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## Mediators in action: Organizing sociotechnical system change

Elin Wihlborg<sup>a</sup>, Kristina Söderholm<sup>b,\*</sup><sup>a</sup> Department of Management and Engineering, Linköping University, Linköping, Sweden<sup>b</sup> Department of Business Administration, Technology and Social Sciences, Luleå University of Technology, Sweden

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## ABSTRACT

To extend and deepen the roles of mediators in relation to sociotechnical change, this article first suggested an analytical approach which thereafter was used for analysing two cases illustrating two Swedish mediating organizations in different sectors at different time periods: the half state-/half industry funded Research Institute for Water and Air Protection, IVL, in the 1960s and 70s; and the Swedish Urban Network Association, SUNA, in the early years of the 21st century. We found that the associated sociotechnical systems changed through the actions of mediators and their organization of time-spatial specific settings. The mediator concept contributed to our understanding of these changes through a number of visible processes of *translating* rather than transferring specific knowledge, by functioning as a *single entrance* to knowledge, by supporting the selection processes, and sometimes by bridging knowledge in unforeseen ways. Overall, the mediating actors took on roles to promote the system and encouraged actors within the system to connect and develop both the system as such.

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## 1. Introduction

Changes in sociotechnical systems are continuous and complex processes. The systems are frequently adjusted and transformed as a result of internal and external pressure, ideas and innovations. These transformation processes are characterized by a great deal of uncertainty in several dimensions [23,20]. One of the most apparent transformations of sociotechnical systems, both in practice and in academic work,<sup>1</sup> is the transformation towards improved system sustainability through reduced uncertainty and risks. Sociotechnical systems are formed in interplay of actors, organizations and the system itself [14]. Networks of human and non-human actors form the system and manage any changes [19,17].

When networks are formed and sociotechnical systems transformed, some actors appear to take on critical roles.

These actors were identified by Hughes as system builders [14]. Also the wider literature on innovation processes focus on these key actors and interpret their actions. The critical set of actors – not only individuals but in broader terms also e.g. organizations and technologies – have been seen as brokers, third parties, entrepreneurs and agencies involved in supporting the innovation process. Howells (2006) defined these actors broadly as “intermediaries [performing] a variety of tasks within the innovation process” ([13]:715). He pointed out that although the literature on critical actors in innovation processes is extensive it does not sufficiently stress, or detail, the intermediary’s interactions with the different organizations and firms of the innovation process; “rather it is more a matter of providing or imparting existing knowledge about a technology” ([13]:719). Thus, there appear to be a need for a more reflexive approach in the analysis of the actors mediating change so that we can comprehend how socio-technical changes are promoted, sustainability improved and risks reduced etc. [21]. For organizational changes, there is a need for actors to “act as a mediator, interpreting and reinterpreting the change, rather than as a passive

\* Corresponding author.

E-mail addresses: [Elin.wihlborg@liu.se](mailto:Elin.wihlborg@liu.se) (E. Wihlborg), [Kristina.soderholm@ltu.se](mailto:Kristina.soderholm@ltu.se) (K. Söderholm).<sup>1</sup> For an extensive survey of this literature, see Ref. [3].

intermediary that simply diffuses a fixed set of ideas and practices, letting them pass without modification” ([26]:16). Given this process of translations, the mediators should be in focus for the analysis of sociotechnical changes in and in-between actors such as firms, organizations and technology as well as of the transformation of the socio-technical system as a whole.

Mediators can be more or less formalized. The least formalized may be ideas and concepts taking on mediating functions. On the other hand, some organisational arrangements aim at mediating certain processes [12]. Over time such organisational arrangements can become formalised and grow in size. Two such mediating organizations formed in different sociotechnical systems and during two separate time periods will here be analysed to extend the interpretation and meaning of mediators in processes of sociotechnical change.

### 1.1. Research focus

The aim of this paper is two-folded. Firstly, the paper will extend and deepen the meanings of mediators in relation to sociotechnical change by deriving and outlining an analytical approach. Secondly, we will use this approach for analysing two cases illustrating the role of Swedish mediating organizations in different sociotechnical settings during different time periods. These include the half state-/half industry funded Research Institute for Water and Air Protection, IVL (in Swedish: Institutet för vatten och luftvårdsforskning) in the 1960s and 1970s and The Swedish Urban Network Association, SUNA (in Swedish: Svenska Stadsnättsföreningen) in the early years of the 21st century. Despite several institutional and sectorial differences between the cases, the critical functions of the mediating organizations in the development of their respective sociotechnical setting are similar, and identifiable in both cases.

### 1.2. Mediating sociotechnical systems—theoretical approach

Theories of sociotechnical systems indicate that they are constructed and given meaning in the interplay between technical and social components of the systems [6]. Some components of the sociotechnical system can however take on a specific role in promoting change and development of the system and its social context – in more general terms they are mediating changes. In the literature they are identified as consultants, system builders, intermediaries and even mediators (e.g. Refs. [14,5,17]). The aim of the following theoretical sections (1.3–1.5) is to conceptualise the meanings of such actors from a multi-disciplinary perspective, combined into a tentative analytical framework. We take off from the concept of intermediaries in innovation studies and extend through a more reflexive and constructive approach, striving to form a tentative analytical model. The reflexive approach is in part made possible through an abductive research process (see further below), i.e., the theoretical conceptualization is generated in mutual interplay with the case analysis as presented after the theoretical sections. The theoretical contribution of the paper is, however, in line with common structures presented first.

### 1.3. Sociotechnical intermediaries

In their overview of innovation activity studies, Bessant and Rush [5] focused on consultants or intermediaries by identifying four critical aspects of these. The authors' focus was on firms and the diffusion of innovations but the approach could also be used in other settings where intermediaries act. Firstly, they focused on the consultant's activity in the process through which technology moves from 'outside sources' to the individual organisation or firm. The consultant can be a single individual but she acts with support from her organisation and the intermediating practice is formed in the interplay of the individual and the organisation. The consultants act as intermediaries to assist and advice (in this case) firms, and the authors listed a number of ways in which the consultants/intermediaries can improve the operation of the innovation process, such as through direct transfer of specialised expert knowledge [5]. The firms using the consultant to acquire the specific knowledge are here considered as relatively passive receivers of knowledge. Bessant and Rush's first point was, to sum up, that intermediaries transfer specific expert knowledge.

Secondly, Bessant and Rush [5] pointed out that the intermediaries play an important role by providing a single point of contact through which (in this case) the firm can get access to a wide range of specialist services (available from the consultant or provided by other organizations known to the consultant). The consultant can act in this way, and provide the knowledge themselves, or as the 'one-stop shop' for knowledge provision from different sources. In this role the intermediaries act as a channel and selection aid to the user-firms helping them articulate and define their particular needs in the innovation process. Bessant and Rush [5] pointed out that:

“Many user firms lack the resources or experience to understand and prioritize their problems in such a way that external resources and opportunities can be effectively utilized. Consultants can provide a valuable input to this first stage of innovation, by creating a strategic framework for change; they can also move from identifying needs in this fashion to suggesting means whereby the identified problems can be solved ([5]:102)”

Hereby, Bessant and Rush's third critical aspect of the intermediaries is their role as channels for selection. Their fourth and final critical aspect concerned the several ways in which intermediaries are bridging knowledge to the user-firms. The simplest way is to transfer knowledge as a consultant. The second way is when the intermediary shares knowledge and transforms it among the users – in this case the user-firms. Bessant and Rush [5] identified this as a process of cross-pollination between locations and contexts. A third way of transferring knowledge is as a “marriage broker”, since the intermediary through one interface opens relations to many other potential providers of solutions for the user-firm. Finally, there is also a diagnostic role of the intermediaries, when they help user-firms to articulate their needs. This role is analogous to medical practitioners who first diagnose the problem and then

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