaction between the network PMS and organisational PMS of network actors by addressing the following research questions: 1) how network actors use the network PMS;

2) how the organisational PMS of network actors is influenced by the network PMS; 3) how the network PMS is affected by the already existent organisational actors' PMS.
The theoretical perspective of complexity theory is here adopted to frame the relationship between network PMS and PMSs of organisational actors in the network. This theory contends that the development of the whole system (the network PMS) stems from the interactions of its parts (organisational PMSs) and it is particularly suitable to explore changes and dynamics of network PMS as a result of the complex interactions of the parts of the whole system.
We empirically investigated these questions within the context of a public transport network in Italy. A longitudinal case study was carried out between 2009 and 2013, following the pathway of the network and the evolving role of PMSs (the whole and its parts). This case was of particular interest for the importance given to the network PMS by both legislation and Regional Government, which was in charge of implementing controlling and regulating the network.
Results evidence the complex dynamics between the network PMS and organisational PMSs of network actors. Both these systems, when clashing, co-evolve in a self-organised manner giving rise to a layered PMS, which comprises both previous organisational PMSs and the newly introduced network PMS. This layered system provides several implications for both academics and practitioners interested in measuring and controlling public networks. To illustrate our argument, the paper is structured as follows. The next section analyses previous literature on PMS in public networks, highlighting current achievements and existing gaps. Section three introduces the framework of complexity theory identifying the relevant dimensions of analysis. Section four describes the methodology of analysis, followed by results, which explore how network PMS and organisational PMS developed. Finally, the last part contains conclusions for both academic and practitioners.

2. PMS in public networks: state of the art and limitations

This section presents extant literature on PMS in public networks. In this paper, we use the definition of public networks given by Agranoff (2007, p.2), who describe them as 'collaborative structures that bring together representatives from public agencies and non-governmental organizations to address problems of common concern that accrue value to managers/specialists, their participating organizations, and their networks' (Agranoff 2007, p.2). Public networks are also called action networks (Agranoff 2007) or service delivery networks (Provan *et al.* 2007). Following this definition, informal networks and policy networks (Klijn and Koppenjian 2000) are not within the boundary of our study.

Previous literature on PMS in public networks can be analysed at two different levels: studies that focus on designing network PMS and studies on the role of PMS in these networks.

The first stream of studies investigates the technical aspects of PMS. These studies, relying on the recognition that 'it is problematic to assess public management networks with the same "output/outcome"oriented aims as that of hierarchical organizations' (Agranoff and McGuire 2011, p.272), have been concerned with the identification of the best indicators to evaluate 'how good' the network is in delivering public services (Provan and Milward 2001; Kenis and Provan 2009; Provan and Lemaire 2012). Different metrics for assessing networks structure and outcome have been proposed (Provan and Sebastian 1998; Provan and Milward 2001; Provan and Sydow 2008; Kenis and Provan 2009; Turrini *et al.* 2010) giving rise to a useful debate on the choice of the most appropriate criteria for measuring networks (Kenis and Provan 2009), and highlighting the importance of adopting multiple parameters in order to account for the vast number of network actors and their many interests (Klijn and Koppenjian 2000; Provan and Milward 2001). In recent years authors started investigating the determinants of network effectiveness, expanding PMS studies to include antecedent factors. It has been recognized that endogenous factors, such as network structure, management strategies or behavioural skills, influence network results (Provan and Milward 1995; Provan and Sebastian, 1998; Klijn *et al.* 2010; Herranz 2010). A recent contribution by Kenis and Provan (2009) highlighted the importance of exogenous factors, above all type of inception, governance and evolution stage, in shaping network performance. These studies have provided a deep knowledge on how to define key performance indicators that suit at best with the network configuration. However, they do not consider if and how PMSs adopted by organisational actors in the network shape these new network measures and in turn how the network PMS influences already existent practices.

The second stream of works explores the role of PMS in networks. This area of research has come to the interest of academics in more recent years (Barretta and Busco 2011) providing some evidence on how the PMS is used inside the network. Studies in this field (Agyemang 2009; Bracci and Llewellyn 2012; Marques *et. al.* 2011) emphasize the difficulties that single organizations have in being responsible and accountable for at network level, where they have no direct control over other actors, but are instead dependent on them for providing services. These studies highlighted the importance of leveraging on both formal and informal controls (Marques *et al.* 2011; Grafton *et al.* 2011) to address problems in co-operation (Johansson and Siverbo 2011), to influence working practices (Carlsson *et al.* 2011) and to co-ordinate network actors (Marques *et al.* 2011). Influence and persuasion are seen as central, but they are also supported effectively through alternative measures, such as indicators assessing inter-organizational relationships (Agyemang 2009) and

narratives describing complex interactions (Bracci and Llewellyn 2012). This second stream of the literature emphasises problems when using PMS in networks, focusing either on the measurement system of the whole network or on implications for individual organisation. Yet the two types of PMS, the network PMS and organisational PMS are always threated as a separated topic, neglecting their reciprocal influence when turned into operational use. This level of neglect on the dynamic interactions between the network PMS and organisational PMSs is an important gap given that it is acknowledged that new practices when introduced clashed with past practices already in place.
This paper aims at empirically investigating micro and macro dynamics of PMS in networks, exploring how a network PMS designed to manage and control the whole network influences and is influenced by past practices already in use by other network actors. Specifically, the following research questions are addressed: how network actors use the network PMS; how the organisational PMS of network actors is influenced by the network PMS; how the network PMS is affected by the already existent organisational actors' PMS.

3. Framework of analysis

In order to answer the question on the dynamics of interaction between the network PMS and organisational PMS, the theoretical lens of complexity theory is adopted. Complexity theory is based on the idea that the whole system is more than the sum of its components and its development stems from the interaction of the parts. This theory comes from natural science, but it has been adopted to study organisational dynamics (e.g. Grobman, 2005) and it has also been recognised fruitful in public administration research (Klijn, 2008; Teisman and Klijn, 2008; Christensen and Lægreid, 2011; Aagaard, 2012). Klijn (2008), when discussing the importance of complexity theory for studying public administration, identified three distinctive elements, which will be here adopted to interpret the findings: dynamics, self-organisation and co-evolution.
The first concept of *dynamics* refers to the unpredictability of complex systems. The whole and its parts do not follow a linear path, nor they maintain the equilibrium as it is. On the contrary, complex systems are characterised by unstable equilibriums and non linear dynamics, which can lead to what is often called edge of chaos (Lissak, 1999). At this point, the system oscillates between a zone of order and chaos. This idea of dynamics of instability rather than stability is not new for studying PMS. Thrane (2007) for example, defined management accounting change in an inter-organisational system as a schizophrenic and non-linear path characterized by unstable oscillations between different statuses of equilibrium. Accordingly, network PMS is also expected to be characterised by complex dynamics of instability and disorder.

The second concept of *self-organisation* focuses on the spontaneous emergence of new order. Given the unpredictability and non linear dynamics of complex systems, they autonomously generate new structures. This idea of self-organising systems is often discussed in studies on the governance of systems (e.g. White, 2001; Wagenaar, 2007), which acknowledged the prevalence of games and the emergence of non controlled behaviours to guide network decisions. In a similar manner, the network PMS, when interacting with its parts of organisational PMSs can favour its autonomous self-organisation.

The third concept of complexity theory is the idea of *co-evolution* of the whole system, which is dependent on the evolution of its part. This idea is particularly suitable to explore the evolution of the network PMS. The parts of the whole (i.e. organisational PMSs) are independent systems that influence and evolve with the whole PMS. Following this perspective, the network PMS can be conceived as the whole system and organisational PMS as its part given that measures collected by network actors in their own PMSs allow to feed the whole network PMS. These two systems are not independent entities, but they reciprocally and dynamically influence with each other and co-evolve in a self-autonomous manner.

At the operational level instead, PMS has been analysed considering its design dimensions of unit of analysis, reporting and performance (Flamholtz, 1996, Malmi and Brown, 2008). The *unit of analysis* addresses the question of 'What does a PMS control?' This aspect considers the entity measured by performance indicators, usually a single organization or its sub-units.

Reporting is related to the documents used to exchange information within the network. It answers the question 'How does information flow within the network?', and includes both formal and informal reporting. This is important to understand the interconnections between network actors, because the exchange of data, documents, reports, or even simply impressions, shapes the way actors are connected with each other (Thrane 2007).

Performance dimension is associated with the question 'What are the relevant dimensions of analysis?' Traditional dimensions of analysis for public organizations are derived from the input-output model (Jackson and Palmer 1993; Pollanen 2005) and include efficiency, effectiveness and equity or fairness. This input-output model has been criticized for being limited when applied to networks (Provan and Milward 2001; Kenis and Provan 2009; McGuire and Agranoff 2011), and public network researchers have widely claimed that performance must be measured through multiple dimensions of analysis and so satisfy the different requirements of the many network actors (Provan and Milward 2001; Kenis and Provan 2009). This multidimensionality of performance measurements is then associated with the seminal problem of evaluating whether

networks are successful or not (McGuire and Agranoff 2011): if multiple criteria are used to evaluate networks, and different measurements give different results, it becomes difficult to assess whether the network is successful or not.

The adoption of complexity theory supports the exploration of how the operational dimensions of unit of analysis, reporting and performance measures that characterised network and organisational PMSs interact with each other.

4. Research methodology

A longitudinal case study of a public network involved in providing local public transport service was carried out between 2009 and 2013. A qualitative methodology was selected with the aim of exploring how actors use performance measurements in their natural settings in order to understand how people create and maintain their social worlds (Neuman 2000). The wealth of data behind the single case study (Yin 1994) means that it is possible to enter into the micro-dynamics of network actors and how they use the organisational PMS together with the macro-dynamics of the whole network PMS. Moreover, even a single case study for a network investigation implies collecting and analysing data from several organizations. The longitudinal analysis supported the investigation of the evolving dynamics between network PMS and organisational PMS, which emerged over time while the system was being used.

4.1 The transport network of the Calypso Region

The network being studied is the local public transport network for Calypso Region (anonymous name for confidentiality reasons), a Region[1] in the north of Italy. The network is composed of the Region itself, 11 Provinces, 11 Municipalities and 26 service providers, which include both public and private organizations. This network was imposed by Regional Government mandate in 2002 (Reg. Law 01/2002) and required the integration of local public transport services throughout the entire region. In practical terms, this meant that the service delivered in the provincial area had to be integrated with the service provided by the municipal area and those of the surrounding Provinces, ensuring the same pricing system and a co-ordinated timetable for movement between one local area and another. This regulation called for a mandated network, where transport providers were required to work together to deliver an integrated service, something that could be not achieved by the single actors.

[1]At the administrative level, Italy is divided into twenty Regions, which are further divided into Provinces. In turn, Provinces are composed of many Municipalities, which are the basic administrative division

For the purpose of the study, we identified three main categories of network actors: service regulators, service providers and service users. The service regulator is the manager and founder of the entire network, and is the body responsible for planning and controlling the service in its area of competence. The Calypso Region, Provinces and Municipalities enter into this category. The Region is also the leader of the whole network, it demanded the network to be set up, and its specific purpose is to integrate the local bus and train transport service across the whole regional area. Municipalities and Provinces have the same role of the region, but with competences on their specific local territorial area. Hence, given the same purpose, the Region, Provinces and Municipalities represent a unique category of actor.

Service providers include public and private organizations in charge of delivering the transport service at an operational level. This service is provided according to the service contracts between each operator and the local regulator, which set out obligations and requirements about service provision. Finally, users are not part of the service delivery network, but they are receivers of the service and represent the third category of network actors. Consumer advocacy groups are, however, actively involved in network activities (Agranoff and McGuire 2001; Provan and Milward 2001) and they form a specific category of actors, the 'service users'. Organized user associations, called AssoUtenti in the Capypso Region, and organized commuter associations are advocacy groups belonging to the network. Actors and their roles are summarised in Table 2.

TABLE 2 *Network actors*

Actor	**Description**	**Role**
Regulator	Calypso Region 11 Provinces 11 Municipalities	Network funding, planning and control
Service provider	26 Service providers	Operative service provision
Users	1 Organized user association (called AssoUtenti) 1 Organized commuter associations	Service receivers

4.2 Data collection and data analysis

Data have been collected longitudinally from a wide variety of sources, such as interviews, fact data from external and internal confidential reports and media commentaries. Interviews were carried out with local Government authorities, transport company managers and representatives of consumer advocacy groups. In total, 31 interviews took place over the period 2009 to 2013 involving all the categories of network actors (see Table 3).

TABLE 3 *Key Informants*

Network actor	**Name**	**Role of the interviewee**
Service Regulators	Calypso Region	1 Director of the Infrastructure and Mobility Department 1 Director of the Regional Public Transport Tariff Department
	Provincial Administration –A Town	1 Mobility Manager
	Provincial Administration –B Town	1 Mobility Manager
	Provincial Administration –C Town	1 Mobility Manager 1 Councillor for transport
	Municipal Administration –D Town	1 Mobility Manager
	Provincial Administration –D Town	1 Mobility Manager 1 Councillor for transport
	Provincial Administration –E Town	1 Mobility Manager
	Municipal Administration –E Town	1 Mobility Manager 1Town Councillor for Transport
Service Providers	–E Town Municipality– Municipality Transport Company	1 CFO 1 Business Analyst 1 Strategic planner 3 Operational managers
	–C Town Municipality – Transport Company	1 Operative director 1 CFO
	–C Town Province – Transport Company	1 General director 1 CFO 1 Operative director
	–E Town Province – Transport Company	1 General director
	–D Town Municipality - Transport Company	1 General director
	–A Town Province – Transport Company	1 General director 1 Operative director
	–D Town Province - Transport Company	1 General director
Users	AssoUtenti	1 Director 1 Vice-director
	Commuters	1 Spokesperson

The following issues were investigated: PMS objectives, types of key performance indicators, PMS documents, approach to collecting and using information, problems and opportunities associated with the use of performance measurements, with reference to both network PMS and organisational PMS. Interviews lasted on average one hour. They were transcribed and textually analysed to identify the interesting patterns. A summary was then sent to each interviewee for any further clarification and final approval.

Fact data include performance information about the quantity and the quality of the transport service provided contained in the official and unofficial reports by local entities, service providers and users of the service. These data were used to support discussions during interviews and to cross-validate findings from the other data sources.

Media commentaries are another data source, giving us the possibility of completing the findings with public opinion and, above all, establishing the service users' point of view, particularly useful

when looking at the third category of network actors. Media perspective has long been recognized as providing an illuminating vision of the city (Czarniawska 2002, p.67) and as a means of getting behind factual accounts of city life (Lapsley *et al.* 2010). We therefore retrieved articles from daily national and local newspapers, information from travel association websites, blogs and social media over the four-year period. Data from the interviews, fact sheets and media commentaries were useful to explore the PMS design and use of each actor in the network.

5. Results

Results are discussed within the theoretical framework of complexity theory, distinguishing between the whole system (the network PMS), its parts (the organisational PMS) and they reciprocal dynamics of self-autonomous co-evolution.

5.1 The whole system: network PMS

The network PMS for the public transport network was defined top-down by the regulator and then formally established with a regional law in 2002 (Reg. Law 01/02). The regulator designed alone this whole system and it was the unique actor accessing the entire system. The PMS was conceived in terms of unit of analysis, reporting and type of performance measurements (see Table 4).

TABLE 4 Network *PMS*

Element of PMS	***Empirical evidence***
Unit of analysis	Service as a whole level Network level Organizational level
Performance dimension	Service output Service demand Service quality Resources Actor integration
Reporting	Annual report: from service regulators to service administration Annual and quarterly reports: from providers to service regulators Mobility chart: from provider to users

The first element of the network PMS design concerns the unit of analysis. The PMS included performance at three different levels, aligned to what theoretically suggested by Provan and Milward (2001): service as a whole, network level and organizational level. The service as a whole level included information about the transport service delivered across the entire Regional area (the

whole network), obtained by assembling data from each part of the network (i.e. PMS of service providers). For example, data on transported passengers at this level of analysis referred to the sum of all data on transported passengers obtained from organisational PMS. The network level focused on the level of integration between providers, and includes data about the quantity and quality of the relationships between network actors, used to evaluate network relations (Kenis and Provan 2009). The organizational level referred instead to each single service provider, and included data about the service delivered by individual organizations.

The second element of network PMS design relates to performance dimensions. They mainly cover demand, output, quality of the transport service, resources required to provide the service and actors integration. Of these, the aspect stressed most was service quality, with regularity and customer satisfaction appearing several times in the official network documentation. Actor integration, on the contrary, does not focus directly on service aspects, but it looks at the ability of service providers to work together and so encourage service integration. Examples of Key Performance Indicators included in this perspective are the revenues from integrated tickets, investments in service interconnection and network personnel.

The third element of network PMS design is reporting, which consisted of formal mandatory documents that network actors prepare, exchange and publish under network PMS indications. Specifically, the reporting system is composed of six documents: the Regional annual report, annual and quarterly reports delivered by Provinces and Municipalities, annual, quarterly reports, and the mobility charts prepared by service providers.

This was the PMS of the whole system, which was claimed by the regulator to be complete providing the network stakeholders with all the information they need. Users received data from each service provider through the mobility chart; Provinces and Municipalities receive quarterly and annual reports from the service providers operating in their catchment area and the region has an overall view of the entire network structure.

In terms of use, the whole system was intended to support decision making as clarified in a formal document:

> ‘Data relating to customer satisfaction, efficiency, effectiveness and service quality are necessary to support Regional decisions on the distribution of financial resources between local regulators.’ (art. 15, Reg. Law 2002)

At the same time, the network PMS was adopted with motivational purposes to induce service providers to work collaboratively with other service providers in order to facilitate service integration. Following this idea, network KPIs were associated with a target value: the achievement

of this target was rewarded with a bonus, while the unattainable results led to a penalty. The design of the whole system and its initial purpose of use has dynamically evolved in a self-autonomous manner when it clashed with its parts: organisational PMSs.

5.2 The parts of the whole: organisational PMS

This section illustrates the parts of the whole, namely organisational PMS, which represented a cornerstone of the whole system by feeding the network PMS with organisational data. Indeed, while the whole system was introduced with the implementation of the transport network, organisational PMSs were already in place by each network actor. Different types of PMS have been identified moving from one network actor to another.

Transport providers had their own PMS, which varied widely passing from large to small organisations. All large companies had been using a PMS for decision-making and internal motivation before the regulator introduced the whole network PMS. Their organisational PMS was very narrow in terms of level of analysis, focusing on their own organisational level with a particular reference on the single route level, something neglected by the whole PMS. Moreover, performance dimensions included more detailed KPIs if compared with those collected by the network PMS. These indicators provided additional and more punctual information on the status of resources (bus or train and their environmental impact) and the reasons behind breakdown in services and customer complaints. Smaller providers, on the contrary, had no system in place when the regulator introduced the network PMS. Having no reporting system, they made decisions on an exception basis (Simons 1991): when something went wrong, appropriate information was collected. Both small and large providers were required by the previous law to provide external information on the transport service by annually publishing a mobility chart mainly focused on service quality.

Users, intended here as organised associations of users and commuters, had developed over time a long experience on PMS, although their role and their activities emerged spontaneously without being involved in formal meetings. These associations have developed over time a particular PMS based, not only on numbers (performance indicators), but also on narrative and images about the status of the transport service. Concerning narratives, AssoUtenti and commuter representatives of commuters used the description of problems encountered by everyday users to increase their knowledge about how local providers were performing. Users often take pictures of problems (conditions of bus-stops or vehicles) to illustrate their complaints. Complaints, experiences and

evidence about service performance are shared between users on social networks like Facebook or Twitter.
These organisational PMSs, those of transport providers and users, were influenced and influence the whole network PMS when introduced, leading to their self-autonomous co-evolution.

5.3 The system and its parts: dynamics of co-evolution

When the network PMS was introduced and become operational, it clashed with already existent organisational PMS of each network actor. Problems emerged when using these PMSs to support decision making and motivation, but the whole and its parts continue to co-exist and influenced with each other leading to an evolved and self-autonomous network PMS.
The whole system, when introduced, clashed with the PMS of large transport providers. These actors considered the network PMS to be 'too generic and not able to support internal decisions, given the high aggregation of performance information' (in one interviewee's words). They preferred to rely on their own reporting systems, as these provided, in the words of the largest company's controller, punctual and detailed information on each possible situation. He specified:

> 'Yesterday we were discussing data on accidents. In terms of the network PMS, we have only to provide data on the number of injured, while internally we also collect data on the specific transport mode, service down time and all the details on maintenance work. We then use this information to understand the reasons behind accidents and to identify actions to prevent them.' (Controller – E-Town, Municipal Transport Company)

Therefore, large transport providers collected data to feed the network PMS, but without in practice using this new PMS system to support decision making. On the contrary, the whole system had a significant impact on small transport providers. They had no structural organisational PMS in place and the network PMS was welcomed as a significant and structured approach to manage and control their own service.
Other dynamics were encountered when using the network PMS to motivate providers working collaboratively. The structure of the network system with KPIs and associated target was intended to motivate providers into sharing their data and so improve collaboration and service performance. However, targets were set too low in the network PMS and sanctions in practice were never assigned. The lack of financial sanctions meant less attention was paid to the network PMS, leading large providers to relegate it to the periphery of the management life. At the same time, target setting meant smaller providers were more willing to share information as reflected in the words of one smaller organizations:

> ‘In order to align my timetable to that of the other providers, I ask them [with reference to the larger bus provider] for their timetable for that specific transport node. It was important so that passengers on my bus-line arrive in time without losing their connection because our timetables do not match up. I have not received any timetable; the provider did not want to give it to me. In the end, I was forced to check the timetables on their website, and even then, they were out of date.’ (General Director – E-Town Province)

This quote highlights an emerging tension between the PMS of large and small providers because of the introduction of the network PMS. The whole PMS required to share data between network actors, but large providers with their articulated PMS did not want to share their data and their expertise with small providers who, in turn, tried to autonomously collect and develop performance measures they needed on the basis of the requirement of the whole system.
The network PMS clashed also with the informal PMS developed over the years by users. The absence of an external reporting for the whole transport network further pushed users to gain insights on their own. Furthermore, users criticised the lack of reliability of mobility charts published by transport providers. In this respect, a representative of commuters argued:

> ‘It seems that there is greater attention on certifying positive data than on providing reliable and trustable information.’ (Representative of commuter 1)

This criticism was mainly related to the recognition that formal reports on public transport were not audited, but self-certified by providers. With the purpose to have reliable data on public transport, users continued to develop their own informal PMS. Social networks, blogs and e-mails are the main channels used by the public to share data about the quality and accessibility of the transport service on a continuous basis, as clarified by the AssoUtenti representative:

> ‘Look (pointing at his laptop screen), these are 34 e-mails about today’s transport problems. Passengers tell us about the problems they face on the bus-line they use. These problems vary widely, from the air-conditioning not working or bad punctuality, to the poor condition of a bus-shelter. We track all this information and we then take action on the basis of the complaints we receive.’ (Representative of AssoUtenti)

These associations started also collecting data about other European cities, spending periods abroad. For example, two association representatives spent one month in Barcelona studying the local service, preparing a report on what the Italian transport system could learn from the Spanish one. Collecting data from external networks gave users a better understanding of the transport system and greater knowledge of the alternative solutions to the current organizational structure. KPIs on

punctuality, regularity, comfort and other measurements of effectiveness increased their knowledge about the actual state of the transport service. When users gained confidence in the PMS, they started using these informal reports with motivational purposes to show politicians and managers that they are capable of using and managing numbers. For example, comments on blogs or emails were used to give the regulator evidence about the low punctuality or reliability of some bus lines. Although the main problem is the limited statistical significance of this information, this informal PMS led to an evolution of the network PMS. In 2012, the regulator formal assigned users a role in the management of the whole PMS.

> 'We have introduced a Regional Assembly to control performance report prepared by consortia and service providers. Participants to the assembly include [....] one representative of the users association and one commuter representative.' (Regional Law 6/12)

This decision assigned users the role of auditing the collected data included in the whole PMS before their external publishing. These dynamics of interactions between the whole PMS and its parts led to a self-adaptation of the whole system, which evolved again after the emergence of problems associated with the use of the whole systems by the regulator itself. Some difficulties arose with reference to the decision-making role of the network PMS. The collection of data at three levels of analysis (service, network and organisation) was recognised not enough to support decision-making. To address this problem, the regulator moved gradually towards further data collection, inserting a more detailed and specific PMS in the initial whole system developed. This new data completed the whole network PMS with measurements from European transport networks, such as those of Paris, Barcelona and Berlin, as a benchmark for regional performance, providing better support to decision-making. For example, a comparison between regional data and data from other European cities, looking at the size of transport operators and their relative level of cost, helped the Region to propose a new organizational structure based on a lower number of catchment areas.

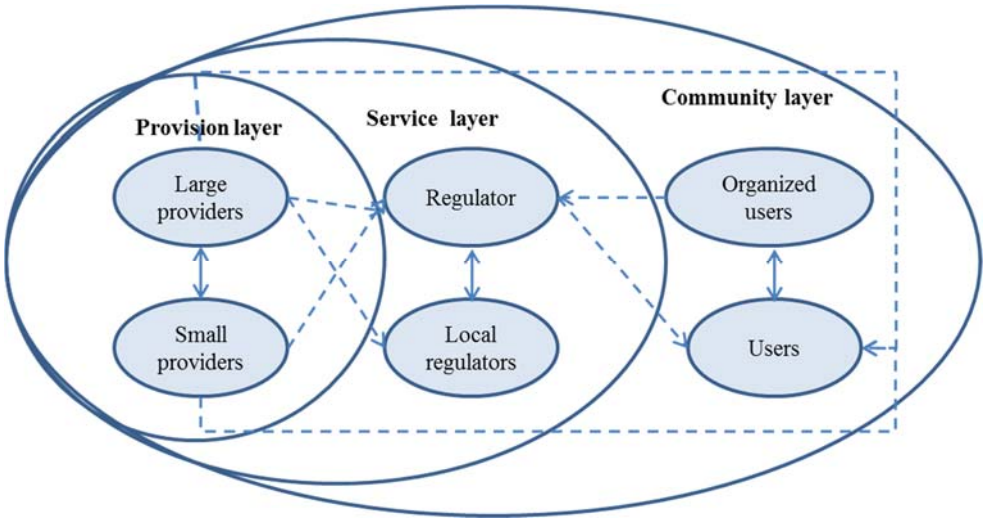
The investigation into how network actors use the network PMS and the evolution of the system overtime unveiled the co-existence of other organisational PMSs along with the network PMS, which overlap and reshape the initial network PMS. This dynamics of self-adaptation and co-evolution supported the conceptualization of what a network PMS is in practice.

5.4. Network PMS: a multi-layered complex system

The empirical investigation showed that the whole network PMS was unable to survive as a standalone entity, but it co-evolved in a self-autonomous way when turned into operational use and

clashed with its parts. The dynamics of co-evolution between the whole PMS and organisational PMS suggests that the network PMS is a complex system composed by different layers centred on network stakeholders and actors, which assembles information on the basis of stakeholders' needs. The layer is the tier of performance measurements collected and managed by each network stakeholder. Each layer has a reference type of actor with its associated PMS units of analysis, performance dimensions and reporting system. All together, these layers constitute a network PMS. Three main layers emerged from the empirical investigation: the *provision layer*, where the primary reference actors are providers; the *service layer*, which refers back to network regulators; and the *community layer*, targeting users and external stakeholders. Following claims about the importance for networks to establish a set of multilateral relationships (Provan and Lemaire 2012), the framework highlights inter- and intra-layer information exchanges, to address flows of formal and informal reporting. Figure 2 shows the graphical representation of the layers, where exchanges are highlighted with arrows (full lines for inter-layer and dotted lines for intra-layer exchanges).

FIGURE 2 *PMS layers*



The *provision layer* is the atomic layer in the network system, developed and managed by service providers. This layer has a two-folded aim: to support providers in managing their own services in a networked configuration and sending information to other layers to give them an overall view on the service. The performance dimensions relate to service output, quality, demand and resources. The unit of analysis is the single activity (the route), used to manage co-operation. This forms the basis of the intra-layer exchanges and is needed to build an integrated service measurement and management. Sharing data about each single route, often through informal reports, allows each provider to understand more about what the other providers are doing, with the aim of identifying

the shared resources that can lead to improvements in service provision. The organizational level is the unit of analysis for inter-layer exchanges. With these exchanges, regulators and users acquire detailed information about the organizations providing the services.

The *service layer* is the layer for the service regulator, represented in this empirical case by the Region and its delegation to Provinces and Municipalities. This system receives information from the provisions network layer and it is complemented with other elements related to the quantity and quality of interactions. The aim of this layer is to provide information on the service as a whole, with a particular focus on the characteristics of the service delivered by the network. Performance dimensions include service output quality, demand and resources collected by the provision layer, combined with the measured of integration between actors. They are used to measure whether network actors can work jointly. As far as the unit of analysis is concerned, it is wide in scope and includes the organizational level, the network level and the service as a whole level, providing the regulator with an extensive view of the network, encompassing both the providers and the entire network service delivered. It is important to ensure this broad perspective, given the role of the regulator in funding and managing the whole network. Here, also, there are intra-layer and inter-layer exchanges. Intra-layer exchanges are needed to align regulators (if more than one) and to complement and triangulate information on the provision layer. The information stemming from this process is particularly useful to understand and control the operations of the network and the capability of actors to interact with each other. The empirical case emphasized the importance of collecting data from several sources, with benchmark data coming from other networks and data arriving from service users supporting the decision-making process more effectively. If the network regulator is to make decisions, it has not only to understand how actors are behaving within the network, but also evaluate whether the current network service is satisfactory. The inclusion of benchmark data from other networks and evidence from users can be used to support decision-making. Inter-layer exchanges are included in the providers' and the users' layers to inform them about the performance of the network service.

The *community layer* is the broadest layer in the network system, and relates to users and external stakeholders. The purpose of this layer is to draw attention to crucial service aspects from the viewpoint of those who receive the service. In terms of unit of analysis, the community layer refers to the route level, the organization level, the network level, and the service as a whole level, which vary according to the specific interest of users or external stakeholders. This approach in focusing on the important aspects of the service is also used when selecting performance dimensions. These mainly cover service quality, but other dimensions can be included depending on the stakeholders' interests, such as equality, intended as access to the service by all the categories of users. The

community layer also contains inter and intra-layer exchanges. The aim of intra-layer exchanges is to promote the sharing of data between users, often using informal systems like social media. The reason behind the different types of data to be exchanged lies in the structure of this layer: the nodes at this level are individuals rather than organizations; although organized user associations interact with actors in other layers, data exchanges occur at individual level and the web is often the fastest and most favoured channel to support such interactions. Inter-layer exchanges, on the contrary, involve the network manager, therefore the regulator layer, and provide him with service performance aspects that are not satisfactorily. These types of report include both numbers and images, giving a clear indication of service performance.

These three layers help to provide the conceptualization of a network PMS, in which each layer is managed by different network actors, with different performance dimensions and reporting structures (Table 5), shedding new light on the structure of network PMS.

TABLE 5 The complex system of the *Network PMS*

PMS Layer	**PMS design**			
	Reference stakeholder	*Unit of analysis*	*Performance dimensions*	*Reporting*
Provision layer	• Service Providers	• Organizational level • Route level	• Service output • Service quality • Service demand • Resources	• Mobility charts • Annual and quarterly reports • Operational reports
Service layer	• Regulators	• Service as a whole level • Network level • Organizational level	• Service output • Service quality • Service demand • Resources • Integration between actors	• Benchmark reports • Annual and quarterly reports • Annual user reports
Community layer	• Users • External stakeholders	• Service as a whole level • Network level • Organizational level • Route level	• Service quality • Resources • Integration between actors	• Informal reports • Web pages/social networks

6. Conclusion

This paper investigated the dynamics of interaction between the network PMS and already existent organisational PMS developed by network actors and already in place before the introduction of the whole system. A public network of transport service delivery has been analysed adopting the theoretical lens of complexity theory. The case was particularly relevant, given the law's insistence

on developing not only an integrated service, but also a network PMS to manage and control the relative network.

The results revealed the co-existence of network PMS with organisational PMSs, both co-evolving in a self-autonomous manner on the basis of the specific problems encountered during the operational use. These findings suggest network PMS to be conceptualized as a complex and *multi-layered system*. The layers that compose the system are the tiers developed for each network actor, tailored around their individual need for information, and are based on their own original PMS, which was in place before the network was required in law.

This result expands the existing view on network evaluation where it is suggested that performance measurements should be developed at multiple levels (Provan and Milward 2001). This study suggests that, not only performance indicators should be developed at multiple levels, but also that the whole system does not exist in isolation, but it is strictly embedded with its parts forming a multi-layered system, where previous practices in use are complemented with the new network requirements and targeted around each network stakeholder's need. The co-existence of different layers for management control and, in particular, the presence of new practices and past systems is consistent with previous research on the implementation of PMSs in private and public organizations (Modell 2001). New systems, when implemented, clash with institutionalized ones (Di Maggio and Powell 1983), especially when imposed from the outside to comply with regulations or with superior hierarchical guidelines (e.g. parent company to subsidiaries). A decoupled situation ensues, with the new systems being applied only for sagacious conformity (Meyer and Rowan 1977). What is distinctive in networked contexts is that, besides all the issues present in organizational contexts (Modell 2001), there is a stronger obstacle to 'coupling' co-existing PMS layers - the desire of some actors to retain information within their organizational boundaries.

This issue about unshared information leads to the second contribution of the study: the evidence of a relationship between PMS use and power dynamics. Public network literature only partially tackled the concern of using information from the PMS (McGuire and Agranoff 2011), with the main focus on the evaluation of whether networks really work (Provan and Milward 2001). Empirical evidence showed that a PMS not only affects decision-making processes at various levels, but it also impacts on network power dynamics. The importance of knowledge as a source of power (Miller and Rose 1992) emerged from the unwillingness of service providers to share data, which is a way for actors to retain the greatest knowledge on their own activities, relationships and the networks as a whole. The approach to keep and create unshared information areas was thrown over by an unexpected actor: the user. Users, especially organized user associations, have

significant power in re-directing policies and actions (Rao *et al.* 2000; Harlow and Harp 2012), relying on crowd power and reputation (O'Connor 2008; Howe 2009). Their role as actors in the network was not initially recognized in the empirical case, and it gradually emerged during the study of PMS use. This investigation into the micro-aspects of the network (Provan and Lemaire 2012), led to an understanding of the actors' dynamics and how the user participation changed the balance of power between the organizational actors, setting the basis for the *wider network PMS*. The highlighted link between network power dynamics and performance information contributes to the current debate on power asymmetries (McGuire and Agranoff 2011), suggesting ways to overcome this barrier. Studies on this topic (e.g. Klijn and Skelcher 2007; Agranoff 2007), acknowledged that the dependence on others' resources and relationships can be overcome through bargaining and technical knowledge. This study provides evidence that sharing information inside the network, if supported by developed PMS skills, is a source of power that rests not only in the hands of agency managers, technical experts and staff managers (Agranoff 2007), but also in those of apparently less powerful actors, like service users.

This contribution underlines the importance of auditing data for and from network PMSs. The empirical analysis revealed that users started developing their system because they did not find the information provided by the available PMS to be reliable. Although service providers and regulators collect and publish a wide variety of data, they are not validated, or controlled, by external parties, leaving room for potential internal manipulation of information. This result adds the importance of auditing information to the extant literature on performance limitations in networks (McGuire and Agranoff 2011). To date, limitations associated to network performance have been concerned with the difficulty in selecting the appropriate performance criteria to account for the divergent interests of stakeholders (Provan and Milward 2001); looking for a balance between network process evaluation and network outcomes (Agranoff 2007); and evaluating network outcome (Kenis and Provan 2009). This study adds to this set of requirements, including the importance of verifying the reliability of information collected in order to support network processes and actors.

To conclude, this paper opened the black box of network PMS conceptualizing it as a multi-layered dynamic system, which is changed by actors pursuing more power within the network. This first empirical study opens up several future areas of research. First, there is potential for a similar investigation into PMS design and PMS use in a voluntary network, where actors are not forced from the outside to work together and, at different stages of network development, verify whether the multi-layered dynamics found here are also generated in different types of networks with different types of beginnings. Second, the relationship between actors' competences and PMS structures can be investigated further by analysing how actor-related dynamics evolve within the

contextual changes of the network PMS. Finally, the structure and the role of data from the users can be studied further, through a content analysis of the information users and other network actors obtain from social media, and by additional research into the preliminary conceptual framework proposed here.

References

Aagaard, P. 2012. 'The challenge of adaptive capacity in public organizations', *Public Management Review*, 14, 6, 731-746.

Agranoff, R. and M. McGuire. 2001. 'Big Questions in Public Network Management Research', *Journal of Public Administration Research and Theory*, 11, 3, 295–326.

Agranoff, R. 2007. *Managing Within Networks. Adding Value to Public Organizations*. Washington, DC: Georgetown Univ. Press.

Agyemang, G. 2009. 'Responsibility and accountability without direct control? Local education authorities and the seeking of influence in the UK schools sector', *Accounting, Auditing & Accountability Journal*, 22, 5, 762–788.

Arnaboldi, M. and N. Spiller. 2011. 'Actor Network theory and stakeholder collaboration: The Case of Cultural Districts', *Tourism Management*, 32, 3, 641–654.

Barretta, A., and C. Busco. 2011. 'Technologies of government in public sector's networks: In search of cooperation through management control innovations', *Management Accounting Research*, 22, 4, 211–219.

Behn, R. 2003. 'Why measure performance? Different purposes require different measures', *Public Administration Review*, 63, 5, 586–606.

Bowman, A. M. and B.M. Parsons. 2013. 'Making connections: Performance regimes and extreme events', *Public Administration Review*, 73, 1, 63–73.

Bracci, E. and S. Llewellyn. 2012. 'Accounting and accountability in an Italian social care provider: Contrasting people-changing with people-processing approaches', *Accounting, Auditing & Accountability Journal*, 25, 5, 806–834.

Carlsson Walle, M., K. Kraus and J. Lind. 2011. 'The interdependencies of intra- and inter-organizational controls and work practices - The case of domestic care of the elderly', *Management Accounting Research*, 22, 4, 313–329.

Christensen, T. and Lægreid, P. 2011. 'Complexity and Hybrid Public Administration—Theoretical and Empirical Challenges', *Public Organization Review*, 11, 4, 407-423.

Cristofoli, D., J. Markovic, and M. Meneguzzo. 2012. 'Governance, management and performance in public networks: how to be successful in shared-governance networks', *Journal of Management and Governance*, DOI 10.1007/s10997-012-9237-2.

Czarniawska, B. 2002. *A Tale of Three Cities*, Oxford University Press: Oxford.

DiMaggio, P.J. and W.W. Powell. 1983. ‘The iron cage revisited: institutional isomorphism and collective rationality in organizational fields’, *American Sociological Review*, 48, 2,147–160.

Flamholtz, E. 1996. ‘Effective organizational control: a framework, implications and applications’, *European Management Journal*, 14, 6, 596–611.

Grafton, J., M.A. Abernethy and A.M. Lillis. 2011. ‘Organisational design choices in response to public sector reforms: A case study of mandated hospital networks’, *Management Accounting Research*, 22, 12, 242–268.

Grobman, G.M. 2005. ‘Complexity theory: a new way to look at organizational change’, *Public Administration Quarterly*, 29, 3/4, 350-382.

Harlow, S. and D. Harp. 2012. ‘Collective action on the Web: A cross-cultural study of social networking sites and online and offline activism in the United States and Latin America’, *Information, Communication and Society*, 15, 2, 196–216.

Herranz, J. 2010. ‘Multilevel performance indicators for multisectoral networks and management’, *The American Review of Public Administration*, 40, 4, 445–460.

Howe, J. 2009. *Crowdsourcing: Why the Power of the Crowd Is Driving the Future of Business*, Three Rivers Press: New York.

Jackson, P.M. and B. Palmer. 1993. ‘Developing performance monitoring in public sector organizations’, *The Management Centre*, University of Leicester, 1-35.

Johansson, T. and S. Siverbo. 2011. ‘Governing cooperation hazards of outsourced municipal low contractibility transactions: An exploratory configuration approach’, *Management Accounting Research*, 22, 4, 292–312.

Keast, R., M.P. Mandell, K. Brown and G. Woolcock. 2004. ‘Network Structures: Working Differently and Changing Expectations’, *Public Administration Review*, 64, 3, 363–371.

Kenis, P. and K.G. Provan. 2009. ‘Towards an exogenous theory of public network performance’, *Public Administration*, 87, 3, 440–456.

Kickert, W. J. M., E.H. Klijn and J.F.M. Koppenjan (eds). 1997. *Managing Complex Networks*. London: Sage.

Klijn, E. H. and J.F.M. Koppenjan. 2000. ‘Public Management and Policy Networks: Foundations of a Network Approach to Governance’, *Public Management*, 2, 2, 135–158.

Klijn, E.-H. and C. Skelcher. 2007. ‘Democracy and Governance Networks: Compatible of Not?’, *Public Administration*, 85, 3, 587–608.

Klijn, E.H., 2008. ‘Complexity theory and public administration: what’s new?’ *Public Management Review*, 10, 3, 299–317

Klijn, E.H., B. Steijn and J. Edelenbos. 2010. ‘The impact of network management on outcomes in governance networks’, *Public Administration*, 88, 4, 1063–1082.

Lacey, D., S. Cuganesan, S. Goode and K. Jacobs. 2012. ‘Celebrating adversity: inter-organizational dependence and public sector performance reporting in the Australian federal police’, *Public Administration*, 90, 2, 393–411.

Lapsley, I., P. Miller and F. Panozzo. 2010. ‘Accounting for the city’, *Accounting Auditing and Accountability Journal*, 23, 3, 305–324.

Lissack, M. R. 1999. ‘Complexity: the science, its vocabulary, and its relation to organizations’, *Emergence*, 1,1, 110–26

Malmi, T. and D.A. Brown. 2008. ‘Management control systems as a package—Opportunities, challenges and research directions’, *Management Accounting Research*, 19, 4, 287–300.

Mandell, M. 1999. ‘Community collaboration: working through network structures’, *Policy Studies Review*, 16, 1, 42–64.

Marques, L., J.A. Ribeiro and R.W. Scapens. 2011. ‘The use of management control mechanisms by public organizations with a network coordination role: A case study in the port industry’, *Management Accounting Research*, 22, 4, 269–291.

McGuire, R. and R. Agranoff. 2011. ‘The limitations of public management networks’, *Public Administration*, 89, 2, 265-284.

Meyer, J.W. and B. Rowan. 1977. ‘Institutionalized organizations: formal structure as myth and ceremony’, *The American Journal of Sociology*, 83, 2, 340–363.

Miller, P. and N. Rose. 1992. ‘Political power beyond the state: Problematics of government’, British Journal of Sociology, 43, 2, 173–205.

Modell, S. 2001. ‘Performance measurement and institutional processes: a study of managerial responses to public sector reforms’, *Management Accounting research*, 12, 4, 437–464.

Moynihan, D.P. and S.K. Pandey. 2010. 'The Big Question for Performance Management: Why Do Managers Use Performance Information?', *Journal of Public Administration Research and Theory*, 20, 4, 849–866.

Neuman, W.L. 2000. *Social Research Methods: Qualitative and Quantitative Approaches*, 4th ed. Boston: Allyn & Bacon.

O'Connor, P. 2008. 'User-Generated Content and Travel: A Case Study on Tripadvisor.Com', In *Information and communication technologies in tourism*: Proceedings of the international information and communication technologies in tourism conference. Austria, 2008 (pp. 47–58). New York, NY: Springer Wein.

Pollanen, R.M. 2005. 'Performance measurement in municipalities: Empirical evidence in Canadian context', *International Journal of Public Sector Management*, 18, 1, 4–24.

Provan, K.G. and H.B. Milward. 1995. 'A preliminary theory of network effectiveness: a comparative study of four community mental health systems', *Administrative Science Quarterly*, 40, 1, 1–33.

Provan, K.G. and J. Sebastian. 1998. 'Networks within networks: service link overlap, organizational cliques, and network effectiveness', *Academy of Management Journal*, 41, 4, 453–462.

Provan K.G. and H.B. Milward. 2001. 'Do networks really work? A framework for evaluating public-sector organizational networks', *Public Administration Review*, 61, 4, 414–23.

Provan, K.G., M.A. Fish and J. Sydow. 2007. 'Interorganizational networks at the network level: a review of the empirical literature on the whole networks', *Journal of Management*, 33, 3, 479–516.

Provan, K.G. and J. Sydow. 2008. 'Evaluating Inter-organizational Relationships', in S. Cropper, M. Ebers, C. Huxham and P. Smith Ring (eds), *The Oxford Handbook of Inter-organizational Relations*. Oxford: Oxford University Press , pp. 691–710.

Provan, K.G. and R.H. Lemaire. 2012. 'Core Concepts and Key Ideas for Understanding Public Sector Organizational Networks: Using Research to Inform Scholarship and Practice', *Public Administration Review*, 72, 5, 638–648.

Radnor, Z. and D. Barnes. 2007. 'Historical analysis of performance measurement and management in operations management', *International Journal of Productivity and Performance Management*, 56, 5/6, 384–96.

Rao, H., H.R. Greve and G.F. Davis. 2001. 'Fool's gold: Social proof in the initiation and abandonment of coverage by Wall Street analysts', *Administrative Science Quarterly*, 46, 3, 502–526.

Regional Law 01/02. 2002. 'Interventi per lo sviluppo del trasporto pubblico regionale e locale', *Bollettino Ufficiale Regione Lombardia*, 1, 1–7.

Simons, R. 1991. 'Strategic orientation and top management attention to control systems', *Strategic Management Journal*, 12, 1, 49–62.

Sørensen, C.H. and F. Longva. 2011. 'Increased coordination in public transport—which mechanisms are available?', *Transport Policy*, 18, 1, 117–125.

Teisman, G.R. and Klijn, H.H. 2008. 'Complexity Theory and Public Management', *Public Management Review*, 10, 3, 287-297.

Thrane, S. 2007. 'The complexity of management accounting change: Bifurcation and oscillation in schizophrenic inter-organizational systems', *Management Accounting Research*, 18, 2, 248–272.

Turrini, A., D. Cristofoli, F. Frosini and G. Nasi. 2010. 'Networking literature about determinants of network effectiveness', *Public Administration*, 88, 2, 528–550.

Vasavada, T. 2013. 'Managing Disaster Networks in India', *Public Management Review*, 15, 3, 363–382.

Yin, R.1994. *Case study research: design and methods* (2nd ed.), Thousand Oaks, CA: Sage.

Wagenaar, H. 2007. 'Governance, complexity, and democratic participation: How citizens and public officials harness the complexities of neighbourhood decline', *American Review of Public Administration*, 37, 1, 17–50

White, L. 2001. 'Effective governance through complexity thinking and management science', *System Research and Behavioural Science*, 18, 3, 241-257.