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Reflections on service systems boundaries: A viable systems perspective
The case of the London Borough of Sutton

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Summary   The aim of this paper is to propose a systems interpretation of the concept of complexity and its implications for a theoretical discussion of the concept of boundary in complex service systems. The proposal highlights the interpretative contribution of a dual perspective of observation that distinguishes between a structure-based view and a systems-based view. When dealing with complexity, the phenomenon under investigation cannot be addressed through management approaches that aim to measure and control it in a vain attempt to find the best solution. Due to the inner nature of complexity, a more rewarding approach to a full understanding of problematic situations should place consolidated management models within a more general interpretation framework that suggests preliminary insights about the real nature of the investigated phenomenon.

First, this paper outlines the theoretical background of the literature on service, service systems and complex service systems, providing evidence of the contribution of recent service research advances such as service science and service-dominant logic. Next, the paper focuses on the basic principles of systems thinking to introduce the Viable Systems Approach (vSa) as a general framework of reference for both the investigation and the governance of social organisations.

The vSa conceptual framework is adopted for proposing some reflections from a systems perspective in the investigation of the case of the London Borough of Sutton (LBS). The focus is on interpreting the paradoxical situation of an increased fear of crime among LBS residents despite the evidence of reduction in the crime rate. Although the incidence has fallen for most types of crimes, a recent poll confirmed that crime is still rated as the most important issue for residents. Therefore, improving safety and reducing crime remain the top priorities for the Safer Sutton Partnership Service. In short, this study proposes to consider ''reducing the fear of crime in a community'' as a complex service system.
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Introduction

Systems theories are attracting growing attention in the area of service research (Barile, Spohrer, & Polese, 2010; Ng et al., 2012). This interest is primarily attributable to the contribution of systems theory to the understanding of complex phenomena, such as co-creation, service exchange and service systems (Barile & Polese, 2010a).

According to the current service logic, organisations are open to many external dynamics and they should relate with many other actors or owners of needed resources. Hence, an organisation's openness influences the conceptualisation of rigid relational boundaries, which consequently maintain a fundamental conceptual role to promote the understanding of governance mechanisms and managerial behaviours.

Many attempts have been made to define a system's boundaries, beginning with the idea of a cross-system interface and frontier through which the enclosed system may access resources that are crucial for its survival (von Bertalanffy, 1968). Ideas have been proposed for a system that encloses a range of interests or a system with a purpose (Forrester, 2003). Later, the concept of boundary was thought to be crucial for maintaining the balance between autonomy and control (Beer, 1972). The boundary specification is intrinsic to the definition of a system's components, relationships among the components and a system's goal.

At a structural level, the boundary may support a distinction between the processes of the observed organisation and those controlled by other actors. These boundaries, varying according to a specific context, take on the function of communication and filtering between the internal and the external contexts (Barile, Pels, Polese, & Saviano, 2012; Barile & Polese, 2010b; Golinelli, 2010). However, the function of a boundary vanishes (Ng, Parry, Maull, & McFarlane, 2010a; Ng, Maull, & Smith, 2010b; Ng, Williams, & Neely, 2009) when passing from a static/structural to a dynamic/systems perspective (Barile, 2009; Barile & Saviano, 2011a).

Accordingly, we propose an innovative interpretation approach to take into account the implications of unpredictable emerging properties in the interaction processes of complex service systems. The investigation of social phenomena, in particular, needs to consider the distinction mentioned above between static and dynamic views of organisational boundaries because the main properties of social phenomena emerge only at the systemic interaction level. Care should be taken to use only descriptive, quantitative analyses for the understanding of these types of phenomena because these analyses implicitly refer to the objective characteristics of the phenomenon and thus cannot fully explain their dynamics, which are systemic in nature and imply a subjective perspective. In this article, we will demonstrate that the dynamic adoption of theoretical models based on objective, quantitative data and information may be insufficient to fully capture the complexity of the observed reality. The phenomenon of emergence implies unexpected interaction with elements external to the structure borders, especially when they involve individuals and organisations. This interaction seems particularly interesting for evaluation in the case under investigation because of the related impact on human feelings and behaviours.

This paper, therefore, outlines the theoretical background of the literature on service, service systems and complex service systems, providing evidence of the contribution of recent service research advances such as service science and service-dominant logic. The paper proceeds by focusing on the basic principles of systems thinking to introduce the (vSa) as a general methodology of reference for both the investigation and the governance of social organisations. The paper concludes with an interpretation of the LBS case in the light of vSa suggestions.

Theoretical background: service, service systems and complex service systems

In the field of service management research over the past decade, we have noted the emergence of scientific discussions that progressively broaden the research focused on the conceptualisation of service, of service systems and more recently, on complex service systems. The three concepts are interconnected and therefore, we address their development in this section by describing service research advances that demonstrate growing attention on complexity.

With the increasing emphasis on services in all business activities (including businesses predominantly based on manufacturing), firms are directing their core business functions on a competitive model based on service quality and service innovation. Moreover, as globalisation has connected the world economically, technically and socially, emphasis is being placed on aggregating products and services to create customer solutions offered by globally integrated enterprises (Qiu, 2009).

Because all economies increasingly depend on human knowledge and the application of information to create benefits (Spohrer, Anderson, Pass, & Ager, 2008), the concept of 'service' has been proposed within theoretical models, enterprise strategies, corporate governance, decision-making processes and virtually all business and social relationships. In the past decade, these developments have been accompanied by an evolution in the notion of 'service' itself-from historical (basic) interpretations of service as an 'intangible good' to more recent multi-dimensional interpretations proposed by mainstream service research such as 'service-dominant logic' (S-D logic) (Vargo & Lusch, 2008) and 'service science, management, engineering and design' (SSMED) or 'service science' (SS) (Maglio & Spohrer, 2008).

According to S-D logic, for instance, service is the application (through deeds, processes and performances) of specialised operant resources (knowledge and skills) for the benefit of another entity or the entity itself. Thus, the emphasis is on the process of doing something for and with another entity to create value. According to S-D logic, service represents the common denominator of all exchange processes whereas goods become mere vehicles for the application of service provision (Vargo & Lusch, 2008).

According to 'service science' (SS), service is a system of interacting, interdependent parts (people, technologies and business activities) that is externally oriented to achieve and maintain a sustainable competitive advantage (Maglio & Spohrer, 2008; Maglio, Srinivasan, Kreulen, & Spohrer, 2006). Service is thus viewed as the performance of acts

for others, including the provision of resources that others will use (Alter, 2008). Table 1 summarises recent proposals for the conceptualisation of 'service'.

In the last decade, service research has proposed a notion of service that is related to the following: value co-creation (Lambert & Garcia-Dastugue, 2006; Prahalad & Ramaswamy, 2004; Vargo & Lusch, 2008); positive interactions among entities in reticular systems; and numerous involved actors engaged in dynamic interactions. Accordingly, the notion of service is becoming more closely related to the notion of systems, especially service systems.

Both S-D logic and SS highlight the importance of the concept of 'service system'. A service system is defined by Maglio and Spohrer (2008) as ''a configuration of people, technologies, organisations and shared information that are able to create and deliver value to providers, users and other interested entities through service''. This integration of needs, resources, information and objectives among providers and users stimulates co-creation processes that have come to dominate the developed economies of the world (Qiu, 2009). Recent contributions to the definition of service systems are provided in Table 2.

Within service systems, service exchanges are favoured through dynamic processes that coordinate infrastructure, employees, partners and clients in the co-creation of value. Given that every service system implies providers and clients of the service that are connected by value propositions in value chains, value networks, or value-creating systems. Businesses, firms and customers are generally interpreted as socio-economic actors engaged within complex service systems, performing actions in the market with the aim of reaching desired outcomes such as solutions and experiences.

In such a configuration of service systems, knowledge can be intended as a 'meta-resource' and service systems as primarily cognitive systems (Rullani, 2004). As knowledge and competencies become more articulated, firms become sets of micro-specialisations that must integrate and transform their resources into a higher order of service potential (Vargo & Lusch, 2008). Resources and learning are thus the foundation for the value-creation processes of service systems and are characterised by four key resources that enable such learning dynamics (Mele & Polese, 2011): customers, individuals, information and technology.

Through their decision makers, service systems act as resources integrators that are understandable in terms of elements of a work system (Spohrer et al., 2008). Within the organisation and through the network that is experiencing resource specialisation are operands and operants (Vargo & Lusch, 2008) such as knowledge, skills, know-how, relationship, competences, people, products, material and money. Service systems are capable of enabling connections and interactions among all involved parties in the service exchange, and the technological infrastructure on which they rely smoothes the channels of communication as B2B, B2C/C2B, C2C, B2S/S2B C2S/S2C (where B represents the business, C represents the customer, S represents the stakeholder and the first letter is the actor activating the interaction) (Gummesson & Polese, 2009).

In service systems, interaction becomes the driver of value, the means through which service systems develop a joint process of value creation (Polese, 2009); hence,

service systems can create competitive advantage by improving the reticular relationships. Because of its intrinsic features, the notion of service systems is increasingly related to that of complex service systems (Miller & Page, 2007). In fact, as socio-technical systems that place individuals, rather than physical goods, in the centre of their organisational structure and operations (Qiu, 2009), service systems are generally characterised by an open and emergent interaction that may generate conditions of complexity (Sawyer, 2005). Complex service systems are frequently based on ICT as the enabler of reconfiguration and intelligent behaviour associated with the aim of creating a basis for systematic service innovation (IfM, IBM, 2008) in complex environments (Demirkan et al., 2008). Complex service systems are everywhere (from complex healthcare services to traffic management, from smart power supplies to rationalisation of food production, from telecommunications to waste management) and all of us experience their performance on a daily basis. Hence, pioneers in service research are approaching the field of complex service systems in an attempt to increase the understanding of the underlying logics to stimulate value-creation experiences (Gummesson, Mele and Polese, 2009; Gummesson, Mele & Polese, 2011).

Introduction to the Viable Systems Approach

Since Aristotle claimed that knowledge is derived from an understanding of the whole rather than of the individual parts (Aristotle's holism), researchers have been struggling with systems and parts in terms of their contents and their relative dynamics. During the last century, this thinking evolved into so-called 'systems theory' (Bogdanov, 1922; Checkland, 1981; Laszlo, 1996; von Bertalanffy, 1968). This interdisciplinary theory encompasses every system in nature, society and several other scientific domains and provides a framework for investigating phenomena from a holistic approach (Capra, 1997).

A system is generally defined as an entity, which is a coherent whole such that a boundary is perceived around it to distinguish internal and external elements and to identify input and output relating to and emerging from the entity (Ng et al., 2010a, 2010b).

By shifting the attention from the parts to the whole, observers can fully comprehend a phenomenon by breaking it down into elemental parts and then re-forming it (reductionism) or by applying a broad, global vision (holism). Therefore, although the elemental components of a phenomenon can be observed, to fully comprehend the phenomenon, it is necessary to also observe it from a higher level with a holistic perspective (Beer, 1972).

From a systemic perspective, every observed system is related to supra-systems and sub-systems. Supra-systems are hierarchically ordered as a function of how critical and influential they are towards the system in focus. Sub-systems should be directed and managed by the system to ensure that they contribute to the larger goal (Barile, 2009a). The introduction of supra-systems and sub-systems relationships and their changes over time challenges the notion of system boundaries, which must be interpreted in a generous and evolving manner. Contact creates participation; a given system tends to absorb supra-systems and

sub-systems (components) to develop as a complete system (Barile, 2009a).

Thus, systems thinking implies a shift in perspective from the part to the whole (Capra, 1997). In this sense, the observed reality is viewed and interpreted as an integrated and interacting unicum of phenomena (Golinelli, 2010).

Systems theories encompass a wide field of research relating to various concepts and areas of focus. In the field of management, a number of authors and scholars have adopted a perspective of organisations as systems with a focus on the analysis of the relationships among organisations and their environments (Aldrich, 1979; Lawrence & Lorsch, 1967).

Because the systems perspective allows a powerful and deep analysis of contexts, it can support the understanding of complex phenomena from both a holistic and a reductionist view. In fact, this perspective allows both the investigation of organisational behaviour, processes and dynamics and the analysis of links, nets and balances. Various views can be chosen to support resources, goals and needs/expectations.

Systems theories are also a powerful perspective and methodological lens for the analysis of service exchange as a complex phenomenon. Systems are not only particular to individuals and their minds but are also found in nature, in society, in business and within socio-economic contexts; moreover, they can be identified within organisations, districts and so on. Systems studies and theories increase the knowledge about multiple perspectives, linking components, connective functions and practical applications of complex phenomena (Mele, Pels, & Polese, 2010). The subject service exchange addresses the reductionism/holism approach. Moreover, the structure/systems paradigm highlights the emergence of systems from structures and the related dynamics as well as the concepts of borders and boundaries. In fact, service exchange takes form as a multi-agent system that merges the contributions of several actors as systems, such as the following: firms, individuals, customers, partners and so on.

In the early 2000s, a group of Italian scholars started to develop the Viable Systems Approach (Barile, 2000, 2009; Golinelli, 2000, 2010), a research and governance methodology rooted in systems thinking and based on the Viable System Model of Stafford Beer (1972).

Beer's model was proposed within stable conditions characterising the time in which it was theorised and hence vSa has been built on the basic principles of the model, shifting attention from a focus on structures to a view broadened to include open systems dynamics.

The vSa method offers general schemes of reference that are useful for interpreting the concept of complexity and highlighting its systemic nature, which may also support the investigation of the implications of complexity for decision making in service systems.

As the acronym clearly suggests, vSa is essentially an 'approach' to adopt 'system' thinking general interpretation schemes as meta-models for understanding any problematic context (Various Authors, 2011). However, it is worth noting that vSa is not a set of operative 'models to apply' to manage complex situations. Rather, vSa is a general 'method to adopt' in applying the rich number of well-established and consolidated management models to increase their effectiveness in addressing problem solving and (mainly) decision making. In addition, vSa proposes a terminological setting that is capable of representing a coherent theoretical framework of reference for both interpreting and governing social organisation dynamics from the perspective of social sciences. The vSa method proposes that organisations (as well as individuals) be viewed as viable systems that aim to survive in their context by creating conditions of relational consonance (harmony) with the sub- and supra-systems, which are perceived as relevant for the functioning of the system (Polese & Di Nauta, 2012). Fundamental is the role of top management in interpreting the context, defining goals and involving all of the relevant actors in the system's plan on the basis of the developed conditions of consonance (Golinelli, 2010).

The interpretative keys of the vSa framework that we are adopting in this paper are the structure system paradigm and the information variety representation, which are detailed below.

The structure-system paradigm (Barile & Saviano, 2011a) is a useful scheme for investigating a phenomenon by focusing on a structure-based view (StBV) or a systems-based view (SyBV) according to the nature of the phenomenon. The StBV is a static and objective perspective that is useful for describing and measuring a phenomenon. The SyBV is a dynamic and subjective perspective that is useful for interpreting the system dynamics. In other words, any phenomenon can be described by objectively focusing on its static components (parts) and relationships (structure); however, to understand its dynamics, the phenomenon's context of interaction must be interpreted (system).

The information variety (Barile, 2009b, 2011) refers to a viable system's diversity, which is useful for supporting key dimensions that are related to the system's identity and affect the interactions among those dimensions. Based on Ashby's Law of Requisite Variety (1956) and Beer's subsequent viable systems model (1972), both individuals and social organisations can be viewed as viable systems pursuing their goal of survival by interacting in an open context. These dynamics can be read in terms of interaction between

Table 1 Recent proposals of the 'service' concept.

Service concept	Main focus	Author/year
Application of specialized competencies	Value enhancement	Vargo and Lusch (2008)
Activity providing assistance/expertise	Solution finding	Grönroos (2008)
System of interacting parts	Competitive advantage	Maglio and Spohrer (2008)
Acts performed for others	Resource valorization	Alter (2008)
Work performed for others' benefits	Provider/user interaction	Katzan (2008)

Table 2 Service system recent definitions.

Service system recent definitions	Authors	Year
Service systems represent value co-creation configuration of people, technology, value propositions connecting internal and external service systems and shared information	Spohrer, Maglio, Bailey and Gruhl	2007
Service systems can simply be a software application, or a business unit with an organization, from a project team, a business department, a global division; it can be a firm, institution, government agency, town, city or nation; it can also be a composition of numerous collaboratively connected service systems within and/or across organizations	Qiu, Fang, Shen and Yu	2007
Service systems act as resource integrators, understandable in terms of elements of a work system, within the organization and through the network enduring resource specialization, those operand and operant, such as knowledge, skills, know-how, relationship, competences, people, products, money, etc.	Spohrer, Anderson, Pass and Ager	2008
Every service systems is both a provider and client of service that is connected by value propositions in value chains, value networks, or value-creating systems.	Vargo, Maglio and Akaka	2008
A Service System is any number of elements, interconnections, attributes and stakeholders interacting in a co-productive relationship that create value, in which principal interactions take place at the interface between the provider and the customer	Spohrer, Vargo, Maglio and Caswell	2008
Service systems are a complex interplay between form and customer that form an open system which needs to be designed using the techniques of viable systems and systems dynamics, in which both parties are focused on achieving outcomes.	Ng and Maull	2008
Service systems can be divided into ''front stage'' (about provider/customer interactions) and ''back stage'' (about operational efficiency) and service performance relies on both of them, putting people (customers and employees), rather than physical goods, in the centre of its organizational structure and operations. The smallest Service System is a single person; the largest one is represented by the global economy	Qiu	2009

the key viable system's dimensions of variety, such as information units, interpretation schemes and categorical values.

When interacting within a social context, viable systems first communicate by information flows. This exchanged information is filtered through interpretation schemes that are affected by categorical values characterising the viable system's personality and identity. Thus, individuals' feelings and reactions, such as empathy, reluctance and fear, are expressions of the level of relational harmony among the involved viable systems that affect the perceived social environment. Accordingly, when interpreting social phenomena, we believe that decision makers should consider the subjective dimension of the observed phenomenon by assuming the individual perspectives of all the relevant actors.

A *vSa* interpretation of system complexity

The theme of complexity is of strong interest to many researchers in both the scientific and humanistic disciplines. However, the concept, examined extensively and at times, quite superficially, is subject to the risk of ambiguity and

uncertainty in terms of comprehension and acknowledged meaning (Barile, 2009a).

Regardless of its common interpretation as issues that are almost impossible to resolve, the term 'complexity' has been adopted according to various scientific standpoints.

Nevertheless, because of its important and infinite implications in numerous scientific domains (Dooley & Van de Ven, 1999; Le Moigne, 2002; Prigogine, 1990; Rullani, 2004; Siano, 1997; Simon, 1969; Tainter, 1988), it seems worthwhile to search for a shared and accepted understanding of complexity. Interesting in this regard are the studies of Dooley and Van de Ven (1999), who propose that the observation of chaotic organisational dynamics often signifies the presence — rather than the lack — of control and/or cooperation, as implied by the vernacular use of the term.

The paradigms developed in the literature on complexity-including complex adaptive systems (Miller & Page, 2007), an algorithmic theory on complexity, the epistemology of complexity and even a computational theory of complexity (Fortnow & Homer, 2003)-define research limits and studies that do not seem to be connected to a single cohe-

sive and well-defined scientific corpus. Accordingly, to make a useful contribution to the debate on systems complexity, we must establish a few explicit premises to clarify our perspective.

Exploring existing conditions and, where possible, measuring the level of complexity in typical business economics scenarios assumes that from the beginning, in the interpretation of reality, we identify and share elements on which it is possible to base observations and further reflections. In the literature of business economics, omitting such elements can generate results that are not comparable and can even be quite contradictory (Barile, 2009a). Thus, in assessing the conditions of complexity, we should take into account the perspective implications by considering the following: (i) complexity is subjectively perceived by different observers; (ii) each observer may have different perceptions of complexity of the same observed phenomenon at different times; (iii) the observer's participation to the investigated phenomenon may vary its interpretation capacity; (iv) complexity levels vary depending on the structural, rather than system, observation perspective.

Thus, when analysing systems phenomena, we should recognise the multiplicity of viewpoints Ackoff (2010) and consider the specific and subjective perspective of each involved observer.

To this point, we think that the interpretative approach, which is prevalent in studies on complexity in business, implicitly refers to quantitative criteria as 'dominant' logics in the analysis of an observed phenomenon.

The dominant logic underpinning perspectives and interpretative approaches that inform the methodology of governance and organisational management has been predominately structural. Despite the shift from the traditional analytical-reductionist approach and its focus on the parts of a phenomenon to an emphasis on the relationships that tie everything together (Capra, 1997), a static vision of the observed phenomenon remains. This static vision tends to describe, enumerate and classify what by nature is actually dynamic. Thus, a framework should be devised for distinguishing between static and dynamic dimensions. Traditional models, techniques and instruments — the decision maker's toolbox — have all been imprinted with a static vision of reality because they are founded on the stability and, consequently, the readability of the environment that justifies a management approach that is essentially oriented towards qualities such as efficiency and productivity; in other words, measurability.

The quantitative approach, which is useful and appropriate in conditions of stability and predictability, loses its capacity to support decision making in rapidly changing contexts. The variety and variability characterising the context in which the decision-making process is developed progressively weakens the interpretative capacity of decision makers. Context dynamics evade interpretative efforts and decision makers experience conditions of complexity.

It is a different challenge to try to decide with certainty when confronted with emerging situations that have never before been tested and that are therefore difficult to approach with the usual models, tools and techniques. Usually, when we attempt to enumerate the constituent elements and therefore 'reduce' the reality through simpler elements, searching to obtain some type of qualification or

measure of complexity, we are forced to operate under a structure perspective rather than a system perspective.

From a practical point of view, by adopting a 'structural' approach, researchers tend to quantify factors, relationships, components, variables or other elements. Indeed, this approach maintains its validity in complicated situations. However, it generates a significant operational difficulty when the real implications of complexity need to be addressed.

In fact, if the boundary between complicated and complex is established by the numerical growth of one or more factors and not by other aspects, we fall into a classical dilemma: when do 'few factors' become 'many' and 'many' become 'a lot' (Fig. 1)?

We consider it relevant that unless the growth in the number of relationships alters the capacity to 'comprehend' the behavioural dynamics of the system on the part of the observer, we will not face the emerging of complexity but, at most, of complicated situations.

If this premise is accepted, an immediate consequence arises that in some way revolutionises the paradigm of complexity in businesses (Barile & Saviano,2010, 2011b). We find that complexity in the field of social sciences and especially in business organisations, intervenes when the decision maker is forced to abandon the structural perspective for the impossibility of adopting known calculation criteria. In essence, complexity arises when the interaction that characterises observed phenomena destroys the certainties and known rules of behaviour.

Hence, the quantitative growth of variables and relationships does not control the emergence of complexity. What seems to be relevant in generating conditions of complexity is the type of relationship involved. In other words, it is relevant when the relationship becomes 'nonlinear', where linearity signifies the adherence to a shared rational inter-
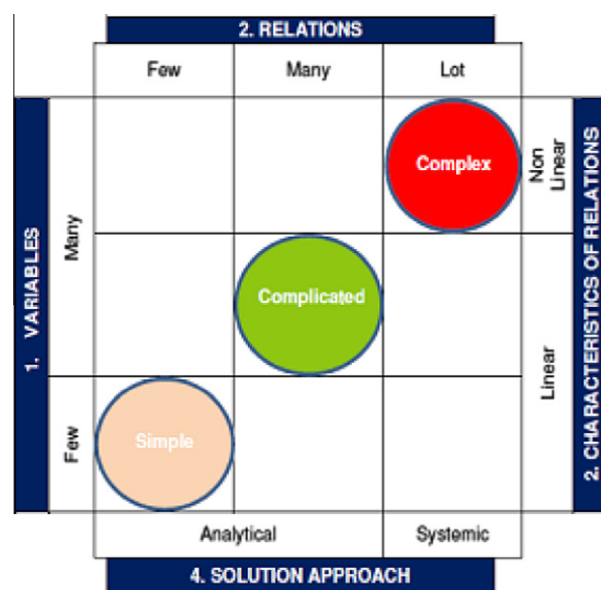

Fig. 1 The dimensions of complexity. Source: Barile S., Saviano M., 2011 (adapted from De Toni & Comello, 2005, p. 16).

pretation scheme derived from the clear-cut criteria of behavioural rules.

Accepting this interpretation, we can observe the following:

- Adequate criteria for complexity governance seem to relate to a systems perspective rather than a structural perspective.
- Complexity manifests itself as the inability to orient and act using criteria and rules that were previously deemed useful.
- When complexity occurs, it is not useful to look for insights to recover stability among models, methods and tools from the past.

Hence, the variability of relationships may generate indeterminacy when observers lose their capacity for comprehension, hence generating complexity (Fig. 2). It is precisely the concept of interaction that, with its functional and intentional aspects, clarifies comprehension of the significance of ''nonlinearity''.

In summary, all of the above addresses a move from an objective to a subjective representation of complexity, considering the following:

- Complexity does not characterise the phenomenon/system in itself but emerges subjectively, characterising the interpretation of the context by the decision maker, who is influenced by his/her mind-set and by emotions emerging from the perception of the context.
- Complexity is not related to the characteristics of the observed phenomenon (variety) or to its dynamics over time (variability); rather, depending on the observer's interpretative capacity, a phenomenon may generate chaos, complexity or complication.
- Complexity arises when the interaction emerging from the relationships in a specific process does not respond to clear-cut criteria of behavioural rules (indeterminacy).
- Complexity forces decision makers to abandon the structural perspective and stimulates the need to evaluate 'objects' that cannot be enumerated on the basis of known calculation criteria (Barile, 2009a).
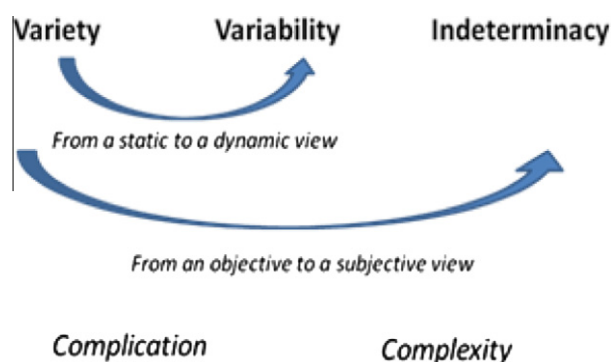

Fig. 2 The systemic (subjective and dynamic) nature of complexity. Source: Adapted from Saviano M., Berardi M., 2009.

A *vSa* interpretation of systems boundaries

The notion of boundaries generally implies a conceptual distinction between an internal context and an external one (Barlett & Goshal, 1989; Ng et al., 2010a, 2010b). From a *vSa* point of view, this leads to the definition of a structure, which may be intended as a static and objective representation of the investigated system. Of course, boundaries vanish when systems dynamics and interactions are analysed. In a certain sense, we can say that interaction redefines the system and with it also its boundaries.

According to the structure-system paradigm (Barile & Saviano, 2011a), it is fundamental to distinguish between the two perspectives that are generally summarised as integrating the descriptive and functional representations of organisations (structural dimension) and the interaction of forces or tendencies that govern the development of processes, subject to constant evolution in response to changing needs imposed by the context (systemic dimension).

It is useful to consider that the statics of the structural perspective, as previously demonstrated, defining a 'physical state' or how 'something is made' of a general entity, are not sufficient to explain 'how it behaves' in the effective development of the entity's systemic dynamics. Moreover, the system emerges from the structure as much in a governed as in an uncontrolled way. This means that even when the planned system is regulated and controlled, interaction and its relative properties will emerge; in other words, they will be activated regardless of the organisation defined by the decision maker.

The phenomenon of emergence (Pessa, 2002) can be traced to the process of forming new collective entities, which are established by the coherent behaviour of the interacting elements and to a process that can be considered dependent on the observer (not so much relative to the observer but a process in which the observer is an integral part). This process considers that collective properties emerge on a higher level of description (i.e., more abstract and requiring a cognitive model other than that in use for the elements); collective properties are detected as new and unexpected by the observer in reference to the cognitive model that is adopted, and are adequate for detecting the conditions of coherence.

The structure, in terms of the composition of correlated elements, has several characteristics. These characteristics include a physical boundary that defines what is proper to the structure and what is extraneous to it, which is of major relevance for identifying the aims of the network analysis (Laumann, Marsden, & Prensky, 1992) and the presence of components to which specific functions have been attributed, and a set of stable links between the components. Unfortunately, these specifications are not useful in identifying features that can be traced to the behavioural dynamics of the structure.

Accordingly, a relevant aspect to consider in adopting a systems perspective is that once interaction has been activated, the emerging system may exceed structural borders involving other external elements in an emergent way and generating unexpected outcomes. In this sense, when an individual focuses attention on a system, all of its observed surrounding reality, together with all of the components of

the system and their relationships, is included in the system (Fig. 3).

Another relevant aspect is the concept of inter-systems stability, which qualifies conditions that are guaranteed by consolidated procedures (routines) that regulate the functioning of the system. At this level, relationships are intended as the ''norm'' in terms of a well-defined mode of interaction among components, which becomes habitual behaviour that is sensitive to influence and is evolving and qualifies the concept of ''rule''. When interaction between components is repeated over time, it is consolidated in ''relationships'' and activates reformulation processes of the same type.

Within a homogenous environment, the rule, which applies the norm, always takes on new profiles and may change over time. As a consequence, the emerging system sees a progressive reduction of consonance with the context, that is, it loses the capacity to guarantee compatibility between its processes and those of the supra-systems that are relevant to interaction with the system and therefore increases the complexity.

This requires the governing subject of every type of social organisation to be aware of these processes and, in particular, to monitor the iterative definition of norms and rules of social behaviour to ensure the constant alignment between governed processes and the expectations, needs and feelings of sub- and supra-systems.

Case implications from a Viable Systems Approach

The London Borough of Sutton Case

The London Borough of Sutton (LBS) is one of the safest boroughs in London (Fig. 4) with one of the lowest levels of crime. Fear of crime by its residents, however, is relatively high. Although crime and the fear of crime have fallen for most types of crimes in recent years, a 2009 poll confirmed that the level of crime was rated as the most important issue for residents. Therefore, residents continue to view improving safety and reducing crime as the top priorities for Sutton Council.

Consequently, the local government objective is working with residents and partner organisations to provide exceptional community safety services to make Sutton the safest borough with the best quality of life in London (Andreu, Ng, Maull, & Shadbolt, 2011).

This case study proposes to investigate the ''reduction of the fear of crime'' as a main goal of a complex service system, emphasising collaboration and adaptation in value co-creation and establishing a balanced and interdependent framework for systems of reciprocal service provision. Sutton Council and the Sutton Metropolitan Police, in fact, work together closely in a unique partnership to improve community safety in the borough. The interdependence of these entities and the integration of their resources are reflected in the Safer Sutton Partnership Service. The objective of the service is to work with residents and partner organisations in cooperation to safeguard well-being and safety in the borough. Through the service, various groups, organisations and individuals can take action, apply

resources and work with others in mutually beneficial ways; the LBS slogan is ''take part, take pride'' (www.sutton.gov.uk).

The London Borough of Sutton as a complex service system

The area of the London Borough of Sutton (LBS) handles numerous services that must be designed, managed, experienced and exchanged, for example, traffic, urban development, energy management, waste management, security and safety, education (schools), local transport and commercial activities. Moreover, LBS may be considered as a complex service system because of the following characteristics:

- The presence of numerous actors who own various types of resources and thus affect service exchanges and co-creation levels according to their specific perspectives and goals;
- high dynamism, which maps numerous relationships and interactions; and
- the difficulty in defining LBS borders.

The number of actors effectively involved within the borough is relevant and we can observe how service exchange is affected by the level at which each actor participates in the service experience. Among these actors we may include individuals/citizens, police, local communities, administrative officers and politicians, shop owners and other commercial activities and households. All of these actors own specific resources that, if shared within the complex system, may support the exchanged service for the specific system's aim, which is the reduction of crime as well as the fear of crime. The determinant of the level of involvement of these actors, however, may be identified in the specific needs and expectations that each actor is willing to fulfil. If an actor perceives satisfaction and a sense of accomplishment related to his/her needs in participating in a specific service experience, then the actor will be willing to share the resource with others in the system.

A high level of dynamics can be observed within the borough because all of the actors, as they interact, are involved at different levels of participation and vary, over time, in their level of satisfaction. Moreover, as service exchanges take place, interaction among actors cyclically modifies the contextual elements that determine changes and trigger dynamics that need to be monitored.

Regarding the boundaries of LBS, it is impossible to define specific borders because each perspective implies a different system. As discussed above, many systems may arise from the same structure, depending on the object under investigation (and the related outcome). Therefore, we may identify the LBS transport system, the LBS energy distribution system, the LBS waste management system and the LBS crime prevention system as components of a whole service system; however, this implies that observers share the same view and outcome because they participate in the ''same'' system. Regarding the safety service system, for example, it is clear that the problem of the fear of crime involves actors that may be relevant for the service exchange. However, this problem also involves actors that
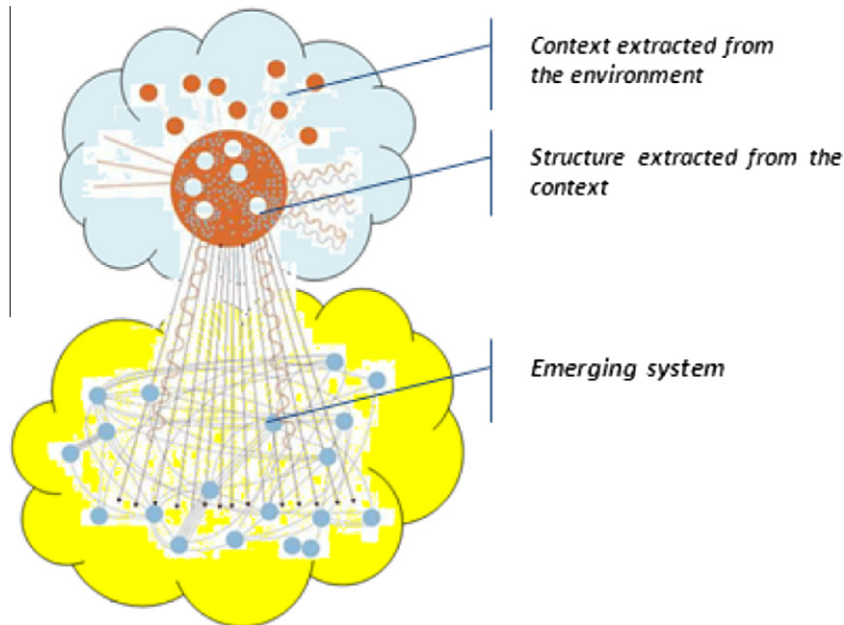
Fig. 3 The emerging nature of viable systems' interaction. Source: www.asvsa.org.

are not restricted to LBS, as in the case of a nearby urban area where many thieves live, which affects the perceived level of crime in LBS because of the criminal activities that are displaced to LBS; in such a case, how could these crimes be placed outside of the boundaries of the LBS system?

On a general level, we have mentioned that from the same structure of components (operand and operant resources of LBS) (Vargo & Lusch, 2008), many systems may arise, depending on the adopted interpretation key (or, we may say, depending on the specific goal under investigation). Thus, the reduction of the fear of crime, once se-

Fig. 4 The London Borough of Sutton. Source: Authors' elaboration from www.rjdance.co.uk and www.londoncouncils.gov.uk.

lected as the goal, highlights, among all possible actors and components, which critical resources can converge towards shared goals. By co-creating value through the generation of synergies, this approach can realise a unitary system that is capable of improving the performance of the complex service system. In other words, the level of fear of crime will decrease if all of the relevant actors are engaged in a service experience that is capable of satisfying their subjective expectations and goals to allow them to willingly share their resources. Table 3 presents a list of actors, resources and goals and prompts consideration of whether or not the specific system can be detected so that LBS will be able to determine positive conditions for the goal under investigation.

Thus, LBS may be perceivable as a complete system only in the case, from a holistic view, when all systems have coherent and compatible dynamics (in terms of resources sharing, goals and satisfaction) and the actors feel they are engaged in a rewarding service experience and are comfortable with allowing their resources to be shared.

The *vSa* contribution to the interpretation of the LBS case

Before we further explore several intriguing insights offered by *vSa* for a better understanding of the LBS case, we must clarify a fundamental premise about the scientific positioning of *vSa* and the expected results of its adoption. The approach is, as suggested above, a conceptual meta-model that can be used to coherently direct the adoption of management models in the investigated problematic context. In other words, *vSa* proposes general interpretation schemes that can be used to better understand a specific complex situation, but it does not provide operative models or a management solution to the investigated phenomenon.

In our opinion, the key issue for LBS which is reducing the ''fear of crime'', involves dynamics that are typical of so-

cio-territorial systems (Barile & Di Nauta, 2011) and that would need to be investigated by adopting a coherent interpretation scheme that is able to capture all of the aspects relevant to the understanding of a phenomenon that is essentially psychological in nature. The *vSa* framework, in this respect, will be valorised to capture the inner nature of the investigated phenomenon, considering its implications for a correct governance approach aimed at making LBS residents feel both safer and more trusting of local government.

Considering the aims of the investigation, we would suggest adopting key elements of analysis and the relative interpretation schemes derived from the *vSa* framework which can be identified by the following:

- The vanishing systems boundaries (structure-system paradigm);
- The subjective psychological nature of the investigated phenomenon of 'fear of crime' (representation of information variety); and
- the role of the unknown in generating uncertainty (complexity model).

Considering the implications of a systems perspective as described above, as a premise for our interpretation proposal we should first clarify which system we are referring to: a system with a goal of ''reducing crime'', a new system with a goal of ''reducing the fear of crime'', or a single system that aims to achieve both goals?

Clearly, it is the ''same'' service system that, despite good statistical evidence (i.e., a lower crime rate), has to address the (apparently) paradoxical outcome of an increased fear of crime, which inevitably affects the perceived service outcomes and consequently the satisfaction of residents as the system's ''customers''.

According to our perspective, the unexpected outcome of ''increased fear of crime'' is an example of the phenomenon of emergence that manifests in open systems interaction and focuses our attention on the problem of drawing boundaries in service systems, as well as in every type of social system.

From a systems perspective, as clarified above, although boundaries are relevant to defining, identifying and managing a system's structure and its components and relationships, they inevitably vanish at the system's dynamic interaction level and unexpected interactions occur. This outcome is due to the typical openness of social systems and although they generally imply negative effects (threats), unplanned interactions may also offer new opportunities to the system in terms of new variety to use to increase the system's ability to face complexity conditions in unstable and rapidly changing environments.

When we refer to socio-territorial organisations such as the LBS case, the system is typically identified and delimited by drawing geographical and administrative boundaries. However, according to the structure-system distinction, it is clear that the system cannot be reduced to the level of a mere physical structure because it involves not only physical operand resources but also non-physical resources and, more important, operant resources that are fundamental to the value co-creation process of the diverse socio-territorial service systems.

However, although government and safety organisations strive to draw boundaries by erecting barriers to undesired physical and non-physical flows incoming from the external context, interaction will emerge that involves all of the elements, even those that are simply perceived by the community and filtered through dominant interpretation schemes, and the service system's outcome will be affected by those elements. Therefore, residents of the community tend to share common norms and rules that, over time, define their culture and influence their interpretation schemes and values systems. Consider, for example, the significance attributed to the graffiti on the walls of the Borough; changing contexts (and perspectives), the same phenomenon may be viewed not merely in a negative way as an expression of vandalism, as well as of political, social (or anti-social) opinions, but even in a positive way as expressions of original artistic attitudes. Therefore, the cultural context, as an expression of the values, norms and rules system shared within a community, cannot be ignored. Thus, decision makers should contextualise every phenomenon and avoid the risks of superficial generalisations.

By valorising these suggestions about a systems interpretation of complexity and its implications when handling non-linear phenomena, we observe how a typical 'linear' problem-solving approach suggests the interpretation of the growth of crime in LBS, despite the evidence confirming an average decreasing crime rate. This points to a problem of inadequate communication of the positive results of the LBS safety service system.

In contrast, our perspective finds that this approach may even produce an opposite effect or otherwise may fail to solve the problem. Our hypothesis is that to the community of LBS, safety is becoming a 'dominant' interpretation scheme (related, in turn, to the more general ''survival'' interpretation scheme that characterises any type of viable system), making the level of crime a top priority and influencing the perception and interpretation of any incoming information that is related to it whether directly or not.

Furthermore, according to the insights introduced above based on the interpretation of the information variety, in the case of LBS, we may argue that the relevance attributed to the information regarding ''reduction of crime'', based on 'statistical' data and quantitative measures, may be not sufficient to balance the effect of the growing uncertainty generated by daily news about crime (through the media) and may result in making the residents feel less safe. In this respect, we should also consider the effects of the attention by local media on crime and the emphasis on the goal of reducing crime by local government; as previously shown, while trying to increase their commitment and involvement in the fight against crime, these entities may actually be contributing to increasing the fear of crime.

From our perspective, this case represents a good example of uncontrollable emergent outcomes of social systems in that what can initially appear as a paradoxical situation (crime is reducing and fear is increasing) can be solved by changing the perspective/approach; this can be accomplished by shifting the focus from an objective consideration of data to a subjective interpretation of the phenomenon based on the LBS community perception that is affected by open interaction dynamics within a global context, even far from the LBS borders.

Table 3 The passage from individual perspectives to a system view of LBS.

Actor	Owned resource	Possible individuals goal s	The emergence of the system	
			Key factors	Convergent goal
Citizen	Consensus Taxes Social involvement	Healthcare Sport Wealth Environment	Behaviour	Reduction of ''fear of crime''
Metropolitan police	Safety control	Road accidents prevention Fire prevention	Crime dissuasion Crime prevention	Safety
Shops/ organizations	Labour offering Economic exchanges	Profits Cheap labour workforce Positive image	Salaries Employed workforce	Profits Reduction of crime
Politician	Investments	Economic growth Taxes reduction Consensus	Communication Crime policy definition	Crime reduction policy
Others	. . .	. . .	. . .	. . .

On the basis of our hypothesis, in the case of LBS, it seems that the more organisations emphasise the safety goal, the more relevance residents attribute to safety and the fear of losing safety grows as well, that is, the fear of crime grows, which is an example of a problem that requires a change at a meta-level, shifting from the internal to the external borders of the problem (Watzlavick, Weakland, & Fish, 1974). This interpretation may even suggest a reduction in the emphasis on the fight against crime, which does not mean a reduction in the commitment to fighting crime but control of unexpected emotional reactions within the community based on a view that extends beyond the local LBS area.

Therefore, we focus on the relevance of the subjective dimensions of the categorical values and interpretation schemes in determining feelings and behaviours in the inter-action process between viable systems (of both individuals and organisations). In other words, decision makers should focus on the social and psychological aspects of LBS residents.

This shift focuses attention on issues that involve different perspectives and in particular, other disciplines (primarily sociology and psychology), hence requiring different types of expertise to carefully investigate the phenomenon. However, the shift also highlights a core aspect of what generally qualifies as complex service systems: the need for a unitary view that overcomes the risk of fragmentation of the knowledge required to understand social systems (which are unitary in nature).

With an awareness of the effects of shifting on other disciplines and to avoid falling into the trap of superficial interpretation, we cannot pass up an attempt to identify the mechanism that paradoxically increases the fear of crime despite evidence to the contrary. This leads us to deepen our understanding of the mechanism of fear as a relevant aspect of social life of service systems at an even more general level. In this respect, the aspect of fear, in the conceptual context of the emergent interaction of open systems, appears to be strongly linked to the conditions of complexity. Complexity is thus interpreted, as proposed above from a *vSa* perspective, not so much as growing variety and variability but primarily as indeterminacy that generates uncertainty.

In the field of psychology, uncertainty is generally defined as a condition that generates a state of anxiety. This condition of anxiety, which is typical of modern society, is significantly responsible for increasing feelings of fear. The fear of crime, interpreted according to the definition of anxiety, manifests as a feeling that is not connected to any specific stimulus (Bourne, 2010). In fact, the cognitive component of anxiety (Seligman, Walker, & Rosenhan, 2001) is associated with the expectation of a diffuse and uncertain danger.

Thus, the identified key items of interpretation of the LBS case-fear, anxiety and uncertainty-clearly link the issue under investigation, the fear of crime in LBS, to the issue of complexity through the concept of uncertainty (Fig. 5). In this respect, the (meta)model of complexity may help to capture the role of the ''unknown'' in generating uncertainty, disorientation and destabilisation in social systems, indicating a shift from ''rational'' to ''emotional'', in which the reference to common rules and criteria becomes ineffective in explaining reactions and behaviours.

From this perspective, the increased fear of crime appears to be anything but paradoxical. On the contrary, it emerges as a coherent and ''linear'' reaction to concretely perceived existing dynamics that can be identified only by 'opening' the view and, most of all, by assuming the points of view of the interested subjects.

Therefore, the strong commitment in LBS to fighting crime strengthens the relevance of safety as a general interpretation scheme and consequently may increase the fear of

Fig. 5 The possible relationships of *openness-uncertainty-anxiety-fear* in the LBS complexity. Source: Authors' elaboration.

losing it. Because the ''fear of crime'' phenomenon clearly appears to be, according to a traditional interpretation scheme, not logically correlated with evidence of the ''reduction of crime'', it cannot be addressed by adopting a problem-solving approach (e.g., through communication). In fact, the phenomenon requires a governance approach that is able to act on the subjective relevance of perceived reality (feelings of fear) by reducing the cognitive distance from the phenomenon (crime). As shown, these considerations suggest focusing on the psychological dimension of service exchange that affects perceptions when dealing with (open) social systems and moves towards ''nonconventional'' solutions to the issue under investigation. Nevertheless, we should be careful in ''trying'' unproven solutions because they can determine other ''unexpected'' outcomes; however, this is a situation of complexity.

Thus, in a service system, when identifying the system's customers and goals and evaluating their expectations of value, it is fundamental to clarify the perspective and processes for analysis; this entails an awareness that systems, as process dynamics, do not themselves ''physically'' exist (only their structures objectively exist) and that is where structural approaches (e.g., building physical and non-physical boundaries to ''defend'' a community from ''external'' threats) may produce unsatisfactory outcomes.

Concluding remarks

Implications for LBS decision makers

Governance actors in LBS (e.g., the municipality, safer neighbourhood inspectors, the ward councillor, the resident association representative, the street scene manager and the council manager) would benefit from the adoption of the citizens' viability perspective and direct governance actions in a sustainable way (Saviano & Iorio, 2010). In this way, these actors can invest resources in monitoring the open context conditions that determine not only criminal actions but also the fear of crime to offer residents safety as well as well-being and trust.

Furthermore, because some of the factors influencing the feeling of fear in the LBS case seem to be related primarily to an emerging uncontrollable and unidentifiable type of crime, such as that attributed to younger generations, whose behaviour is becoming more unpredictable, traditional forms of control and prevention may fail in reducing both this type of crime and the fear of it among LBS residents. In this respect, we should also consider that the common criteria adopted in interpreting and classifying criminal actions may suffer from the consequences of ''evolution'' in criminal activities that are changing over time and becoming more difficult to identify and classify on the basis of traditional criteria. ''Higher class'' forms of crime are increasing, breaking down the ''boundaries'' between what can be clearly identified as ''criminal'' or not and current statistics based on offence type may not effectively consider these new forms of crime.

The effect of these conditions becomes evident: it increases uncertainty and has a strong impact on the levels of trust and safety in the community. This is where the complexity conditions in the LBS service system aimed at ''reducing the fear of crime'' clearly emerge, making it difficult to identify effective solutions and lines of action.

Implications for researchers

This discussion of the LBS case demonstrates the complex ''decision-making'' nature of these types of issues and warns decision makers against addressing them by adopting a simple problem-solving approach (Barile, 2009a; Vannini & Di Corpo, 2009). Accordingly, the adoption of *vSa* to the LBS case will not provide solutions or prescriptive suggestions; however, this adoption will improve the decision maker's opportunities to understand the observed phenomena by stimulating the adoption of specific interpretation schemes.

In conclusion, it is worth noting that the proposed interpretation does not absolutely aim to be accepted as the best one. It simply aims to warn decision makers about the risks of hasty choices, suggesting that they avoid becoming overwhelmed by traditional interpretation ''borders'' and, by changing perspective, that they be open to the contribution of other knowledge domains, even those that are far from the established and orthodox (also ''comforting'') traditional toolbox. Thus, decision makers will be able to valorise and capture the inner significance of decision making under conditions of complexity (Saviano & Berardi, 2009).

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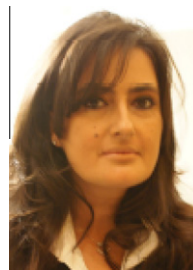
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