A Multi-Level Framework for ICT-Enabled Governance: Assessing the Non-Technical Dimensions of 'Government Openness'

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Abstract: This paper proposes an interpretative framework which aims to provide a systemic perspective and an instrument to elicit the links between Information and Communication Technologies (ICTs) and governance, outlining the various challenges that this poses. In particular, it discusses the multiple dimensions of governance and identifies the public value drivers underpinning the conceptual and measurement framework proposed. In doing so the paper focuses on the 'openness' of governance mechanisms through its interoperability dimension. It considers state-of-the-art contributions at both academic and practitioner level and it also looks at how the proposed framework can be applied to the evaluation of two case studies at cross-border, and national-city level in Europe. Interoperability in fact is predominantly seen as an instrument for enabling cross-border collaboration between public administrations within and between different Member States. Many initiatives and projects have been promoted and carried out during the last decade resulting in a growing number of potentially reusable best practices and benchmarks. Nevertheless, the complexity and volume of resulting project outcomes represent a challenge for effective exploitation of the results in other initiatives and intervention contexts. Moreover, despite the recognition of interoperability as a multi-faceted concept (i.e. technological, organizational, and semantic), it seems to be mainly the technological aspects of interoperability that emerge from the available project results. The paper concludes outlining indications for future research and in particular on interoperability as a key driver for ICT-enabled governance. Interoperability is found to play a strategic role in the delivery of e-Government services to local and national communities within the EU. Moreover, its significance is expected to increase over the next few years, especially in terms of how it supports emerging city governance models and acts as the backbone of communications at a pan-European, national and local level.

Keywords: interoperability, eGovernance, information systems, Europe, policy, value

1. Introduction

The interpretative framework for ICT-enabled governance proposed in this paper resulted from exploratory research conducted by the Information Society Unit of the Institute for Prospective Technological Studies (IPTS) of the European Commission's Joint Research Centre, on emerging ICT-enabled governance models in EU cities (EXPGOV) (Misuraca 2010a).

This research aimed to better understand the interplay between ICTs and governance processes at city level and formulate a multi-dimensional framework to assess the various dynamics emerging from the application of ICT-enabled service innovations in European cities.

In this research governance is defined as the process of decision-making and the process by which decisions are implemented, monitored and evaluated. These changes in decision-making are strongly conditioned by historical transformations in society's underlying values and organisational models and can be analysed from several research perspectives (Misuraca 2010b). In particular, ICTs are important tools to support the transformation of governance processes through eGovernance, where eGovernance is defined by Misuraca as the field of activity where policy design, decision-making, co-ordination, arbitration, networking and regulation, with ICTs, but also of ICTs, take place (Misuraca 2010b). eGovernance can therefore be considered as a broad framework to capture the co-evolution of ICTs' various stakeholders with the political institutions, at local, national and global level. eGovernance can also be regarded as a multidimensional construct that encompasses ICT research, at the intersections with social, economic, political, and organizational science research, and

addresses the investigation of the missions of government in relation to the interests of society (Misuraca 2010a).

The proposed framework aims to provide a systemic perspective and an instrument to elicit the links between interoperability and governance, outlining the various challenges that this poses, especially from a European perspective, in order to link local to pan-European perspectives. It is feasible to say that local authorities should be considered a fundamental part in this multi-level or - as it is often called in official documents – "pan-European" governance, which consists of increasing networking between local and national administrations across the European Union and of the emergence of a new and more integrated "European public space". European strategy related to the harmonization of policy-making in the field of e-Government among the Member States is not a "law-making system". On the contrary, it is based, as Criado states, on "'soft' institutional mechanisms of coordination, which consist of spreading best practices, benchmarking, defining common policy objectives and common technological, semantic and organizational standards. While vertical mechanisms are based on adaptive pressure and coercion, horizontal mechanisms indicate policy framing, mutual adjustment and policy learning" (Criado 2009, p. 301). In this sense, local e-Government initiatives and experiences play an important role in this process of "soft Europeanization".

This paper thus looks at the state of the art in e-Government, discussing the multiple dimensions of ICT-enabled governance within the EU, the value drivers underpinning the conceptual and measurement framework proposed, and how this could be applied to the evaluation of ICT-enabled governance systems in two case studies at cross-border and national-city level in Europe. The paper concludes by presenting the main findings of this exploratory analysis, and outlining indications for future research on interoperability as a key driver for ICT-enabled governance.

2. A multi-level network approach to analyse ICT-enabled governance

Research on organizational networks can be broadly characterized by two basic approaches: the 'network analytical' approach and the 'network as a form of governance' approach, both of which are limited when it comes to analyzing multi-level networks functioning and governance.

Network analytical approaches focus mainly on micro-level, egocentric aspects of networks, building largely on work done by sociologists studying networks of individuals. This perspective has had a long history (since Moreno 1934). Scholars have contributed especially to the description and explanation of network structural characteristics using such concepts as density, centrality, and structural holes (see e.g. Burt 1992; Wasserman and Faust 1994). The units of observation are a set of objects called nodes, positions, or actors, and a set of present or absent relations among these objects referred to as edges, ties, or links (Knoke 1990). In network analytical approaches, the main objective can be either to describe, explain, or compare relational configurations or to use these configurations to explain certain outcomes (Provan et al, 2007).

The functioning of organizational networks can be partially addressed using this approach, since functioning is defined as the process by which certain network conditions lead to network outcomes. The problem, however, is that for the most part, what gets analyzed and explained is not the network itself, but the 'nodes' and 'relations' that comprise the network (cf. Graddy and Chen 2006; O'Toole and Meier 2006). Apart from some notable exceptions (e.g., Owen-Smith and Powell 2004; Powell et al. 2005; Provan and Milward 1995; van Raaij 2006), the unit of analysis (i.e., the phenomenon to be investigated) in this literature is not the complete network but a node (ego) or a dyad. In these studies, findings are related to questions of whether or not the way an actor is embedded in a network has an effect on the outcomes of the actor (such as level of innovation, performance, and learning) (Ahuja 2000) or on describing and explaining the birth, death, effectiveness, etc. of dyadic relationships (cf. Larson 1992; Van de Ven 1994; Uzzi 1997). Consequently, this literature tells us little about the functioning of networks, because networks are seldom treated as the unit of analysis.

The network as a form of governance approach, in contrast, does treat networks as the unit of analysis. Network is viewed as a mechanism of coordination, or what has often been referred to as network governance. Starting with Williamson's (1975) Markets and Hierarchies, a rich literature has developed on different forms of governance over the last three decades. As seen from an economic perspective, this literature challenged the conventional wisdom that the market is the only efficient system of non-hierarchical coordination. From an organization and administrative science perspective, the most innovative aspect of this literature is that it made clear that organizations cannot

be taken as something for granted (see Perrow 1986) and that other forms of coordination, such as networks, can equally achieve goals. Consequently, a discussion unfolded as to whether networks are simply a combination of elements of market and hierarchy, and could, therefore, be placed on a continuum between market and hierarchy, or whether they would be better understood as unique forms of governance in their own right (see Powell 1990).

This literature moved toward treating networks as discrete forms of governance, characterizing them as having unique structural characteristics, modes of conflict resolution, bases of legitimacy, etc. (cf. Jones et al. 1998; Raab 2004). Although the governance approach considers networks as the unit of analysis, the tradition has been for networks to be treated as undifferentiated forms, as if they all be characterized in the same general way (e.g., Jones, Hesterly, and Borgatti 1997; Powell 1990). This may be due to the fact that for the most part, networks were seen as a 'new' and 'positive' mode of coordination that needed to be distinguished from markets and hierarchies.

A functionalist argument dominated, claiming that networks are a response to failures of markets, failures of hierarchical coordination, and to societal and technological developments. The implication was, and continues to be, that despite problems, networks in general can produce positive outcomes that would not be possible in a market or a hierarchy.

What we propose in our approach (see Misuraca et al., 2011), instead, is to combine the network analytical and 'governance' perspectives, and focusing specifically on the enabling networking role played by ICTs in support of the functioning of the governance system, intended as a network (networked governance as ICT-enabled governance model).

The governance perspective is valuable in that the network itself is considered to be the unit of analysis. Networks are forms of social organization, which are more than the sum of the actors and their links and which deserve to be studied in their own right (O'Toole 1997). The network analytical perspective contributes another central idea to our work -that networks are a set of actors or nodes, with relationships between these nodes as being either present or absent. Thus, networks are considered to vary with regard to their structural patterns of relations and according to the use of ICTs for governance to enable network effects.

Consistent with this logic, we view networks enabled by ICTs as a variable, examining different networked governance configurations and the conditions for the effectiveness of each form (i.e. ICT-enabled governance models) we aim at demonstrating that ICT-enabled governance networks with different configurations have different network-level effects. This can be considered also our main research hypothesis and the basis for establishing a rationale for developing multi-level network theories in the area of ICT-enabled governance and the further development of a measurement framework.

3. The interoperability dimension of Governance Openness

Interoperability plays a strategic role in the delivery of e-Government services to local and national communities within the EU. In terms of technical definition, an interoperability platform is a solution that enables two or more software applications to exchange data and achieve a common objective, even if the two applications were not originally intended to cooperate. However, interoperability can take place at different governance levels; i.e. from the exchange of simple data items, to structured documents (e.g., a purchase order), to business process cooperation where different organizations are enabled by interoperable software applications to achieve a common objective (Gottschalk 2009). According to the European Interoperability Framework (EIF) and the UNDP e-Government Interoperability Study Group (UNDP 2007), there are three *layered stands* for interoperability:

- *Technological interoperability*: This includes both hardware and software issues. The former mainly concerns connectivity and protocols (e.g., TCP/IP), while the latter concerns a common syntax (e.g. XML) for data, but also standards for messaging (e.g. SOAP and WSDL). A technological interoperability platform allows two organizations to reliably exchange messages, but the actual understanding of message content remains outside of its scope.

- *Semantic interoperability*: This implies that, despite divergences in the structure, organization and content of the exchanged data, the intended meaning is correctly conveyed, the information is correctly acquired and the expected actions are understood and undertaken.

- ▪ *Organizational interoperability*: For an effective and far-reaching cooperation between two (or more) organizations, organizational interoperability also needs to be addressed. The latter means that the two (or more) cooperating organizations are able to effectively perform a cooperative task, exchanging information and services. Furthermore, this layer also includes the progressive adoption of best practices, necessary to ease an effective interoperability. Organizational interoperability is generally supported by adopting an appropriate framework, such as ebXML, TOGAF, or e-GIF.

These three layers are interdependent. For instance, the user interface and interaction methods (for civil servants and end users) require solutions that cut across the three layers. They also have an inherent progression, in terms of the achievable interoperability scope.

Two further conceptual elements help scholars and practitioners to assess the interplay between these three levels: interoperability maturity models and interoperability scope. The *maturity level* concerns the organizational capacity to achieve interoperability. Interoperability initiatives should consider the actual administrative needs and available resources according to the defined objectives. When complex organizations start a process aimed at integrating its different databases and application systems, they should clearly define the progressive levels of interoperability they want to achieve. To help in this direction, administrations should adopt a layered maturity model for interoperability (Interoperability Maturity Model, or IMM). In order to achieve advanced and effective interoperability solutions, to consistently model the organizations involved in the interoperability process is a crucial precondition. The IMM (already adopted by many governments around the world, such as the Australian Government for example) closely follows the Capability Maturity Model Initiative (CMMI) framework, which consists of the following five maturity levels: Initial; Managed; Defined; Measured; and Optimised.

Interoperability maturity models aim to define different stages across a continuum of networking capability of organizations. These stages are described not only in technological terms. On the contrary they are a mix of policy, management and technological elements. In general these models expand their perspectives beyond a technology development perspective (i.e., software development or implementation) and focus on the required mix of policy, management, as well as technology capabilities to achieve the broader goal of improved delivery of government services and programs (Pardo and Brian Burke, 2008). Thus It is feasible to say that Interoperability has no value per se; its value depends on the context of cooperation among organizational units and the benefits produced in terms of the public value they contribute to produce (Misuraca and Zambrano 2009).

Finally, the concept of maturity level of interoperability is tightly related to the kinds of object that are managed via the interoperability platform: i.e the concept of interoperability scope. The interoperability scope is determined by the elements that are considered and managed by the interoperability platform, namely: simple data items, structured documents, services, processes, organization models and strategies. Interoperability initiatives should be undertaken considering the actual administrative needs and resources according to the defined objectives.

4. An interpretative framework for assessing the public value of ICT-enabled governance

With specific regard to the evaluation of the impact of ICTs on governance, despite considerable resources have been invested in supporting innovation in public administration through ICTs, a consensus about how to evaluate the results of the investments in e-Government projects to transform governance systems is still lacking.

On the one hand this is due to the fact that not all the results of the ICT-enabled innovation processes, which have been put into action, are visible yet. On the other hand, the complexity itself of the concept of eGovernance makes it difficult to define an evaluation system that can be applied to all the areas covered by this multi-dimensional construct (e-Administration, e-Services, e-Inclusion, e-Participation, etc.).

Adopting a broad definition of e-Government, such as the one suggested by the Organisation for Economic Cooperation and Development (OECD, 2003), where *e-Government can be considered as the process of innovation of Public Administration in order to achieve innovative forms of government*

and governance through the use of ICTs, the evaluation of an e-Government system must be referred to its capacity of improving on the whole the performance of the organisation adopting it.

In this perspective, the concept of public value can provide an interesting support for the evaluation of ICT-enabled governance. Public value refers to the value created by government through services, law regulations and other actions (Moore 1995). The close relationship between the concept of public value and e-Government was first noted by Kearns (2004). From this perspective, the use of ICTs to improve government and governance is also a means to improve the production of public value. Thus, an e-Government system resulting from a process of technological and organisational innovation can be indirectly evaluated by considering the possible increase of public value deriving from the adoption of that system. In general, a public value-based evaluation must be performed by considering the value that citizens perceive in their interactions with Public Administration (Alford 2002; Bannister 2002). Since the interactions between stakeholders and Public Administration can concern both stakeholders as users (mostly citizens) and stakeholders as operators of Public Administration (mostly private organizations and suppliers), public value can be measured both from an external point of view (stakeholders as users) and from an internal point of view (stakeholders as operators). In the first case, the policies for e-Government can be evaluated with respect to the quality of the services delivered. In the latter case, they can be evaluated with respect to their ability to improve the system of local government (Castelnovo and Simonetta, 2008). All these results can be achieved only by means of a governance framework that considers the various relations and effects (not only from a technical perspective) in a 'dynamic' manner, and maintains the aggregations (for example, at city or community level) stable in time.

Within this context, we make reference to recent work in the area of social studies, public policies and ICTs (see e.g. Viscusi et al. 2010), and more specifically to the research conducted by the Information Society Unit of the Institute for Perspective Technological Studies (IPTS) of the European Commission's Joint Research Centre, namely the Exploratory Research on emerging ICT-enabled governance models in EU cities (EXPGOV) which developed a theoretical model and a proposal of framework for assessing ICT-enabled governance. The EXPGOV theoretical model argues for the adoption of a wide definition of e-Government as a system of ICT-enabled innovation policies for public administration and related governmental functions. From this point of view, ICT-enabled projects can be considered high-level, context-sensitive interventions that aim to introduce and facilitate gradual changes.

In this connection the EXPGOV project has identified three main *value drivers* that constitute the basis of a measurement framework for ICT-enabled governance:

- *Performance*: effectiveness and efficiency (enabling optimal use of resources for citizens and tax payers in the service delivery); and also, indirectly, responsiveness (serving all citizens in a consistent and predictable way).

- *Openness*: access to information as a proxy for participation (enabling the empowerment of citizens so that they can legally control service delivery to their advantage) and transparency (bringing visibility to citizens of the service workflow by means of automated service delivery); and accountability (creating standards against which the individuals providing a service and the service delivery can be held accountable), that also serves the goal of ensuring consensus orientation (following democratic practices).

- *Inclusion*: equity and inclusiveness (referring to citizens receiving a service on an equal basis and providing services to disadvantaged and minority groups), which implicitly ensures respect for the rule of law (ensuring that laws and regulations governing the service are applied impartially).

These value drivers represent the principles and the expected outcomes of ICT-enabled initiatives, experiments and pilot projects taking place at different governance levels.

More specifically, the Openness value driver also includes as a fundamental component, the interoperability dimension, both in terms of Technological interoperability (i.e. diffusion of standards and technological infrastructures and systems for interoperability) that in terms of shared data and services (i.e. the ability of administrations to access data by means of the inter-administration back office, and the possibility for external users to access administrative data via ICTs).

In this regard, though it has been recognized that interoperability plays a key role in ICT-enabled governance, there has been little research into the non-technical dimensions of this phenomenon, or into the relation between interoperability and governance processes. Furthermore, there are few instruments which allow the systemic perspective needed by scholars and public administration managers to face up to the challenges of these multiple facets of interoperability. At the moment, a silo representation of interoperability tends to prevail. For this reason in this paper we discuss a conceptual model built on the analysis of state-of-the-art research and literature on ICT-enabled governance, and also the authors' previous experiences in the implementation of concrete projects.

The conceptual model represented in Figure 1 aims to support the elicitation of different configurations of Interoperable governance systems on the basis of the relationships between the following factors:

- Governance model characteristics (i.e. cultural administrative tradition and socio-economic characteristics of the intervention context)

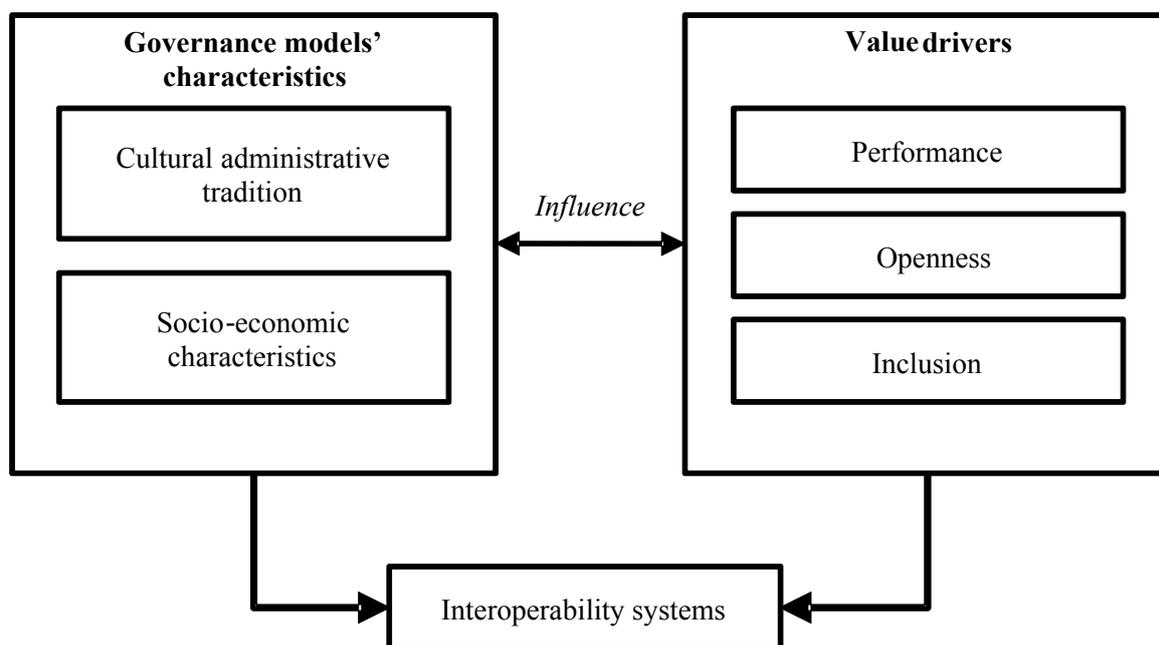- Value drivers (i.e. performance, openness, inclusion).

Figure 1: The conceptual model

This conceptual model aims to provide an interpretative instrument to deal with the multiple facets and layers of ICT-enabled interoperability and governance. In particular, the role played by interoperability and its impact on the *value drivers,* in turn influenced by *governance model characteristics* and related dimensions (see Figure 1), can be evaluated in terms of quality dimensions associated with the considered value drivers. Thus, for each driver we provide a set of quality dimensions, which enable a better interpretation of the type of contribution offered by interoperability initiatives. The relevance of a systemic perspective on quality assessment to support the strategic planning of e-Government initiatives has been discussed in Viscusi, G. et al. (2010), who also propose a quality framework. This framework has been applied to eGovernance issues in Misuraca, G and Viscusi G. (2011) and Misuraca, G., Alfano, G. and Viscusi, G. (2011).

In this paper, we apply some of the dimensions of this framework to the elicitation of interoperability targets and goals for each considered value driver (see Table 1).

In the following section, we apply the conceptual framework to two European case studies at different governance levels: one is a cross-border pan-European project and the other, a city government initiative.

5. A pan-European case study: STORK

STORK (Secure idenTity acrOss boRders linKed) is a large-scale project involving 17 EU countries, with backing from the European Commission. The STORK project deals with the use of electronic identities in a cross-border context and it has established a number of pilot projects to test the mutual recognition of eIDs by public authorities in different European Union member states (Tauber, A. and Rössler, T., 2010). STORK is working on an EU-wide interoperable solution to provide mutual recognition of eID and eID-based services such as authentication, which will enable citizens and businesses to use their national eIDs in any Member State involved in the project.

Table 1: Drivers, quality dimensions and related levels of application

Value driver	Dimension	Quality level
Performance	Efficiency	Service
	Effectiveness	Organization
Openness	Transparency	Service
		Organization
	Accountability	Organization
		Legal
	Accessibility	Organization
		Technology
		Information
Inclusion	Accessibility	Service
		Technology
		Information

The six STORK pilots (described in Table 2 with related goals, value drivers, and involved countries) are testing common eID specifications for several applications that have a substantial impact on e-Government across Europe. In particular, the technologies and services developed and tested by the STORK project are expected to be key enablers of interoperable electronic identification management (eIDM) for access to e-Government services across Europe. The STORK electronic identity project has gone live with a first pilot initiative, which demonstrates how European Union citizens can use their national eIDs to receive electronic documents securely from eDelivery portals of any participating EU Member State. As an example, the cross-border eDelivery pilot demonstrates how citizens of Slovenia, for example, can register at Austria's eDelivery portal. Using their existing national eID cards, citizens are able to receive and pick up electronic documents by accessing the Austrian eDelivery portal. In addition, citizens may also receive eDeliveries from senders in other Member States through the Austrian portal. Currently, Austria, Estonia, Finland, Luxembourg and Slovenia are participating in the cross-border eDelivery pilot.

The STORK project is expected to be a best practice or benchmark for further cross-border initiatives dealing with the exchange of sensitive information and documents. Indeed, the main outputs of projects like STORK are expected to be functional documents for ICT-applications integrated in a

cross-border platform. As a confirmation of the 'best practice' nature and aims of STORK, the project on 15 November 2011, is set to receive a Best Practice Certificate at the European Public Sector Award (EPSA) 2011 to be held in Maastricht, the Netherlands (furthermore, STORK is among the 58 projects were submitted by 18 European countries)[1].

Table 2: STORK Pilots goals, value drivers, and participants (source: https://www.eid-stork.eu/pilots/index.htm)

Pilot number	Pilot name	Pilot goals	Value driver	Participants
1	Cross border authentication for electronic services	• Deliver technical interoperability between the electronic services in one Member State with the eID infrastructures in other Member States via the interoperability layer provided by STORK. • Demonstrate the flexibility and scalability of STORK common specifications for the EU interoperability layer to accommodate a range of national services. • Test and implement the trust framework by operating services requiring different authentication levels. • Test the use by citizens of a variety of credentials to access cross border services. • Assess ease of use and take-up of cross-border e-ID services.	• Openness	• Austria • Belgium • Estonia • Finland • Germany • Iceland • Italy • Portugal
2	Safer Chat	• Enable students and teachers to use their secure national electronic identities in the Member States. • Test secure and easy-to-use eID solutions for students and teachers at both national and European levels. • Interact with other EU initiatives to maximise the usefulness of eID services and the long term sustainability of the SaferChat application. • Provide a scalable solution with open source specifications for possible take-up throughout the EU and for sustainability of the solution in the long term.	• Openenss	• Austria • Iceland
3	Student Mobility	• Use the STORK infrastructure for developing cross-border electronic services in the academic environment. • Evaluate the viability of extending the application to provide, for example, interoperability between administrative offices from different universities.	• Openness	• Austria • Estonia • Italy • Portugal • Spain
4	Electronic Delivery	• Demonstrate how the STORK protocol elements, can be used to create a cross-border eDelivery solution. • Create a rudimentary cross-border eDelivery protocol. • Deploy the STORK authentication components in the national eDelivery portals of the participating partners for authentication purposes.	• Openness	• Austria • Estonia • Finland • Luxembourg • Slovenia
5	Change of address	• Develop a set of common specifications for the implementation of	• Openness	• Estonia • Finland

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[1] See http://epractice.eu/en/news/5313444

Pilot number	Pilot name	Pilot goals	Value driver	Participants
		a pan-European Change of Address service. • Achieve interoperability for the Change of Address service without changing internal processes currently in place in the Member States. • Identify potential problems and pitfalls preventing wide-scale adoption of such a model. • Provide a working technical solution independent of the legal constraints in each Member State. • Develop a pilot service that allows citizens to change their legal addresses to a new location in any participating Member State, through the use of the STORK interoperability layer.		• Portugal • Slovenia • Spain • Sweden
6	The ECAS (European Commission Authentication System) integration	• Enhance European Commission electronic services by Member States' electronic identities	• Openness	• Austria • Belgium • Estonia • Germany • Iceland • Italy • Portugal • Slovenia • Spain • France

Nevertheless, even though interoperability is declared to be a multi faceted concept, the final outcomes of projects like STORK tend to focus mainly on the technological aspects of interoperability. Therefore, the main challenge would be to elicit the multiple dimensions of interoperability for the value drivers that underpin ICT-enabled governance systems. As to STORK, Table 2 points out *openness* as the main value driver emerging from the comparison of the different pilots related goals. Indeed, as discussed in Section 4 *openness* concerns access to information as a proxy for participation/accessibility (Pilots 2, 3, 5, 6), transparency (Pilots 1, 4), and accountability (Pilots 1, 5, 6). Taking these issues into account, in Table 3 here below we apply the interpretative model proposed to the STORK project.

Table 3: Governance value drivers, quality dimensions, and type of interoperability

Value driver	Quality dimension/level	Type of interoperability (enabling layer)
Openness	Accountability/Legal	Organizational
	Accountability/Organization	
	Transparency/Organization	
	Accessibility/Service	Semantic
	Accessibility/Legal	
	Accessibility/Technological	

As shown in Table 3, the main challenge for cross-border initiatives (such as STORK is) dealing with the exchange of sensitive information and documents is related to the fitness or alignment of the *openness* value driver (as the strategic and political guiding principle) and the different cultural administrative traditions at operational and procedural level. In the STORK project, the alignment has been reached by dealing first with the legal and organizational issues, and then with the service and related technological issues.

In terms of quality elicitation, the implementation of the openness value driver focused first on *accountability* at legal (*who is the by law owner? who is the guarantor of information flow? how can rules and laws from different legal frameworks be aligned?*) and organizational level (*how can the administrative process be coordinated in order to make transparent the service provision and the local responsibilities?*). As a consequence, *accessibility* was also a relevant quality dimension which could improve the above mentioned accountability and transparency levels: e.g. accessibility to citizens of

services (in terms of language and appropriateness for the e-readiness level of constituencies); accessibility at legal level to public administration employees and managers (in terms of understanding laws and rules from foreign legal frameworks); accessibility at technological level (in terms of cooperative information system architectures, allowing multichannel provision of services at front-office level).

Thus, the application of the interpretative model discussed in Section 4 shows that organizational and semantic interoperability are the main focus for projects like STORK and should be addressed in parallel to technological interoperability issues. Furthermore, the model allows us to elicit the critical quality dimensions to be considered and the level at which they have an impact. This again highlights the need for a multi-level analysis when conceptualizing and implementing such a broad and ambitious interoperability initiative at pan-European level.

6. A city case study: VENIS

VENIS (Venezia Informatica Sistemi S.p.A.) is an ICT company owned by the local authorities and the public utilities of the City of Venice. It has a wide spectrum of objectives concerning the design, implementation, management and maintenance of the information systems, the software, the technological infrastructures and the telecommunication networks used by the majority of the local authorities and the public utilities of Venice. Venis states on its internet page that the 'innovation of the City' is the mission it has been given by the local authorities.

The local government is the biggest shareholder in Venis (75.1%), followed by ACTV S.p.A – a local transport company (14.9%), the municipal Casinò of Venice and Veritas S.p.A a local public utility (5% each). Moreover in the future shares will be issued to other important institutions of the City of Venice, such as, for example, the "Fondazione Musei Civici" – the municipal cultural foundation that manages and promotes the museum system of Venice. This broad sharing of ownership of VENIS amongst Venetian public institutions aims to secure wide product diversification, with economies of scales. Furthermore, it contributes to fostering interoperability between the information systems of local authorities - the backbone for enabling an ICT-enabled governance system for the City of Venice.

Although it is owned by local institutions, VENIS has considerable managerial autonomy in the industrial, commercial, and financial operations covered by its statutory purpose. It is fair to say that the projects managed by VENIS are not focused on the technological needs of a given institution but on the urban systems as a whole. In 2009 and 2010, two of the main projects VENIS dealt with were the construction of an urban fibre-optic network and the design of "Venice Connected", the official city website for tourism that aims to develop a sustainable tourist flow into Venice. The fibre-optic network provides a high transmission capacity (10 Gigabits) and connects not only municipal offices but also the whole University system of the City (University of Venice Ca' Foscari, IUAV). Moreover, the urban fibre-optic network constitutes the backbone for 120 free WiFI hotspots that provide high-speed access to the Internet in the whole urban area to citizens and tourists.

The website "Venice Connected" is defined as an "interoperable platform" (Figure 2) for the online booking and sales of the City's tourist services (transport, museums, etc,). It helps visitors to reserve the services they are interested in and, at the same time, it helps the City to organize services according to the actual number of visitors expected. Venice Connected allows the purchase with a single payment transaction of various tourist services from different providers. Tourists get a single booking number which they can use to access all the most important services in Venice (from transport to museums).

The website aims to encourage tourists to reserve services before they arrive in the city through a differentiated pricing policy. The lowest prices are applied if you book online and the website explains the different prices, depending on the season. It thus contributes to guiding the flow of tourists and limiting the number of unsustainable peaks of too many tourists in the City. Using Venice Connected site tourists can receive discounts by booking tickets from museums fees to parking spaces and "water taxis". The site provide a colour-coded calendar so tourist can choose between high season - the most expensive time to visit - versus more economically feasible times of the year. Therefore tourists are incentivized to choose the less crowded time of the year to visit Venice.

The aim is to make a step toward a more sustainable tourists flow for the whole city of Venice. In fact the peculiarity of the city of Venice makes sustainable tourism an issue of public concern. For

inhabitants and institutions' opinion the city of Venice can host only a determined amount of tourists in a given moment of the year without negative consequences for the monuments and the population itself. In fact 16 millions of yearly visitors have a strong impact on a city population of only 80 thousand inhabitants that is also constantly decreasing also because of these impacts, such as for example the price of residential housing and other primary public services. Venice Connected site, then, attempts to manage the arrivals into the city with the aim of combining a positive effect for the inhabitants and quality experiences for tourists.
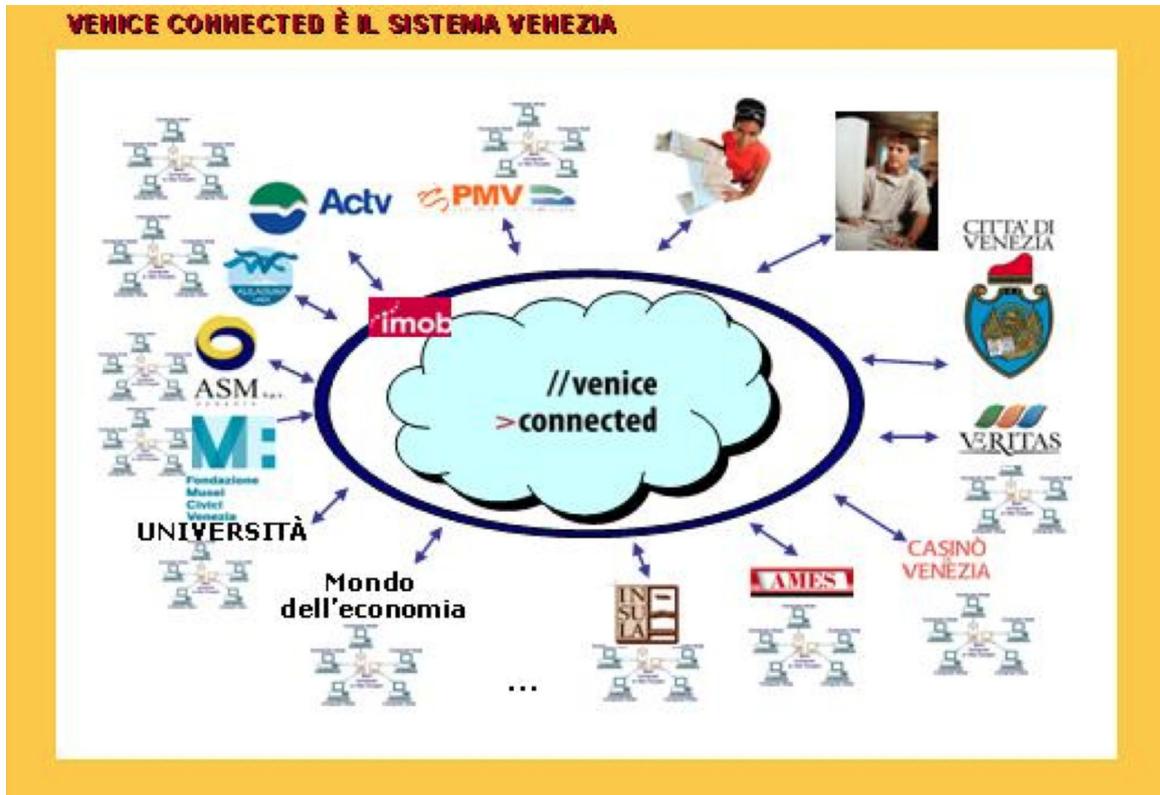

Figure 2: The interoperable system of Venice Connected (www.venis.it)

As shown in Figure 2, the technological infrastructure shared amongst different Venetian local authorities and public utilities fosters the development of interoperability projects for the urban system.

Another important project in this sense is the "imob" smart-card that, in the near future, will contain all the information and the codes for access to mobility services in the city (e.g. public transport, parking spaces, car-sharing, bike-sharing, and others). Imob system also collects and provides information about passenger's flows that could be analysed in order to improve the city's public transport. In this regard, the high-speed network and interoperability between the information systems of local institutions and public utilities are important enablers for technological and organizational innovation in the City's public services.

In summary, the case of VENIS is interesting as it highlights how far the aforementioned technological, semantic and organizational levels of interoperability can be connected and interdependent. The development of interoperable systems amongst public authorities in this case is conditioned by an institutional and organizational structure that is peculiar to Venice. This structure enables city policies and city governance models that are strictly dependent on the technological infrastructure and the interoperable systems – as seen in the example of tourism policies and coordination between tourism services in the city (Venice connected). In this sense, it can be argued that the ICT-enabled governance system of Venice is characterized by the presence of a single organization, which is owned by the local authorities, and is focused on the technological development of the urban area. In Table 3, we apply the conceptual model proposed in this paper in order to understand the specificity of the interoperability system in this city.

Indeed, the aforementioned interoperable applications and projects are interconnected with a significant change in policy strategies, in stakeholder relationships and in organizational structures

(Alfano, 2011). In this case, *Performance* and *Inclusion* (see Table 4) are the two main value drivers as the improvement of the urban system via ICT and interoperability infrastructures and policies both set out to improve public services and provide wide and ubiquitous accessibility.

Table 4: Governance value drivers, quality dimensions, and type of interoperability

Value driver	Quality dimension/level	Type of interoperability (enabling layer)
Performance	Efficiency/Service	Technical /Semantic
	Effectiveness/Organization	
Inclusion	Accessibility/Service	Technical
	Accessibility/Legal	
	Accessibility/Technological	

Thus, the application of the interpretative model shows that technical and semantic interoperability are the main concerns in the Venice case; whereas, organizational and semantic interoperability were more relevant in the cross-border pan-European case described in Section 5.

7. Conclusions and future work

The paper has proposed and discussed an interpretative framework for assessing ICT-enabled governance with a specific focus on analyzing government openness. This framework aims to provide a systemic perspective and an instrument to elicit the links between ICTs and governance, outlining the various challenges that this poses. In this connection, the paper has discussed the multiple dimensions of governance and the value drivers underpinning the conceptual framework proposed together with its application in evaluating more specifically the interoperability dimension in two case studies at cross-border and city level in Europe. The application of the framework showed how at both cross-border and city level different cultural administrative traditions and objectives influence the critical governance value drivers and characteristics of interoperability systems deployed. Different governance levels of focus and objectives influence different value drivers at cross-border (*openness*) and city level (*performance/inclusion*) enabled by different types of interoperability, i.e. organizational/semantic at cross-border level and technical/semantic at city level. It is worth noting how semantic interoperability is relevant for service layer at both levels of investigation: *accessibility/service* (cross-border level) and *efficiency/service* (city level).

The results of this preliminary analysis of the application of the interpretative framework provide insights for further analysis and research on how the design and reuse of interoperability initiatives should be implemented. As shown in the two examples analysed, technical interoperability seems to be more appropriate for local initiatives focused on elementary services (such as payments, booking services, etc.); whereas organizational interoperability is a critical factor in cross-border initiatives, where the alignment of legal framework constraints and administrative requirements are the key to an effective (and reusable) outcome of the initiative.

In both case, however, semantic interoperability plays an intermediate role as a representational tool which enables both the correct translation of organizational and legal requirements (at cross-border level) and the efficiency of the technical infrastructure (at city level).

However the sample of application of the framework does not yet allow more than a classification of the initiatives and the elicitation of the relevant type of interoperability to be considered by policy makers when planning interoperability initiatives. In future work, we aim to further refine and apply the quality dimensions of the conceptual framework proposed to categorize and possibly benchmark the type of barriers to interoperability initiatives underlying ICT-enabled governance and particularly its openness component. This should allow us to reach higher granularity in the analysis of the application of the interpretative framework. Finally, we will extend the analyses in order to have a wider set of case studies for comparison of experiences at the same and different levels of policy design and implementation.

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