Collaborative Information Exchanges in Policy-Oriented Socio-Technical Systems: Insights from Piedmont

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ABSTRACT
As they result from the dynamic intertwine of social and technical networks Socio-Technical Systems (STS) are a means for structuring, in a participatory way, more resilient organizations. Collaborative information exchange is a key activity for a Socio Technical System to exist and play the main role in steering its evolution. These arguments are the main focus of the paper. An overview of the features of a STS is provided. To ground the discussion, the experience gained at IRES in developing STS collaborative information networks for road safety and health care management is mentioned. Although no data have been gathered so far, clues exist that these projects are raising awareness about STS potential for regional policy management. Even more notably, they are providing a major contribution to a progressively steady shift towards a more innovative process-oriented planning approach to regional transport and health care.

KEYWORDS
Socio-Technical System, Collaborative information exchange, Information platform, Road safety, Hospital facility and biomedical technology management

RÉSUMÉ
Les systèmes socio-techniques (STS) résultent de l'interaction dynamique des réseaux sociaux et techniques : ils sont un moyen de structurer, d'une manière participative, des organisations plus résilientes. L'échange collaboratif d'informations est une activité majeure pour l'existence de ces systèmes et a un rôle principal dans le pilotage de son évolution. Ces aspects font le sujet de ce papier. Nous présenterons d'abord le cadre de référence conceptuel des caractéristiques d'un STS. Puis, pour situer la discussion dans un domaine pratique de l'action publique, nous mettrons en avant l'expérience acquise à l'IRES dans le développement de réseaux d'information collaboratifs STS pour la sécurité routière et la gestion de services de santé. Bien qu'aucune preuve n'ait été recueillie jusqu'à présent, des indices montrent que ces projets apportent une plus grande confiance dans les possibilités des STS pour gérer des politiques régionales. De plus, étant axés sur les processus, ils fournissent une impulsion majeure pour la mise en place de pratiques innovantes de planification dans les domaines des transports et de la santé.

MOTS CLÉS
Système socio-technique, échange d'information collaboratif, plate-forme d'information, sécurité routière, gestion des structures hospitalières et des technologies biomédicales

INTRODUCTION

Purposively oriented interactions between Information Communication Technologies (ICT) and social networks, what is generally known as Socio-Technical Systems (STS)

are a main vehicle for structuring, in a participatory way, more resilient organizations (Whitworth, 2009).

In the current trend of societal transformations, geo-political turmoil and concerns about climate changes, the potential of STS is becoming increasingly attractive in policy activities: in the face of deep uncertainty, their flexibility, proactivity and self-steering ability make this type of system best suited for sustainable planning activities (policies) (Occelli, 2015).

It is realized, however, that a STS entails a number of transformations in the ways public organizations operate by and manage their government and governance relationships (Gil-Garcia, 2012). For example, addressing the STS very notion calls for a new understanding of human activity systems and of their needs of public services; managing STS operations has to leverage forms of cooperative relationships across different government departments and between government organizations and citizens; providing direction to a STS evolution requires a shift from administrative laden procedures to more open and participative undertakings. The last aspect, in particular, is a main outcome of the collaborative information exchange underpinning a STS. In fact, it is at the core of contemporary adaptive/anticipatory governance approaches that acknowledge the role and limitations of knowledge on which policy choices are conventionally based; encourage monitoring of outcomes and information sharing in policy-making processes (Fuerth and Faber, 2012; Walker *et al*., 2013).

The next section provides a synthetic overview of a STS. Then to give empirical ground to the discussion, the experience gained at IRES in developing a STS collaborative information network for road safety and the management of some health care service components (hospital facilities and biomedical technologies) is presented. Finally, the last part deals with some STS challenging issues to be addressed in future research.

1. FEATURES OF A STS AND COLLABORATIVE INFORMATION EXCHANGE

A synthetic overview

Notwithstanding the term has varied nuances in the literature, the following conceptual keys can be convenient for tackling STS notions.

a. STS general principles

The main tenets can be summarized as follows:
– organization of human activity systems, such as those concerned with the delivery of population, government and firm services, depends on (the conditions created by) the interaction of social and technical networks, the latter being established and maintained by a variety of bonds, as individual agents regularly engage in their social, economic and communication practices;
– each network alone (social or technical) is unable to handle the feedback and cumulative effects affecting the performance of human organizations;
– although no supremacy is claimed by social and technological networks, each one plays a role insofar as their joint functioning is expected to improve the performance-capability of an organization;

b. STS components

They deal with the different features of technological and social networks, such as: a) the type of service provided by the wired and wireless broadband infrastructures and ICT applications; b) agents' readiness to use ICT artifacts; c) the gains or losses yielded to the activity systems as the number of ICT users increases; d) empowerment of agents' reflexive ability and sense-making as collaborative information exchanges are maintained and progressively consolidated.

c. STS functioning

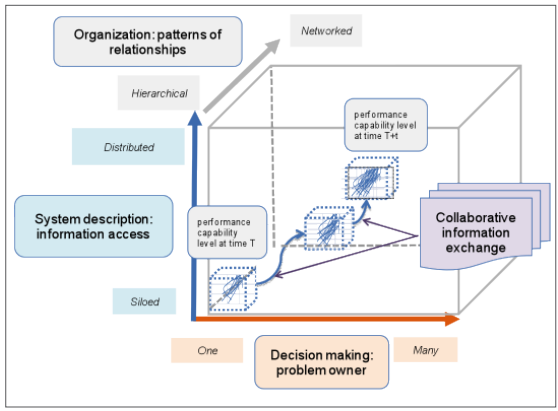
Many ways exist through which a STS works and takes on improving its situation. They can be grasped considering the following perspectives:

– the system descriptive lens used by agents in observing the system: they vary along a continuum, ranging from an internal and generally narrow-focused (siloed) approach requiring a small set of in-depth information to an external and broader in-scope view entailing a greater variety of distributed information;

– the decision-making process, that is the range of cognitive activities, such as search, selection/adaptation and evaluation, carried out by agents when they commit their actions overtime. An additional feature to be accounted for is whether responsibility is entrusted to a single decision-maker or is shared by many agents;

– organization, that is how a STS arranges its elementary units according to some logically consistent way in order to assure consistency in its internal processes and consonance within its environments. Single level hierarchical and multi-level networked arrangements are usually considered as limiting cases of a continuum of organizational patterns.

Figure 1. A schematic representation of a STS (adapted from Occelli, 2015)



A STS in action

Figure 1 presents a schematic representation of a STS according to the descriptive perspectives mentioned in sub c. The cube may be understood as an ideal enveloping agents' behaviours, at a point in time. Its three-dimensional position gives a synthetic account of the STS performance-capability level. As STS components (see sub b) change overtime, the working of the organization will vary accordingly, thus causing a move to a new

position in the multi-dimensional space. This, furthermore, is expected to be associated with a greater maturity in achieving reliable and sustainable required outcomes, thus reaching a higher performance-capability level (Corsi and Neau, 2015).

Collaborative information exchanges among STS agents (see point b above) have a pivotal role in this improvement. Two aspects are prominent here, and namely the fact that such exchanges require a pluralist approach to knowledge, including scientists, stakeholders and policy recipients (Umpleby, 2014). Besides they make it possible for a STS to update its learning rules. When agents regularly engage in some joint activity it may happen, as in the metaphor popularized by Banathy (2000) that they decide to produce some new type of information which better satisfies their knowledge needs.

2. SOME INSIGHTS FROM PIEDMONT

The above discussion finds some ground in the activities recently carried out by IRES through regional policy projects in the domain of transport and health care. Both projects have at their core the management (and development) of an information platform meant to support road safety planning[1] and funding of hospital facilities[2] and biomedical technologies[3].

Launched in the late 2000s, both projects are a case of STS implementation. To fully appreciate their accomplishments, a description of the Piedmont context and development steps would be necessary. This is beyond the scope of this paper, but some insights are offered by table 1 which highlights in a comparative way the projects' main features, also in the light of the previous discussion.

On the whole, both STS projects have succeeded in meeting their main goals. When considering the capability maturity stage reached in each case, however, it turns out that achievements have been lower in Project 2 than in Project 1.

Apart from any judgment about their operational performance, the information exchanges leveraged in Project 1 have helped to better connect internal and external knowledge approaches to road safety, thus making the links between back-office and front-office activities more robust. In Project 2 instead, such an exchange, although beneficial, has involved back-office health care activities and mainly focused on efficiency improvement.

Indeed, some activities carried out by Project 1 are having an even greater impact. They are providing evidence that a STS can support a process-oriented approach to transport planning which includes road safety in a forward looking strategy of sustainable mobility. Such an approach is greatly needed in the Piedmont region, where an ageing population is causing mounting concerns. Not only the number of road crashes among senior citizens is increasing, but safe active transports (such as walking and cycling) need to be

1 See www.sicurezzastradalepiemonte.it

2 See www.ires.piemonte.it/sanita/edilizia-sanitaria-ires/database-edilizia-sanitaria

3 See www.ires.piemonte.it/sanita/health-technology-management/flusso-informativo-tecnologie-biomediche

promoted as a part of a broader strategy for coping with the growing health care costs in the region.

Table 1. A comparative overview of STS implementations carried out in Piedmont

		PROJECT 1. Road crash information platform, managed by the Road Safety Monitoring Centre (RSMC)	**PROJECT 2. Health information platforms managed by Research Professional Teams (RPTs)**
General setting	Institutional background	A National agreement was signed in 2007 among main institutional stakeholders (Tansport, Defence and Interior ministries, national association of municipalities, National Bureau of Statistics). An Inter-institutional Committee (IIC) has been created liable to entrust local authorities in the information production process	Regulations were passed by the Regional Authority in 2007-2008 which established the health information platforms
	Main goal	Improving crash data quality in order to design more effective countermeasures at the regional level	Establishing a digital data flow procedure to make the regional funding allocation process more efficient
	Operational objectives	a) Re-alignment of crash data-gathering process; b) data quality processing; c) policy reporting; d) dissemination activities and education of the agents involved in data gathering	a) Data flow management; b) accounting of hospital facilities and biotechnology equipments; c) policy reporting
STS features	Decision-making: problem owners	National and regional Bureau of Statistics, regional and district transport departments, national and municipal polices, regional IT provider, (Ires) RSMC	Regional health care department, hospital facility offices, clinical engineers, regional and private IT providers, (Ires) RPTs
	Decision-making: agents with an institutional responsibility	National and regional Bureau of Statistics, IIC, regional Transport department	Regional health care department
	Information access: back-office and front-office	Back-office: distributed data source and restricted access area for authorized users. Front-office: public website with communication services for the general public	Back-office: distributed data source and restricted access area for authorized users
	Organizational structure	Multi-level hierarchy: a set of nodes exist that are in charge of a specific function. The RSMC acts as a binding node	One-level hierarchy: the regional health care department is in command. The RPTs provide a functional interface between the regional actor and those in the local health premises

CONCLUDING REMARKS

This paper sought to show how STS and collaborative information exchanges enable to build more resilient organizations. Underlying the arguments is a view that open-minded agents with a commitment for a networked purposeful mind-set can improve a certain system situation, by using ICT. A claim was made that STS set a sort of scaffolding up which enhances agents' reflexive ability and bears a more responsible engagement in policy practices.

The Piedmont case studies offered some clues in this respect and showed that a concept of STS is taking ground in the region. They also made clearly apparent, however, that to fully exploit its potential in policy practices, a number of questions deserve to be investigated further in future research. In this regard, the following topics are suggested:
– *STS self-awareness (identity)*, that is how to ensure (by design?) that participants to the environment created by STS collaborative exchanges both give to and get something

back from that environment. This is a thorny issue as it is confronted with still largely untapped problems of legitimization of STS actions and measurement of public values produced by their outcome.

– *STS functioning*, that is the modulation between enlargement of the problem and solution space, resulting from the inclusion of the many problem's owners, and the closing down, in order to select the most satisfying alternatives and enable action (Smith and Stirling, 2007).

– *STS learning capability*, that is the appreciation of the different information maturity levels likely to exist between agents within and outside government organizations, and how the crossing (bridging) of these levels can help reinforcing knowledge-based (new) policy actions.

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