Chapter 1
Evolution of Inter-Organizational Information Systems on Long Timescales:
A Practice Theory Approach

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ABSTRACT

Inter-Organizational Information Systems (IOIS) are computer-based systems shared by, or connecting, several organizations. The on-going use and evolution on long timescales of these large-scale socio-technical systems so far cannot be satisfactorily explained on the basis of existing theories of IS adoption, implementation, and use. In this chapter, we present a theory of IOIS in which the on-going use and evolution of IOIS is treated as a practical and socio-material accomplishment of communities through boundary practices and structures. We draw on the structure/action reproduction paradigm of Structuration Theory to account for the persistence of these systems, and thus explain their structure, while using the embodiment of action from Practice Theory to treat the material nature of these systems. We distinguish three dimensions of structure—material, normative, and ideational—and we also distinguish patterns of actions (along these three dimensions) from constraining and enabling structures. However, we attempt to treat these three structural dimensions and their reproduction processes symmetrically throughout. This symmetrical treatment leads us to propose that these action/structure dimensions are not reproduced in isolation but rather undergo an intimate mixing, or mangling, in the process, which in turn suggests a new kind of two-way causal accommodation between the various aspects of structure that we term "resonance."

INTRODUCTION

Many countries engage in building ICT infrastructures in areas as diverse as customs clearance, electronic patient records or collection of road tolls. These infrastructures are by design multi-stakeholder enterprises, and many of them cross the boundaries between the private and public sector. These infrastructures are broad in scale and scope; they affect the life of individuals, are likely to change the landscape of industries, and are claimed to have transformative power. They are also instances of Inter-Organizational Information Systems (IOIS). As IOIS are evolving to become infrastructures for industries or even across industries, they need to be studied at that level.

In this paper, we argue that while the extant literature has largely succeeded in explaining success and failure of IOIS initiatives on the timescale of particular projects and at levels of analysis of single organizations, dyads and a little higher, it does not provide a theoretical framework for addressing the evolution of IOIS over long timescales and at the scale of industries within nations, an issue that has been identified as a significant gap in the literature. Specifically, in a review of research on Electronic Data Interchange (EDI, a key IOIS technology), Elgarah et al. (2005) find that "most studies reviewed in this research … employed the technological imperative to understand the short-term benefits and shortcomings of data exchange" (p. 19). In addition the time frame of the majority of studies was categorized as "cross sectional single snapshot" (p. 16).

By contrast, when we take a view of IOIS on longer timescales than these, and at units of analysis larger than organizations or dyads, different phenomena become visible that are both challenging and important. Many significant IOIS, such as computerized airline reservation systems (Copeland and McKenny, 1988) and electronic ordering systems in pharmaceutical distribution (Short and Venkatraman, 1992; Klein et al., 2008), have persisted for several decades with a recognizably persistent identity despite changing material form and institutional embedding. The traditional theoretical themes of IOIS research that, according to a recent survey by Robey et al. (2008), are adoption, governance and organizational consequences, do not capture the nature of this phenomenon. Beyond adoption we need to be able to explain post-adoption phenomena such as routinization, drift, adaptation to changing circumstances, in short, the evolution of IOIS. Beyond the usual conceptualization of governance in terms of hierarchies and markets (Robey et. al., 2008) the role and governance of IOIS as shared, and possibly contested, infrastructure comes into view. Beyond organizational consequences the issue of how to conceptualise the role of Information and Communication Technologies (ICT) in the transformation of whole supply chains, industries and institutions needs to be dealt with. In addition to managers, policy makers in governmental organizations, trade associations and the like become addressees of recommendations developed by the IS discipline.

Explaining and modelling these phenomena requires theoretical tools that are different from those employed by IOIS research at the firm or network level of analysis dominant in the literature. In this paper we put forward a new theory of IOIS consisting of a set of concepts and relations between concepts, which, as we will argue in detail, are both required by the nature of this phenomenon and form a coherent framework for theorising IOIS in a way appropriate to this new timeframe and scale.

Development of a theory that operates on this level of analysis poses a significant challenge as any such theory has to resolve an issue that still puzzles many researchers, namely the way that technology, as a material structure, interacts with organizational and institutional forces (Orlikowski and Scott, 2008). Specifically, focusing on IOIS evolution on long timescales implies that we treat technology, as materiality, symmetrically with regard to other social forces such as norms and

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