Network Theory

The Bricks and Mortar of Integrated Public Service Systems (IPSSs)

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ABSTRACT

This article explores the feasibility of employing network theory, complexity science and integration elements in building a case for the topology, operability and sustainability of an integrated public service system (IPSS). The emphasis of the article will be on presenting network elements as bases, i.e. bricks and mortar, for the formation of an IPSS. As all systems produce outputs and outcomes, the argument for the existence of an IPSS will be that the IPSS will produce outputs, outcomes, adaptation and sustainability values, referred to as public values (PV), i.e. benefits and values for social well-being, social progress and raised quality of life for all citizens.

The article sets out to present insights into the nature and characteristics of networks with the view of recognising the knowledge bases for the formation of an IPSS. To this end, the value of networks, network integration and expansion, the incorporation of actor network theory (ANT) and complex adaptive systems (CASs) will be utilised as theoretical constructs for IPSS formation. Matters related to network typology, in an IPSS context, will be addressed.

In argument for an IPSS, which is systemically juxtaposed to the employ of bureaucratic methods of management and governance, the article puts forward suggestions for the management and governance of an IPSS, in the context of maintaining the valuable and essential network environment. The place and importance of efficiency and effectiveness in networked governance will receive considerable attention.

INTRODUCTION

In searching for a public service delivery system befitting the post neo-liberal digital era, one may borrow from the theoretical and practical advancements made in human connectivity, governance theory, nonlinearity, complexity, public value theory and finally network theory. Herein one finds elements, that when combined in a certain way, will facilitate the rise of an alternative public service delivery system, referred to therefore as an integrated public service system (IPSS). The IPSS is designed to utilise elements embedded in network theory, such as transformative change, flexibility, transparency, accountability, complexity, value creation, nonlinearity, discursive dialogue, feedback methods, collaboration, participatory methodologies, consensus and openness between stakeholders (i.e. network actors). These elements are absorbed to greater or lesser extent, in building sound stakeholder relationships, as stakeholders are the actors, nodes and hubs in integrated networks. An IPSS is described as highly participative in nature. Network theory advances a means, i.e. an empirical foundation, for the conceptualisation of an IPSS. While public value (PV) will not be analytically addressed in this article, it is the raison d'etre of the IPSS. PV is generally referred to as social value, public goods or public choice.

Several issues raised in the article relate directly to the employ of network dynamics, in support of addressing the feasibility and proper functioning of an IPSS; these issues are: (i) network attributes contribute to formulations of IPSS operability, performance, networked governance and integrative management; (ii) that lines of network connectivity generate sustainable patterns of behaviour and small transformative changes in society, referred to as adaptations or sustainability measures; (iii) the growing need for participation, responsiveness, openness, recognition and inclusivity in the delivery of public services demand systemic transformation, vested in networked operability, networked governance and collaboration; (iv) to provide a clear understanding of integration as a process of engaging communities, government organisations and stakeholders as network actors, nodes and hubs, in an unpredictable and uncertain environment; (v) releasing opportunity and innovation in IPSS networks. Networked governance is defined as possessing the substance for transformative change, volatility and partnerships shaped by society (Benington and Moore 2011:34).

The aim of the article is to advance an IPSS which displays the nature, characteristics and dynamics of networks. To this end, the aims of the article are set out as follows: (i) to explore the nature and character of networks in terms of its value, integration elements and principles of actor network theory (ANT) and complex adaptive systems (CASs), as knowledge bases of an IPSS; (ii) to present aspects of network topology; (iii) to present network governance elements and

efficiency and effectiveness criteria; and (iv) to frame IPSS implementation in a network context within an integrative management framework.

THE NATURE AND CHARACTERISTICS OF NETWORKS

The Online Etymological Dictionary (2015) defines a network as an interlocking system. It will be argued that network properties and elements are compatible with IPSSs. The genesis of networks is to be found in organic systems theory, which encompasses issues of adaptation and growth, complexity, nonlinearity, transformability, self-organisation, co-evolution and open systems (Whitehead, Kohler and Lotka (1925) in Bertalanffy 1968:11–12; Klijn 2008:299). Provan and Milward (1995:3) hold that public networks offer "benefits of reduced fragmentation and greater coordination of services".

Mitleton-Kelly (2003:5) states that complexity science is conceptual: a way of thinking and a way of observing the world. One may deduce that IPSSs, networks and complex systems share common systemic elements, hence the unique element of interconnectivity between the micro, meso and macro levels of networked relationships are induced. Mitleton-Kelly (2003:5–25) lists 10 principles of complexity science which cannot be discounted concerning IPSS operability:

- co-evolution;
- dissipative (open) structures existing in far-from-equilibrium states;
- exploration of the space of possibilities;
- self-organisation;
- organisational emergence as complex evolving systems;
- the creation of new order;
- connectivity;
- interdependence;
- positive and negative feedback; and
- network path dependence and increasing returns.

The theoretical point of departure for an IPSS is vested in complexity science, particularly in relation to the elements of uncertainty, unpredictability and the 10 elements listed above; network theory and open systems theory bears similar reliance on the principles of complexity science, without which the concept of nonlinearity could not feature in IPSS dynamics.

Value of network elements

Watts (2003:28–29, 32, 48) holds that networks are organic and continuously evolving and self-constituting systems having synchronous and asynchronous

transformational properties that are able to yield products of value through a process utilising the full potential of the network. Watts (2003:231) adds that networks utilise the principle of multidimensionality and are able to absorb conflict and act on past experience and perceptions with inherent variability. Meek and Newell (in Weber 2005:265) point out that complexity in public administrative organisations may be valuable as integrative and interdisciplinary stimuli, while Grobman (in Weber 2005:265) suggests that complexity increases organisational resourcefulness and purpose, thus stimulating opportunities, new perspectives and innovation. One may therefore claim that an IPSS is comprised of network topologies and configurations and should have the ability to accommodate and absorb complexity (i.e. the laws of unpredictability and uncertainty), which are phenomena which escape mathematical predictability, resulting only in possibilities for order and equilibrium over time. Writers such as Sveiby (1997); Edvinsson and Malone (1997); Wallman and Blair (2000); Lev (2001); Eccles *et al*. (2001) (in Allee 2008:2) are of the view that networks are the most suitable means for the conversion of intangible values (intellectual capital, trust and experience) into tangible assets (financial, human and physical resources).

Network strength and network resilience, are generally dependent upon the quality of the structure (i.e. strength of ties, diameter, density, resilience and modularity) and the functioning of inter-organisational emerging relationships within an integrated system, driven by commonality of purpose. The network elements of nonlinearity, resilience, convergence, balance, self-organisation and autocatalytic feedback (i.e. elements of complexity science) are essential sustainability features of network operability (Meyer, Gaba and Colwell 2005:456).

Capra (1997:10) holds that networks offer stakeholders the advantage of influencing others, thus driving a paradigm shift from hierarchies to networks (and IPSSs). Discontinuous change, a behavioural characteristic of network dynamics, may appear as systemic 'jolts' which compel transformation, innovation and change in a strategic direction, heralding new network forms, states of normality, equilibrium and balanced positions (Meyer, Gaba and Colwell 2005:456–458). These network attributes may add or subtract from network strength; however, it may be deduced that network strength, i.e. resilience, is a factor of IPSS strength.

Grewal (2008:3–10) argues that networks are united by standards, i.e. shared norms that facilitate cooperation among the actors in a network. He states that network strength demands shared forms of social coordination such as social productivity. Frickle and Moore (2006:302) note that the values of participatory learning, emancipatory knowledge and emancipatory potential, strengthen ties and relations in driving the participation of hubs, nodes and actors. The authors indicate that network strength is dependent on: (i) a stable authority; (ii) institutional rule making; (iii) collaborative organisational dynamics; and (iv) the utilisation of research (Frickle and Moore 2006:8–14). These factors it may be

argued compound network typologies and hence IPSS strength, bonding and propensity for connectivity.

Elements particular to network integration

Network integration demands the utilisation of systemic elements such as network agents, commonality of objectives, actor participation, consensus and sound relationship ties to effectively utilise information, capacity and resources. Networks are dynamic, therefore they are able to shrink, dissipate, grow and develop. Network integration is tied to the theory of CASs, borrowing once more from the rudiments of complexity science. In open, nonlinear systems the connecting elements for integration would be directed strategically at integrating supportive institutions, organisations and individual actors from across the micro, meso and macro spectrum of public interactivity, cooperation and partnership building. According to Kim, Oh and Swaminathan (2006:704), network alliances require inter-organisational flexibility and readiness for change, vital for network integration. Kim *et al.* (2006:711) hold that organisational history, age, size and duration in the alliances are factors that may lead to network inertia, thus affecting integration negatively. Alliance formations need to create synergies across various functional areas to retain robustness (Kim *et al.* 2006:711). Battistella and Chester (1973:495, 498, 512) ascertain that network integration can be constrained by

Table 1: Summary of constraining and promoting integration factors

Integration-constraining factors	Integration-promoting factors
• Communication problems. • Axiological differences. • Poor interpersonal relationships among staff. • Fear of reprimand or sanction by staff in voicing opinions. • Outcomes were not what were expected. • Top and middle management must integrate actors at the lower levels of the organisation. • The principles of network integration have not been properly implemented.	• Shared vision and values. • Agreement on common goals. • Inspirational and energetic leadership. • Sound governance. • Recognition and valuing of diverse professional contributions. • Improving and building relationships between parties. • Improve communication and cooperation. • Facilitate and encourage liaison between parties, multidisciplinary teams, co-location of services and coordination at local level. • Deal with issues of conflict and power. • Capacity to address issues of power, through frequent and effective communication. • Time and resources particularly allocated. • Understand participants' practice, philosophy, culture, ideas and beliefs.

Source: (Adapted from Schmied, Mills, Kruske, Kemp, Fowler and Homer 2010:3521)

negative attitudes about effective integrated delivery of services. An IPSS therefore relies on network integration for its survival, utilising each of the constructs, elements and attributes listed above and reducing the risk of constraining forces. Table 1 summarises the constraining and promoting factors to network integration. It may be argued that the nature and characteristics of networks are transferable and adaptable to IPSSs; similarly, network operability and open systems operability have much in common. The relevance of the argument presented here is to show feasibility for the emergence of an IPSS, capable of fulfilling its purpose, i.e. generating PV (Uys and Jessa 2016:198–199).

Utilising actor network theory (ANT) and complex adaptive systems (CAS) as theoretical bases for an IPSS

ANT and CASs provide perspectives and complementary knowledge bases for understanding network behaviour and are instrumental in offering explanations for network expansion, growth and intractability; the way society relates to the material aspects of life in growing uncertainty, assigns new social dimensions to network theory. The nature of networks and hence IPSSs, rely on the premises of ANT and CASs for its commonalities and contributions, vis-à-vis their constructs of integration, adaptation and organisational dynamism; these constitute valuable epistemological contributions for network theory, application and network systems' operability.

Actor network theory (ANT)

Latour (1996:1–3) holds that the links between nature, society and artefacts, the material and non-material worlds, permeate our daily activities and relationships; he asserts that these linkages are inseparable. Accordingly, a complex network may assume a form and symbolism that embraces the sum total of human and non-human capacities (i.e. elements of ANT) in an attempt to represent the daily interconnection between the material and the non-material. Latour (in Thompson 2012:253) argues that human and non-human actors create new sources of power and legitimacy as they renegotiate socio-political meaning, action and outcomes. An IPSS has the task of linking the tangibles with the intangibles, in whatever product it generates.

Complex adaptive systems (CASs)

CASs are constantly developing and co-evolving networks, expanding at an indefinable rate, bearing systemic characteristics of integration, resilience, irreversibility and highly dependent and volatile interconnections between actors. Tomasino (2011:1355–1358) and Zambonelli (2011:Slides 29 and 30) hold that CASs are difficult to analyse, since their dynamism cannot be generalised

to particular aspects of complexity theory or systemic states. The increasing expansion and evolving complexity of CASs are autopoietic and interconnected. Deneubourg (in Zambonelli 2011:Slide 35) explains that the process of self-organisation and self-perpetuation emerges solely from numerous interactions among smaller, lower level networks, giving rise to nonlinear, dynamic, multidimensional nested systems which acquire the attributes of the larger system. Rihani and Geyer (2001:239–240) contend that CASs adapt to changing internal and external environmental conditions through small but effective modifications. Best, Greenhalgh, Lewis, Saul, Carroll and Bitz (2012:423) contend that the advantages of CASs are contained in the qualities of flexibility, adaptation and transformation, i.e. ever increasing robustness. Initially insignificant actions may evolve and later assume tremendously significant impact on network adaptability, explained as the *butterfly effect*. It could be argued that IPSSs, bearing the qualities of CASs, would behave in a similar manner.

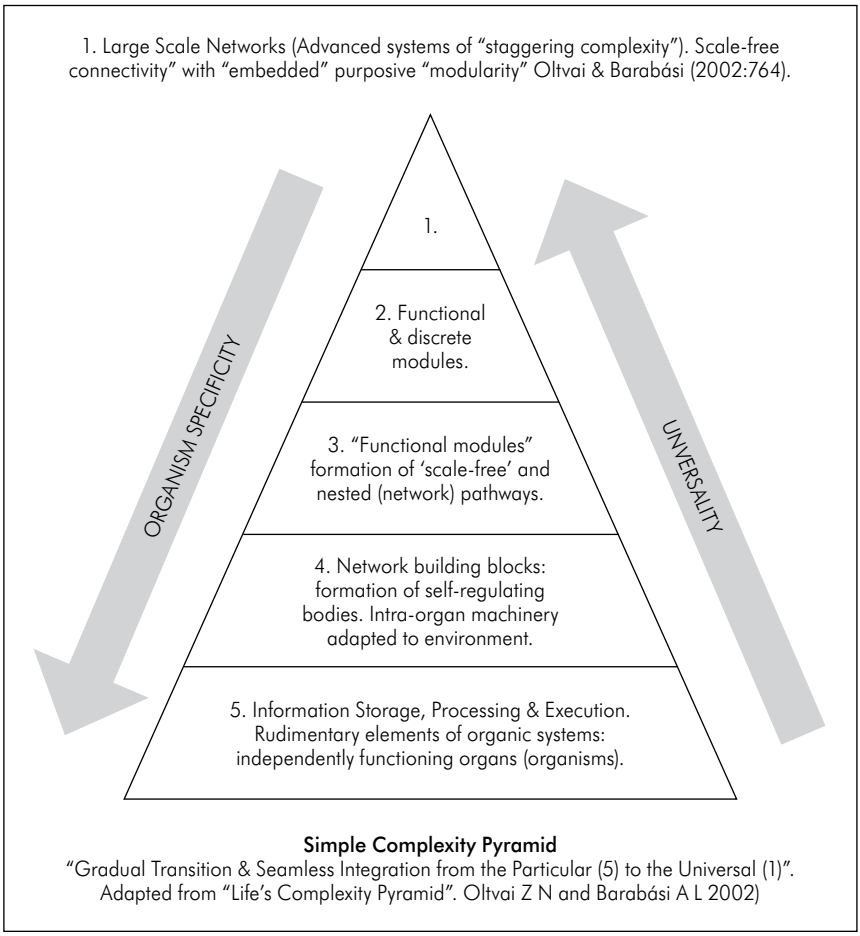
NETWORK TOPOLOGY

The emergence of network structures, expansion and its sustainability are dependent upon multiple variables. An IPSS it is argued, is comprised of network topologies and configurations, bearing the expressed qualities on nonlinearity, systemic operability for absorbing complexity difficulties and the assumed capability of generating PV, the raison d'être of an IPSS. A theoretical coalescence of network, IPSS principles and constructs is necessary for the substantiation of IPSS viability, its renewal and functioning as a means for its survival.

Levels of complexity

Oltvai and Barabási (2002:763–764) contend that organisms undergo gradual transition from rudimentary network structures and purpose to advanced and staggeringly complex network structures, as depicted in Figure 1. The 'complexity pyramid' illustrates transition patterns (i.e. growth and development) of organisms (i.e. organisational structures) for network actors, shown to progress from stage 5, a lower level, to stage 1, experiencing operability at a high level of sophistication and order. The analogy compares network structural growth and development with levels of organic specificity, progressing from the primitive to the advanced and from low universality levels, to higher levels of universality, i.e. from single, simple entities to sophisticated organised bodies possessing purposive modularity (Oltvai and Barabási 2002:763–764). Organic networks are influenced by the material (physical), the non-material (political, policy, strategic direction) and the non-static environment in which they develop. In primitive organisms the levels of complexity

Figure 1: The "Complexity Pyramid" showing progression from simple to complex networks



Source: (Oltvai and Barabási 2002:764)

are recognised as simple, with few governing laws, while in higher order systems, such as integrated public systems constituting large complex network typologies, the governing laws are more directed towards order, stratagems, convergence and equilibrium (Capra 1997:28–29). Hence one may deduce parallels for advanced and perpetually advancing network typologies, as may be expected for IPSSs.

According to Oltvai and Barabási (2002:763–764), the properties of complex network topologies are: (i) inter-connectedness; (ii) modularity, i.e. the ability of networks to separate and reconstitute; (iii) scale-free, i.e. the tendency of

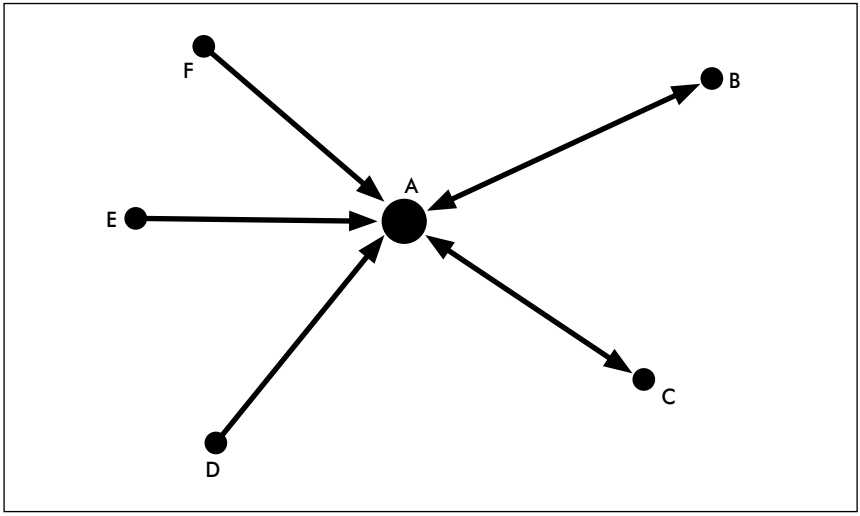
networks to naturally drift towards hubs; (iv) self-regulation and adaptation to varying environments; and (v) embeddedness of social groupings' expectations from governing authorities.

Barabási and Frangos (2002:5) hold that networks are intrinsic to complex systems. As networks evolve along paths of connectivity, their density and diameter are likely to alter; the volume of hubs in a network can increase (or decrease) in number and strength, adding to network (IPSS) resilience and robustness.

Relationship between actors, nodes and hubs

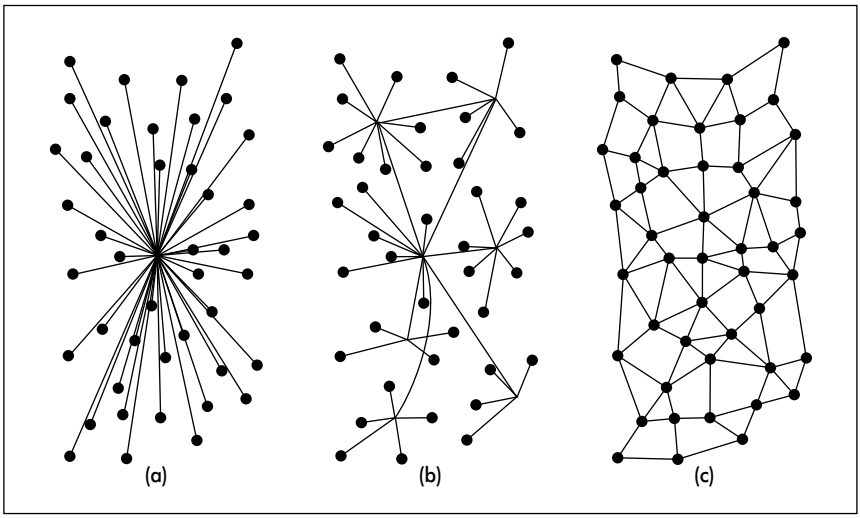
In arguing that networks evolve into IPSSs (illustration Figures 2 and 3c), network direction, structures and function, i.e. network dynamism, influences the strategic paths of its component actors, nodes and hubs (Scott 2000:10–14). Referring to Figure 2, the following points may be highlighted: (i) nodes B and C are in reciprocal relationship with hub A, but have no pronounced reciprocal relationship that is being developed between them; (ii) nodes F, E and D, are in a one-directional (non-reciprocal) relationship with hub A as well, and have no reciprocal relationship between them; and (iii) in order to evolve as an IPSS, B, C, D, E and F must forge reciprocal relationships with hub A and importantly, between them, reaching what is referred to as a distributed network by Baran (in Barabási and Frangos 2002:114–143).

Figure 2: Sociometric star analogy for developing relationships between actors, nodes and hubs



Source: (Scott 2000:10)

Figure 3: Baran's network diagrams: (a) centralised, (b) decentralised, (c) distributed networks



Source: (Barabási and Frangos 2002:88)

Baran (in Barabási and Frangos 2002:114–143), founder of the INTRANET, explains the progression of network development in Figure 3: (a) indicates a centralised network (hub) unsupported and at risk of annihilation; (b) indicates a decentralised scale-free network with many hubs and nodes; and (c) indicates a large complex distributed network securing the system with many hubs, displaying high degrees of resilience, i.e. topological robustness, akin to the advancement made in INTRANET communications. The underlying principles one may employ in ascertaining viability for an IPSS are: (i) that empirical evidence obtained from the study of networks is highly applicable to IPSSs; and (ii) the efficiency and effectiveness of the INTRANET developed over time, i.e. similarly, an IPSS develops over time.

Ghosh and Githens (2009:26) explain the existence of structural holes between actors and nodes, as these gaps represent a lack of connectivity for the facilitation of information exchange. Burt (1992:12–30) and Haythornthwaite (in Ghosh and Githens 2009:25–26) contend that structural hole analysis assists in identifying the 'holes' in networks, that when 'closed', strengthen information sharing, expand content, direction and strength of the ties. Karapetrovic and Willborn (in Wilkinson and Dale 1999:97) note that systems are regarded as integrated when network interdependence increases. Figures 1, 2 and 3 describe network progression and expansion. It may be deduced that an IPSS will display similar tendencies, since it shares typological and dynamic characteristics with

networks, i.e. nonlinear systems that cannot be clinically structured, as they are flexible systems which evolve over time.

Strength and weaknesses of relationship ties

Network ties, (i.e. relationships between actors) may be likened to the bricks and mortar potentially capable of connecting actors, nodes and hubs (i.e. the public and or stakeholders); complex patterns of connectivity, representing the value and intensity of stakeholder relationships, reciprocity and readiness for negotiation and collaboration are established (Scott 2000:65). The strength of these relationships is a major factor in resources (as well as capacity and information) utilisation, as it determines the purpose and quantification thereof in an IPSS. Granovetter (1983:201–229) explains that low-density networks provide opportunities for relationship strengthening, social harmony and collaboration to form densely knit networks.

The effective, efficient and economic use of resources, information, capacity and sound governance practice, is vastly hampered by weak relationships between stakeholders. Weak relationships between stakeholders result in duplication and triplication of tasks at a huge cost to the fiscus; the use of modern technology such as middleware as an aid for effective communication between stakeholders is important to IPSS success. The bricks and mortar of IPSSs are none-other than strong relationship ties, common objectives and goal-directedness.

Structural factors influencing IPSS formation

Koka, Madhaven and Prescott (2006:722–724) suggest that network expansion, reconfiguration of relationships, network strengthening and network shrinkage, shape the formation of an IPSS. The authors hold that these factors may be used in developing an understanding about the interrelatedness between network dynamic factors and IPSS formation, in line with the self-constituting and self-regulating principles of nonlinear systems. Hagedoorn (2006:674–677) emphasises the importance of negotiating levels of environmental, inter-organisational and dyadic embeddedness in IPSS formation. He adds that history, knowledge of network properties, experience and the age of the integrated system, and the cross-level embeddedness of partnership formation, are factors influencing IPSS structure. Rangan, Samii and Wassenhove (2006:739) add that positive externalities (when citizenry enjoy benefits from IPSS formations) arise when government, business and public groups form IPSSs. Negative externalities arise when IPSSs are formed at a cost to society. Rangan *et al.* (2006:744) suggest that IPSS arrangements can enable creative strategies when (i) the government or the private sector lacks either resources or governance leverage; (ii) there is high

uncertainty in the market; and (iii) private actors do not possess the expertise to govern.

NETWORK GOVERNANCE ELEMENTS

Prior to an examination of IPSSs and governance elements, it is necessary to demarcate lines of comparison between networks and IPSSs. There are undoubtedly more similarities than differences between networks and IPSSs; similarities which are vital for the operability of an IPSS. An IPSS is therefore comprised of network topologies and configurations, bearing the expressed qualities on nonlinearity, an operability which absorbs complexity attributes and hence capability of generating PV, the raison d'être of an IPSS. The continuum from networks to IPSSs is highly dependent upon building relationships, trust and accountability between stakeholders. A short comparison of network and IPSS 'states' is provided in Table 2 from which IPSS governance or networked

Table 2: Comparing characteristics of networks and IPSSs governance elements

	Networks	Integrated Public Service System (IPSS)
1	Essentially a structure.	Essentially a public system / systemic process.
2	Presents no indication of value.	Produces public value (PV), material and non-material.
3	Ethical behaviour determines network strength.	Need or ethical operation.
4	Conduit for sharing common information, knowledge and objectives.	Conduit for sharing common information, knowledge and objectives, community needs, desires, and expectations.
5	Legitimacy determined by law.	Legitimacy determined by public law in particular.
6	Open and non-defined in general.	Defined networks i.e. IPSS clusters, e.g. housing and social development IPSS clusters.
7	Employs advanced technology and expert capacity.	Need for advanced technology and expert capacity.
8	Links actors (stakeholders) in private capacity.	Links actors (stakeholders) in public-private capacity.
9.	A wide variety of networks are employed socially	A need for IPSSs exists in order to generate PV (i.e. well-being, social progress, increased quality of life).

Source: (Uys and Jessa 2017 own data)

governance indicators might be drawn. Table 2 thus identifies the characteristics of the continuum from networks and IPSSs.

Four key governance elements create PV within an IPSS: (i) negotiability; (ii) manageability; (iii) conversion; and (iv) social value and perceived value (Allee 2008:3). Hickey and Siegel (2008:168–177) and Allison, Gilliland, Mayhew and Wilson (2007:72–73) found parallel phenomena pertaining to integrated quality initiatives regarding network governance imperatives; they are: (i) knowledge; (ii) alignment of outcomes to the quality expectations of citizens; (iii) financial controls; (iv) performance; and (v) relationship building.

IPSS operability and governance

Networked governance principles are likely to emerge from the values and motivations which were responsible for driving an IPSS formation. These networked governance principles would be common to the actors involved in the process of the IPSS formation as the actors are bound by organisational networks, some of which are nodes, hubs or individual actors. The commonalities and expectations between networks lend direction to the IPSS's purpose.

Krippner, Granovetter, Block, Biggart, Beamish, Hart, Arrighi, Mendall, Hall, Burawoy, Vogel and O'Riain (2004:110) support Granovetter's (1983) view that social action is embedded in networks of social relations. Krippner *et al.* (2004:116) believe that IPSSs are domains where cooperation, trust, domination and compliance are generated, as in most socio-economic systems, since social systems cannot be sustained without them, and because IPSSs are stakeholder (i.e. public) driven. Governance norms therefore emanate from 'below' and are eventually adopted and sustained by stakeholders operating in an IPSS.

Deseve (in Goldsmith and Kettl 2009:121,127) and Allison *et al.* (2007:69–71) argue that in netcentric environments (i.e. where complex formal and informal integration and collaboration of public functions occur dynamically and where human and technical connectivity and interoperability interface) network management is regarded as highly necessary to achieve efficiencies in service delivery. Deseve (in Goldsmith and Kettl 2009:135–141) and Overbeek, Janssen and Van Bommel (2012:185–6) hold that all networks integrate operating features, innovative governance and value-centred leadership, as a means to achieve PV 'systemic' operability and sustainability.

Morgan and Trist (in Clinton 2000:8), Overbeek *et al.* (2012:185) and Wilkinson and Dale (1999:95–102) promote the following elements for IPSS operability and governance:

- integrated organisational learning;
- establishment of common values and norms;
- integrated (holistic) address of matters and issues;

- maintaining flexibility;
- utilisation of technology (open information interfaces);
- macro quality management; and
- continual feedback.

Stoker (2006:43–44) brings the focus of networked governance into prominence, not only as an important consideration for an appropriate governance framework for an IPSS, but also for the interpretation of the nature of the IPSS by stakeholders. Networked governance ensures that effective value is generated by network stakeholders and that such value is geared to the needs and demands of government, citizens and private actors on an equal basis. He holds that networked governance relies on bottom-up approaches, deliberation, deliberative reflection, reflexive intervention, maintenance of the systems' capacity, shared values and the exclusion of monopoly factors. Volatile networks can increase their resilience by adopting strong governance practices, while smaller networks will disappear or merge with stronger hubs or nodes.

IPSS effectiveness and efficiency

Network theory, complexity science, understanding integration and PV theory are the four primary pillars of IPSS formation. Since the IPSS cannot be defined by bureaucratic limitations, the IPSS utilises these four pillars in an interconnected and inseparable manner and hence becomes systemically geared to generate efficiency, effectiveness, equity, equality and efficacy, i.e. values and measures appropriate to open, flexible, participatory, transparent, nonlinear IPSSs (Uys and Jessa 2016:183).

IPSSs effectiveness and efficiency are determined by the interrelatedness of endogenous and exogenous factors, examples being actual achievement of objectives, community satisfaction and transformation indicators (McGuire and Agranoff 2011:274). Moore (in Andrews and Entwistle 2013:261) adds the legal and moral authority of the state, i.e. procedural efficiency, for effecting democratic balance in public service provision. Scharpf (in McGuire and Agranoff 2011:265) argues that structural challenges and environmental tensions faced by actors, are contributing factors to network (IPSS) efficiency and effectiveness.

Table 3 presents both a framework for performance evaluation of networks, as well as a means for understanding levels of performance in relation to open and flexible systems. Table 3 offers nine critical performance dimensions within a corporate governance regime (CGR); one may argue that the CGR matrix encapsulates the essence of IPSS performance as it bears the elements of holistic integration and collaborative purpose (Emersen and Nabatchi 2015:723). The concept of 'adaptation' is timely introduced; hence the performance tool regards

outputs, outcomes and adaptation as measurable in a nonlinear environment. By 'adaptation' is meant small, significant, progressively positive change or adjustment in a collaborative, nonlinear, network environment. The CGR framework is applicable to regeneration programmes and projects where the community takes a central role in its own development and empowerment, establishing well-being and social stability, utilising effectiveness and efficiency as key success factors.

Table 3: Corporate Governance Regime (CGR) performance levels for actions outcomes and adaptation. A performance measuring instrument for an IPSS

Performance Level	Unit of Analysis		
	Participant Organisation	Collaborative Governance Regime	Target Goals
Level One: Actions & Outputs	Efficiency	Efficacy	Equity
Level Two: Outcomes	Effectiveness	Legitimate relations with stakeholders	Effectiveness
Level Three: Adaptation	Equilibrium	Viability	Sustainability

Source: (Emerson and Nabatchi 2015)

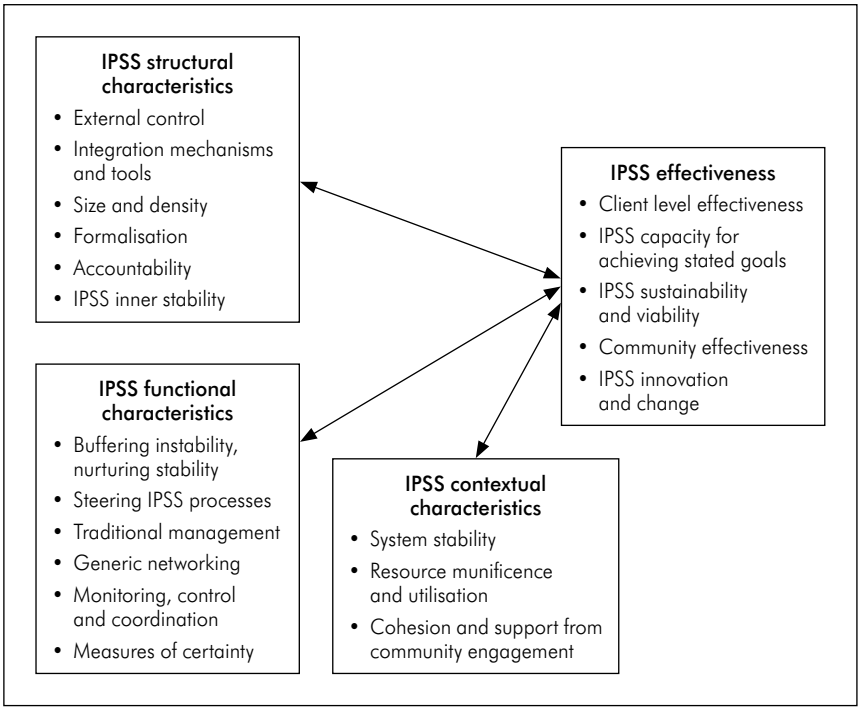
Inter-organisational collaboration, organisational strength and the production of quality products and services requires evaluation. Provan and Milward, and Bardach (in McGuire and Agranoff 2011:271–272), Provan and Milward (1995:23–27) and Provan and Milward (in Turrini, Cristofoli, Frosini and Nasi 2010:530–538) hold that high levels of efficiency are required in order to achieve citizen satisfaction and preserve relationships between network structures. Their suggested evaluation criteria are: (i) IPSS modularity; (ii) monitoring, control and coordination; (iii) IPSS stability and sustainability; (iv) measures of certainty; (v) measures for the degree of embeddedness in relation to a resource-abundant environment; (vi) levels of scarcity of resources; (vii) audit of benefits accruing to citizens and management; (viii) innovation; (ix) accountability; and (x) goal achievement.

Whelan (2011:275) contends that five levels of evaluative analysis are possible in the domains of network structure, culture, policy, technology and relationships. For each of these domains the following should be noted: (i) endogenous and exogenous variables; (ii) integration design; and (iii) efficiency of information and communication systems. Tension arises over values and interests between the parts and the whole, and between the network and the community.

Framework for measuring IPSS effectiveness

The construction of a framework for IPSS effectiveness will utilise network operational principles, such as positive and negative feedback loops, nonlinear coordination and the elements stated in the CGR framework presented in Table 3. The relevance for measuring network effectiveness lies in the need for the effective and efficient utilisation of information, resources and capacity, taking cognisance of holistic and synchronous development. Figure 4 illustrates the employ of effectiveness indicators, employed by network-IPSS actors in a nonlinear manner. An integrated framework for network effectiveness is illustrated by Turrini (2010:546) in Figure 4. The author draws on the work of Provan and Milward (1995) and McGuire and Agranoff (2011:274) on network structure, function and contextual characteristics, providing a basis for measuring integrated network effectiveness. Having adopted a continuous feedback process, messaging takes on a nonlinear form, the purpose being continuous improvement and enhancement of programmes and projects current or not. The indicators may be obtained from the diagram, i.e. Figure 4. Gaster (1996:80–89) holds that quality

Figure 4: An integrated framework for network-IPSS effectiveness



Source: (Adapted from Turrini A, Cristofoli D, Frosini F and Nasi G 2010:546)

consciousness among citizens becomes entrenched when the infrastructure for quality exists alongside public participation, a quality service chain and supported by key stakeholder teams, i.e. integrative leaders, working within a holistic framework for the effective implementation of IPSS products and services.

IPSS IMPLEMENTATION IN A NETWORK CONTEXT

The theory of the IPSS has yet to be tested in reality. Government organisations, which are considered hubs in a dedicated network environment, would have to edge much closer to its stakeholders, citizens and communities, a leap not

Table 4: Three sets of imperatives for the operability and implementation of the IPSS

Principles of open, organic systems	Integrative managerial imperatives	IPSS operational and implementation guidelines
Nonlinearity. **Holistic** thinking and Gestalt ideology. **Reciprocation** and deliberative reciprocity. **Entropy reduction**: towards increasing order. **Intractability**: i.e. natural irreversible growth. **Autopoiesis**, natural self-organisation and self-regulation. **Network resilience.** **Co-evolution** of IPSS elements. **Convergence** of IPSS elements.	**Developmental** in all aspects of producing public value (PV). **Deliberative,** open, engagement. **Sharing** resources, capacity and information. **Collaboration**: channelling ideas, innovation and creativity. **Coordination:** effective scheduling, planning and evaluation of outputs, outcomes and impact. **Cooperation:** readiness, responsiveness and assuming responsibility for activities. **Communication**: the employment of digital technology, such as 'middleware'. **Trust and legitimacy.** **Citizen satisfaction.**	**Networked,** integrative governance. **Feedback.** **Functionality.** **Focus on utility.** **Financial** control to avoid financial distress. **Sustainability** and stability. **Accountable** and transparent. **Inclusivity**, open to engagement. **Learning;** organisations and actors learn. **Consensus** and commonality of objectives. A focus on **innovation.** **Recognition of PV** tangible and non-tangible elements. **Economic value** to society. **Holistic evaluation** of functions, activities, stakeholder and actor performance.

Source: (Uys and Jessa 2017 own data)

generally accepted in the global environment. Table 4 provides a point of departure as it sets out principles for open, flexible systems in defined public networks, integrative managerial imperatives for collaborative and networked governance and what would generally comprise IPSS objectives gained from participatory methods with stakeholders residing within a defined network.

An evaluative model, based on the frameworks presented in this article, will be a necessary requirement in consideration of the methodology that will be used to measure IPSS outputs, outcomes, adaptability and sustainability of programmes and projects. In presenting a framework for IPSS implementation, Table 4 outlines three sets of imperatives for IPSS operability and implementation by IPSS network actors.

Integrative management for an IPSS

The implementation of an IPSS requires a paradigm change and bottom-up approach by managers to operate effectively and efficiently in a system which demands a new governance perspective for engagement between institutions of state, stakeholders and individual actors. Emerson, Nabatchi, and Balogh (2011:1–23) define integrative management as being broad in scope, utilising co-management, the interaction of multi-partners, nonlinear principles and a reliance on network dynamism. The CGR framework, presented in Table 3, is an instrument for integrative learning. The authors hold that the drivers of integrative management are interdependent leadership and a coalescence of resources, information and capacity. The implementation of the CGR instrument employs critical managerial tasks such as principled engagement, shared motivation, deliberation and the will to address outputs, outcomes, adaptation and sustainability jointly; in this manner, the integrative manager sets forth to practicalise IPSS operability, dealing with complexity, matters of trust between stakeholders, integration and the delivery of effective and efficient services to citizens.

The nonlinear qualities of an IPSS, which define the difference between hierarchical and open systems, must logically inform the approach, style and practice of management relevant to maximising IPSS operability. Integrative managers borrow from the best management practices and frameworks available to them. The tables, figures and criteria presented in this article are guides for integrative management frameworks. To the integrative manager, cost efficiency entails the elimination of waste, sustaining organisational financial health, effective and efficient programme, project management and participatory budgeting; as it relates to both tangible and non-tangible outputs and outcomes. Integrative management, public value management and networked governance have been put forward as management methodologies for an open IPSS. Table 4 lists some of the criteria available to integrative managers for implementation.

The evaluation and measurement of network interconnectivity (strength of ties, modularity, degrees of betweenness, density, etc.) employs Gephi, Egonet, Graph tool and Java Universal Network Graph (JUNG) software. Stakeholder satisfaction rating scales, PV Scorecards, Balanced Scorecards and Integrated Frameworks for Network Effectiveness may be tailored to the needs of integrative managers (Turrini *et al.* 2010:546).

Network dynamism is synonymous with stimulating growth and development, its opposite being organisational stagnation. The dynamic nature of the IPSS is determined by the demands, needs, expectations and desires of stakeholders in the pursuance of their common objectives, driven by integrative managers in an empirical and participatory, yet not clinical manner.

CONCLUSION

The basic elements of network theory were presented in order to substantiate purpose and viability for the establishment of an IPSS. While the present governing system employed by institutions of state are linear, fragmented and authoritarian in nature, network theory offers an alternative for improved engagement, participation by stakeholders, community and citizenry. As all networks known to society generate measurable outputs and outcomes, an IPSS by contrast, possesses the potential to deliver PV, measurable in terms of its outputs, outcomes (i.e. social well-being, quality of life and social progress), sustainability and adaptability. An IPSS consolidates and utilises the elements from network theory, complexity science, public value theory and integration participatory methodologies to produce a public system for the delivery of services which espouse the characteristics of openness, flexibility, nonlinearity, effectiveness, accountability, transparency and inclusivity. These elements comprise the bricks and mortar of an IPSS; a system which measures the value (i.e. PV) it generates to its stakeholders and broader society. An IPSS employs the practice of utilising common stakeholders' objectives, common targets, common purpose, collaboration, engagement and empowerment of stakeholders, interest groups and individuals.

The typology of the IPSS is therefore based on network typology, in terms of its dynamism, its outputs and its modus operandi, guided by networked governance, integrative management, fairness, cooperation and collaboration. Since IPSS constructs were borrowed from network theory, six normative underpinnings for IPSS functionality may be established: (i) the importance of factoring in the attributes of complexity science as it sets down the laws of unpredictability and uncertainty; (ii) government and community organisations are stakeholders of equal status, promoting efficacy in respect of IPSS operability; (iii) continuous feedback is essential to IPSS operability; (iv) an IPSS employs democratic ideals;

(v) an IPSS seeks to deliver its outputs effectively, efficiently and economically; and (vi) networked governance and integrative management principles were listed as knowledge bases to be utilised in the implementation of IPSSs.

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