

Toward a Theory of IOIS Variance: A New Framework for Studying Inter-Organisational Information Systems

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ABSTRACT

Observing that existing models of inter-organisational information systems (IOIS) have not been developed to explain IOIS variance, in this paper the authors develop three criteria a new theoretical framework should meet: 1) It should support identification of and distinction between essential properties of IOIS; 2) it should explain the resilience of IOIS, that is, why (properties of) IOIS persist in the face of environmental change; and 3) it should offer a way of describing IOIS on organisational and collective levels, that is, the level of various types of collectives of organisations, such as networks, associations or industries. This paper then assesses four theories commonly used in IOIS studies (Transaction Cost Theory, Resource Dependence Theory, Neo-Institutionalism, and Structuration Theory) in view of these three criteria. Based on this discussion, the authors develop a new framework for studying IOIS variance which views IOIS as constellations of aligned practices.

Keywords: Comparative Studies, Descriptive Models, Information Systems Adoption, Inter-Organisational Information Systems, Practice Theory, Structuration Theory

INTRODUCTION

Why is it necessary to provide yet another 'new' framework for studying inter-organisational information systems (IOIS)? The literature is replete with such frameworks (Barrett & Konsynski, 1982; Johnston & Vitale; 1988; Benjamin et al., 1990; Kumar & van Dissel, 1996; Choudhury, 1997; Esbjerg, 1999; Fleisch & Österle, 2000; Riemer et al., 2001; O'Daniel,

2001; Hong, 2002; van der Vorst et al., 2002; Themistocleous et al., 2004; Qiu & Ling, 2004; O'Donnell & Glassberg, 2005) and one might want to first ask why they are not sufficient for our purpose. In this article, we argue that while the extant literature has largely succeeded in explaining success and failure of IOIS initiatives, it has yet to cope with a phenomenon that has evaded academic attention, namely a substantial variation in existing IOIS which is not easily accounted for.¹ For example, we find entirely different systems in similar industries but situ-

DOI: 10.4018/jsita.2010070104

ated in different countries. Do country-level factors dictate or constrain the types of IOIS that emerge as stable systems in an industry? Furthermore, we find different systems in the same industry co-existing peacefully. Do these systems address different requirements of different segments in that industry? In that case, one would probably rather rely on industry-level factors for predicting which types of IOIS will emerge as a sustainable system in a given environment. Then again, we find cases in which all relevant contingencies seem to be almost identical but prevailing IOIS still differ significantly. However, looking at their evolution reveals that different types and constellations of factors have played crucial roles at early development stages or that these systems have been created at different points in time. This observation might lead one to speculate that those types of IOIS which emerge as stable systems are influenced by the particularities of their development process suggesting an explanation based on the theory of path-dependency.

An ability to explain variance of IOIS would make a significant contribution to theory development in the IS field. Scholars are still puzzled by the relationship between new information technologies and existing organisational and institutional structures. Specifically, the question in which way organisational and institutional factors influence deployment of information technology has not yet been satisfactorily answered. While the notion that institutional and organisational factors in some way constrain IT deployment is largely unchallenged, it is not clear how such constraints work. As a consequence, the opposite view, that organisational and institutional structures follow constraints inherent in technology—so-called technological determinism—has mostly been abandoned; yet it would seem to be a mistake to adopt a stance of ‘institutional determinism’ in which organisational and institutional structures determine viable forms of IT deployment (Markus, 2005). Ability to explain variance of IOIS would have to rely on a deeper understanding regarding this relationship between organisational and institutional factors on the one hand and forms of IT

deployment on the other. We assume that IOIS variety would—to a large extent—follow from a variety of organisational and institutional settings while not every difference in organisational or institutional structure should be associated with a different type of IOIS.

However, thus far we lack the conceptual apparatus as well as a widely accepted list of properties to identify and describe IOIS. Consequently explaining variance of IOIS would be a rather haphazard undertaking because it would not be clear whether one would be looking at different types of IOIS or rather describing similar IOIS differently. For example different types of IOIS are sometimes identified by different types of underlying technologies (EDI over VANs, EDI over Internet, XML-based information exchange; cf. Williamson et al. 2004). Yet, these technologies may actually support the same type of IOIS. Thus, authors may emphasize different aspects of IOIS which leads them to see different types of IOIS where others would only see different underlying technologies.

The purpose of this paper is to lay the foundation for explaining IOIS variance by developing a theory-based method for identifying and describing IOIS. Existing IOIS taxonomies (Barrett & Konsynski, 1982; Swatman & Swatman, 1992; Alt & Cathomen, 1995; Meier, 1995; Klein, 1996; Kumar & van Dissel, 1996; Choudhury, 1997; Hong, 2002; Qiu & Ling, 2004; Eom, 2005; O’Donell & Glassberg, 2005) do not provide such theoretical links so that empirical research could only be based on statistical evidence but not on case study research which requires theory-based explanation (Yin, 2009). The large number of possible influence factors in combination with a relatively small total population of IOIS—as compared to the number of possibly relevant influence factors—and the difficulties of empirically separating the IOIS phenomenon from its relevant context indicate that case study research is more promising for the task at hand than statistical analysis (cf., Reimers et al., 2004).

In the next section we will first discuss the requirements that a theory used for that purpose

should meet and then, in the subsequent section, evaluate four theories commonly used in the IS field in view of these requirements. A comparison of these theories then leads us to identifying strengths and weaknesses of each theory which provides cues to extending and elaborating existing approaches for the purpose of devising a theory of IOIS variance. Building on that elaboration we then develop a new model for identifying and describing IOIS. In the final section, we show how the framework meets the theoretical requirements developed at the outset and discuss ways to further elaborate the model.

REQUIREMENTS FOR A THEORY OF IOIS VARIANCE

We propose that a theory for explaining IOIS variance should meet the following requirements: (1) It should support identification of and distinction between essential properties of IOIS; (2) it should explain why (properties of) IOIS persist in the face of environmental change, i.e., the resilience of IOIS; (3) it should offer a way of describing IOIS on the organisational as well as on the collective level, i.e. the level of various types of collectives of organisations such as networks, associations or industries.

The first requirement is rather straightforward. Without being able to identify essential properties of IOIS it is impossible to identify differences between IOIS and thus capture their variance. However, while many schemes have been developed to describe and classify IOIS (for references see above) we require here that such a scheme should be integrated with the theoretical framework, i.e., the categories used for distinguishing (properties of) IOIS should also be categories of the theoretical framework.

Regarding our second requirement, we want to explain resilience of IOIS rather than implementation success or failure. Resilience here refers to the observed ability of IOIS to withstand medium-sized changes in their technological and organisational environment. Resilience implies that an IOIS has become an integral part of the institutional environment in

which people act. Thus, this requirement also implies that we focus on IOIS which have been in use for a considerable period of time and that their existence and use has become taken for granted. In contrast, studies of success/failure of IOIS often focus on project management goals such as whether implementation results met original goals regarding effectiveness, costs and schedule or on explanations of adoption and diffusion. However, resilience could follow an implementation process which would be considered a failure from the perspective of project management goals. Thus, implementation and adoption success and IOIS resilience refer to different phenomena with different implications for their theoretical explanations.

Requirement 3 concerns the fact that IOIS are typically multi-level phenomena (Damsgaard & Lyytinen, 1998). Hence the theoretical framework has to incorporate multiple layers of explanation. On the level of individual organisations, resources and processes of firms become part of an IOIS. On the collective level, firms often collaborate to jointly create standards or operate infrastructures which are also part of the IOIS. While description of resources and processes assimilated in an IOIS requires an organisational perspective, standards and infrastructures cannot be described from an organisational point of view.

CANDIDATE THEORIES

We propose the following candidate theories for explaining variance of IOIS from which we are going to select the most suitable as a basis for our theoretical framework: Transaction Cost Theory, Neo-Institutionalism, Resource Dependence Theory and Structuration Theory. All these theories have been previously applied in IOIS studies while no other theories have gained broad currency in this field (Malone et al., 1987; Suomi, 1991; Hart & Estrin, 1991; Barrett & Walsham, 1995; Reekers & Smithson, 1996; Johnston & Gregor, 2000; Baldi & Borgman, 2001; Teo et al., 2003; Mansell, 2003; Christiaanse et al., 2004; Phelps, 2007).

Transaction Cost Theory

From a Transaction Cost Theory perspective, there are two possibilities for explaining variance of IOIS (Reekers & Smithson, 1996). One, when viewing IOIS as transaction cost reducing devices, different types of IOIS can be explained as responses to different types of transaction cost problems dominating a given business relationship, i.e. different transaction attribute constellations would explain different IOIS used to reduce transaction cost. This explanation would have to consider IOIS as governance structures because Transaction Cost Theory can only explain different governance structures, not (properties) of technological systems directly. However, IOIS have been described as governance structures in their own right in the literature (cf., Klein, 1995).

The second possibility would be to view IOIS as instances of so-called asset specificity, i.e., as investments by one or both parties to a business relationship that will lose most of their value if the relationship were severed. In order to protect their investments, the business parties need to devise dedicated IOIS governance structures which prevent one party from exploiting the other by threatening to break up the relationship. From this perspective, different types of IOIS could be explained with reference to the type of dedicated governance structures required for supporting them. For example, some third parties (such as special industry bodies) may take over this role enabling deployment of IOIS which would otherwise not be sustainable. This explanation would reverse the usual direction of analysis in Transaction Cost Theory since it would not explain emergence of different governance structures based on characteristics of underlying investments but derive viability and thus existence of IOIS as special instances of asset specificity from the availability of certain governance structures which, as a consequence, would have to be considered as given.

Both theoretical explanations would satisfy the first requirement formulated above. When viewing IOIS as governance structures, different types of IOIS can be distinguished with

regard to the type of transaction cost problem addressed by them. Types of transaction cost problems have been identified in the literature (e.g., Williamson, 1987) and these classifications could be used for this purpose. This would also link these descriptions with the theoretical framework. When viewing IOIS as instances of asset specificity, they can be distinguished by the characteristics of governance structures required to support them which would also provide the link with their theoretical explanation. Again, types of governance structures have been described in the literature and could be used for this purpose (e.g., Noorderhaven, 1995).

Regarding the second requirement, the assessment is mixed. If IOIS are viewed as governance structures, significant changes in the transactional environment would affect the type of IOIS existing in that environment, i.e., IOIS would not be resilient in the face of ongoing environmental changes. If IOIS are viewed as instances of asset specificity, some measure of resilience can be expected because IOIS-types would be explained by availability of appropriate governance structure which is characterized by a measure of resilience to the extent to which they are institutionalised.

Both Transaction Cost Theory-based explanations, however, cannot meet the third requirement. This is because Transaction Cost Theory is limited to analysing bilateral business relationships since its fundamental unit of analysis is the transaction. Although attempts have been made to apply Transaction Cost Theory to collectives of firms (such as networks of firms, cf., Picot et al., 1996), Williamson (1996) has made it clear that this would violate one of the theory's core assumptions. Therefore, Transaction Cost Theory can be used for describing IOIS only on the level of a bilateral business relationship, not on the level of collectives.²

Neo-Institutionalism

Using Neo-Institutionalism (Meyer & Rowan, 1977; DiMaggio & Powell, 1983; Zucker, 1977) IOIS would be viewed as organisational forms which are explained by the three major

forces recognized by the theory, namely mimetic, coercive and normative pressure (Teo et al., 2003). Mimetic force refers to imitation of organisational forms among firms due to some type of uncertainty, coercive pressure to government action enforcing an organisational form and normative pressure to the influence of professional organisations on the adoption of an organisational form. The term 'organisational form' is used somewhat ambiguously, often referring to the emergence of new industries; it might be re-interpreted as a new business model, e.g. when firms start to build small breweries in bars (Aldrich, 1999). The term, however, is also used in its more common meaning as implying certain organisational principles which spread in an existing industry, e.g., the diffusion of the so-called M-form (multi-divisional organisational form; cf., Armbrüster, 2006).

While Neo-Institutionalism can thus explain ongoing use of certain types of IOIS as a specific instance of organisational form in a 'population' (of firms or other types of organisations), it does not provide explicit clues regarding their description. The term 'organisational form' is rather flexible, but at the price of being underspecified. Therefore, there is no theoretical link between properties of organisational form and the mechanism through which a specific organisational form becomes widely accepted. Thus, organisational form could be any construct describing aspects of organisational structure or process with no specific or necessary theoretical link to the mechanisms by which it spreads or diffuses across a population. Indeed, without much effort it may be possible to replace the construct of organisational form through some other object which diffuses through a population such as a new technology or a new management method while the mechanisms accounting for this diffusion process would still remain the same. Therefore, the link between 'organisational form' as the dependent variable and the above three mechanisms can only be created 'empirically', i.e. through statistical analysis. Accordingly, most studies in the field rely on statistical analysis for creating such a link (e.g., McKendrick & Carroll, 2001; Galvin, 2002;

Kostova & Roth, 2002; Heugens & Lander, 2009). Thus, the requirement that the categories used for explaining IOIS variance are also the categories for distinguishing between different types of IOIS is not met by Neo-Institutionalism while the second requirement, explanation of resilience of IOIS, is easily met since Neo-Institutionalism's main focus is on explaining institutionalised phenomena of social and economic organisation.

However, the theory does not 'scale' as it is limited to the population-level or field-level of analysis (generally meaning an industry); i.e., it cannot explain or describe phenomena on lower levels such as bilateral relationships (unless they are common to a whole population or organizational field). As a consequence, it cannot describe variance of IOIS on both the organisational level and the level of collectives of firms (requirement 3).

Resource Dependence Theory

From the perspective of Resource Dependence Theory, IOIS would be viewed as devices of organisations to lessen dependence on other organisations or to increase dependence of other organisations on resources which the organisation itself controls (Reekers & Smithson, 1996; Baldi & Borgman, 2001). Variance of IOIS would then be explained by different types of dependencies or different types of (external) resources which create dependencies among firms or other organisations. For example, if a firm depends on distributors providing it with sales information in order to coordinate its marketing activities, that information represents a critical resource which is controlled by another firm. The firm may then try to create an IOIS which facilitates the capturing and transmission of such data or even automates the whole process and reckon that this will lessen its dependency on its distributors, especially if operation and maintenance of the system is under its own control.

Regarding our requirements, different types of IOIS can thus be distinguished by different types of resources underlying the external

dependency relationship. However, as with Neo-Institutionalism the concept of resource dependence is rather vague and ambiguous (Casciaro & Piskorski, 2005) and the theory does not provide an established classification of types of resources which could be used for that purpose. Rather, anything required by a firm could be considered to be a resource which creates a dependency relationship, even IOIS themselves. As a consequence, the first requirement is not met, namely that the theory provides the categories for identifying essential characteristics of IOIS. In contrast, the second requirement is satisfied since the theory explains resilience of IOIS as institutional responses to underlying dependencies.

The theory does address several levels of analysis when describing measures firms can take in order to lessen their dependence on external resources. In addition to mergers and acquisitions, these include product standardisation and lobbying by trade associations, bilateral personal relationships, creation of norms of behaviour, interlocking directorates, and cartels. These measures exist on different levels of social activity such as a bilateral business relationship, a group of firms, a whole industry or even a whole country (in the case of behavioural norms). Thus, the third requirement, that the theory should describe IOIS on the organisational as well as on the collective levels, is met. However, the theory does not distinguish between these levels explicitly, but only implicitly through description of measures aimed at reducing external dependency which exist on different levels of social activity.

Structuration Theory

From the perspective of Structuration Theory IOIS can be associated with either of the theory's two main constructs—structure and action. When viewed as instances or aspects of structure (e.g., Orlikowski, 1992), different types of IOIS can be identified and described by distinguishing between different types of structures. However, as with Neo-Institutionalism and Resource Dependence Theory, Structuration Theory has

not yet gone very far in terms of developing a classification scheme for distinguishing between different types of structures. One basic distinction regards that between resources and rules which together constitute the notion of structure. Another established distinction regards that between facilities, norms and cognitive structures which are related to so-called modalities, namely domination, legitimation and signification. However, these distinctions refer to different aspects of structures rather than different types. Therefore, they may be useful for identifying structural aspects of IOIS but not for distinguishing between types of IOIS.

Second, IOIS may be considered as patterns of behaviours and flows of materials and information resulting from actions. The difference between patterns and structures is that patterned flows and behaviours extend in time and space while structures, according to a strict reading of Structuration Theory, do not. As a consequence, these patterns can take on system-like features if time-space linkages become systemic in nature (Rose, 1999). In contrast, structures supposedly only exist as 'memory traces' which enable action by, for example, offering norms guiding (and constraining) behaviour in a specific situation. However, the term structure in the theory also encompasses the notion of resources and/or of facilities as mentioned above which arguably exist in time-space too and not just as memory traces; then the difference between patterns and structures is not easily described. It seems that Structuration Theory shows an ambivalence here which, so far, has not yet been addressed, probably because it is mostly used as a meta-theory. If IOIS are considered as patterned behaviours and flows of data and materials, different types of IOIS can be distinguished with reference to different action patterns which, in turn, are related to different types of structures. As above, this approach would be hampered by a lack of a developed classification scheme for distinguishing between different types of structures.

Resilience of IOIS can be explained in both cases through the concept of duality of

structure. According to this concept, structures are related to action in a twofold manner. On the one hand, structures enable and constrain action, as indicated above; on the other hand, action reproduces the structures which enable and constrain it. Thus, this two-way ('recursive') relationship creates a cycle which perpetuates existing structures unless some other mechanisms are invoked. The main such mechanism is called reflexive monitoring of action, meaning that the structural consequences of action can be appreciated by actors and taken into consideration in their actions. Hence, structures can change in the course of their reproduction. If IOIS are considered as aspects of structures or structures in their own right, resilience of IOIS would follow from the concept of duality of structure. Similarly, if IOIS are viewed as patterns of behaviours and flows of materials and information, their persistence would be explained through the structuring of actions which account for these patterns. Thus, in both cases, the second requirement (explanation of resilience of IOIS) would be satisfied.

Regarding the theory's ability to describe social phenomena on different levels of aggregation, a specific characteristic of Structuration Theory comes into play, namely that the theory does not operate on any specific level of aggregation but, rather, simultaneously addresses multiple levels. This is because the theory views action on all levels (groups, firms/organisations, industry, region, country, etc.) as implicated in the reproduction of a 'societal totality' characterized by a certain 'clustering of institutions'. Specifically, the theory does not distinguish between micro- and macro-analysis, a distinction which often assumes that structural constraints exist on the macro-level while agency exists on the individual level. Thus, such an analysis could explain the interaction of agency and structure only under the assumption that these are located on different levels; structures (on the macro-level) can then be explained as consequences of agency (on the micro-level); alternatively, and more frequently, agency would be explained as conditioned by structures on a higher level. As a consequence, analyses which distinguish

between the analytical functions of levels in this manner cannot simultaneously explain social phenomena on multiple levels; rather, they would have to explain such phenomena by sequentially applying the structure-agency dichotomy ('dualism' in the terminology of Structuration Theory) to pairs of levels. The specific characteristic of Structuration Theory, to view agency and structure as mutually (recursively) constituting one another, allows for attempts to simultaneously describe and explain social phenomena on multiple levels, albeit at the price of having to find an alternative method of distinguishing levels of social activity since the possibility of distinguishing levels by associating them with either agency or structure is excluded.

Comparison

As is clear from the preceding analysis, none of the four theories as applied in the past meets all three requirements while all four would provide an explanation for resilience of IOIS (requirement 2), albeit with the caveat that Transaction Cost Theory can explain IOIS resilience only if IOIS are viewed as instances of asset specificity but not as governance structures. Also, except for Transaction Cost Theory, they all require development of a classification system for identifying and distinguishing between different types of IOIS. While developing such schemes would be possible in all these cases, the theories do not yet provide the categories for describing differences between IOIS. It is also clear from this analysis that empirical identification of IOIS would substantially differ based on which theory one chooses for explaining IOIS variance. Essentially, these theories have different implications for the question of what constitutes an IOIS.

Regarding the third requirement, only Structuration Theory and Resource Dependence Theory offer a framework for describing IOIS on different levels of social activity. However, Resource Dependence Theory does not explicitly distinguish between different levels of social activity. Transaction Cost Theory and

Neo-Institutionalism operate only on a single level, namely the level of bilateral business relationships and the level of whole populations respectively. As a consequence, they cannot describe IOIS on different levels. These results are summarized in Table 1.

Since the phenomenon of variance on different levels of social activity is crucial for the study of IOIS and also because the lack of an existing categorization system found for all theories, except for Transaction Cost Theory, seems more easily amended, we propose to use Structuration Theory as the core of our theory of IOIS variance. We also propose that Resource Dependence Theory holds some promise and will attempt to explore this theory for our purpose in future work. However, the fact that Resource Dependence Theory does not explicitly distinguish between different levels of social activity suggests that it is not especially interested in the layering of social activity. Thus, a crucial first step for applying Resource Dependence Theory to the study of IOIS variability would be to assess how the theory would address multi-level phenomena of social organisation.

Earlier Attempts to Apply Structuration Theory to the Study of IS

In developing our theory we are aware of earlier attempts to apply Structuration Theory to the study of technology in organisations. Such applications have most prominently been developed by Orlikowski and colleagues

(Orlikowski, 1992, 2000; Orlikowski et al., 1995; Yates et al., 1999). Orlikowski (2000) reviews and criticizes many of these attempts (including her own earlier proposals) as too closely wedded to notions of technological determinism. Specifically, she argues that earlier conceptualisations of embodying structures in technologies (during technology development) and appropriating structures through technology use do not acknowledge the open-endedness of technology use as implied in Structuration Theory. She suggests overcoming this weakness by substituting the notion of “emergent structure” for that of embodied structure and “enactment” for that of appropriation. In addition, she refers to the concept of practice by, in effect, replacing the notion of technology through that of “Technologies-in-Practice”. This is related to a fundamental problem which occurred in earlier attempts in which “technology” was treated as a separate instance of structure so that the relationship between structure and technology became problematic. In contrast, the notion of “Technologies-in-Practice” refers to rules which guide the way that people use technologies. These rules emerge in the process of technology development and use and are not determined by the properties of the technology being developed or used.³

However, we think that this re-conceptualisation shows two weaknesses. The first regards the concept of technology itself. It is not obvious how technology should be modelled in terms of Structuration Theory; in Orlikowski’s (2000) attempt, technology stands for various things such as a software program, an information

Table 1. Comparison of the four candidate theories

Can ...	Transaction Cost Theory	Neo-Institutionalism	Resource Dependence Theory	Structuration Theory
.. distinguish IOIS types	X	-	-	-
.. explain IOIS resilience	(X)	X	X	X
.. describe IOIS on organisational and collective level	-	-	X	X

Note: ‘X’ means that the requirement listed in the first column is met by the respective theory; ‘(X)’ means that whether or not the requirement is met depends upon a certain interpretation of the theory regarding the nature of IOIS.

system or even the way a technology is used. In order to describe and explain variance of information systems (including inter-organisational information systems) it is mandatory to explicitly define how technology is to be conceptualised in the theoretical framework. Also, replacing “technology” through the notion of “Technology-in-Practice” further aggravates this problem. While technology had a definite – albeit problematic – place in earlier attempts (as embodying certain aspects of structure), it is not clear how it even enters the theoretical framework when being replaced by “Technology-in-Practice”. The second weakness regards the way that reproduction is treated in Orlikowski’s framework. She suggests that reproduction occurs through repeated interaction with the technology in question. However, Structuration Theory is a theory of social systems; therefore, in our view it is mandatory to specify structural reproduction as a social process and not as a process of individual technology use.

In order to examine the mechanisms of structural reproduction we introduce two extensions: a) Max Weber’s distinction of material and ideational forces which allows us to consider the role of ideas in shaping the development of IOIS as well as modelling the role of technology and b) the notion of social practices which provides a rich, bodily and socially embedded view of activities. We will interpret IOIS as aligned forms of practices which allows us to define and classify IOIS and also to distinguish between the organisational and the collective level regarding IOIS development and use. Although Orlikowski also refers to the ‘practice lens’, she basically replaces the notion of ‘technology as structure’ with that of ‘technology as practice’. In what follows, we propose a different way of incorporating the concept of social practices into a model of IOIS. From Structuration Theory we retain the concept of duality of structure which, in our view, defines the core of that theory. In contrast, other conceptual elements of Structuration Theory such as the distinction between modalities and structure

or that between social and system integration are not used for our model.

OUTLINE OF A THEORY-BASED IOIS DESCRIPTION MODEL

In this section we will propose a way to distinguish between types of IOIS which implies that we first define what constitutes an IOIS; for this purpose, we heavily draw on the literature on social practices; next, we will address the issue of how to combine the notion of social practices with that of duality of structure and how to incorporate the material aspects of IOIS, i.e. information technology, in our model. Finally, we will suggest a way to separate the two levels of analysis that we are most interested in, namely the organisational and the collective level as they regard IOIS development and use activities.

IOIS as Sets of Aligned Practices

Reckwitz (2002) characterizes a practice as “routinized bodily activities” (p. 251). This emphasis on the human body distinguishes theories of social practices from other variants of cultural theories in sociology which have in common the idea that what gives order to the social world are “symbolic structures of knowledge” (p. 245) rather than self-interested intentions (as in traditional economics) or social norms (as in traditional sociology). The notion of bodily activities in theories of social practices also comprises mental and emotional activities, use of things, and talking, reading and writing (discourse), in addition to other (routinized) movements of the body. Mental and emotional activities, in turn, include forms of understanding (knowledge) and desiring (motivation). Structure manifests itself in and through routine patterns of body movements (in the above sense).⁴ This notion of practice thus contains elements which can be used for empirically identifying a practice, namely the repeated (routine) performance of a specific

body movement, including routine patterns of discourse and use of things. One cannot capture actions of a non-routine kind by this method, of course, which are enabled and constrained by structure just as well. This disadvantage, however, seems to be minor in the context of the study of IOIS since the operational aspect of IOIS implies a focus on routine action.

Practices are the basis of organisational processes. An organisational process consists of a sequence of tasks, involving a certain flow of information—and possibly objects—which are handed on from one task to another (Scheer, 1992). While these flows and work sequences may be formally defined in manuals or other documents, such formal representation does not guarantee their smooth execution (Wenger, 2002). Rather, each task needs to be embedded in a practice which ensures that the task is accomplished in a certain way so that a smooth flow of information and objects is established.⁵ In view of these flows of information and objects across a series of tasks, the several practices in which these tasks are embedded may be said to be aligned, meaning that each practice is structured so as to facilitate a smooth flow of information and objects given the structure of the practices with which it is interconnected.⁶

Based on this conceptualization of practices we define an IOIS as a set of aligned practices which reside in separate organisations and which jointly support some automated information processing functions. Types of IOIS can then be characterized as *constellations of practices* (Wenger, 2002). For example, an IOIS could consist of just one pair of aligned practices residing in separate organisations so that information exchanged between these organisations is automatically processed in either both organisations or in just one organisation; a more complex IOIS may contain more sets of aligned practices. One example involving practices distributed across three organisations which jointly support the functions of automatically creating and confirming purchase orders is illustrated in Figure 1.

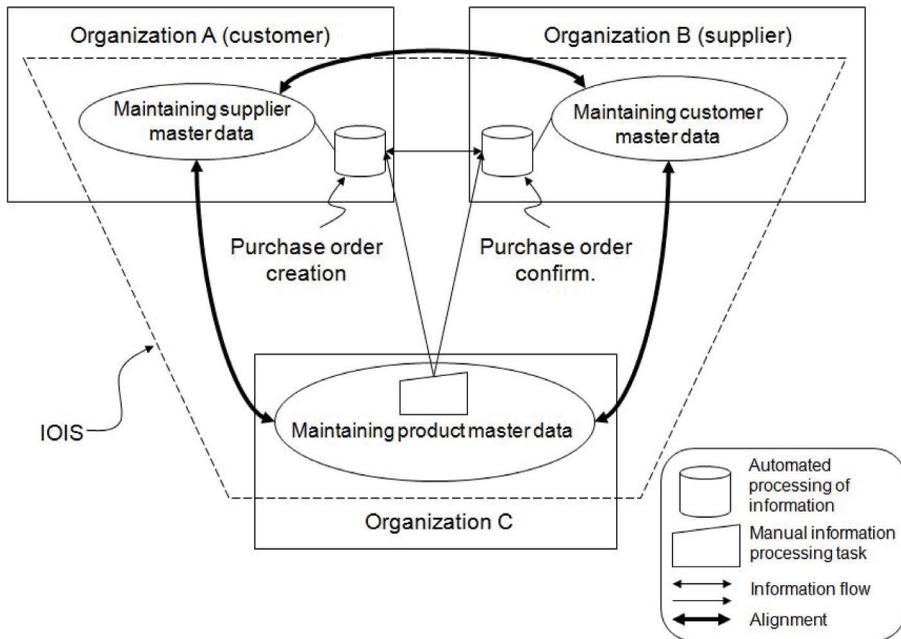
Practices and Structural Reproduction

Invoking the concept of practice in the study of IOIS also allows for clarifying the way in which structures are actually reproduced through action, a major element of Structuration Theory which, however, has not yet been fully specified. Practices consist of repeated performances of certain actions. As these actions are repeated, they result in certain patterns of behaviours or movements of things which can be observed. Through observation of these patterns and through ensuing action aimed at creating similar or modified patterns, i.e. through learning, structures are reproduced (Wenger, 2002, p. 96).⁷ For example, as a new employee in the purchasing department observes how his or her new colleagues usually go about the business of ordering products, he or she tacitly reconstructs the rules which (supposedly) guided these actions and draws on these (inferred) rules to guide her or his own actions (which, in turn, create patterns of behaviour which can be observed by others and so on).⁸ The reproduction of social structure is not necessarily intended; rather, in most cases it is an unintended consequence of action.

This notion of practice can be easily incorporated into Structuration Theory; in fact, it may be said that based on the literature on communities of practice (Lave & Wenger, 1991; Wenger, 2002) it becomes possible to explicitly describe the reproduction process which is largely implicit in Giddens' main exposition of Structuration Theory (1984). The central relationship according to Structuration Theory is depicted in Figure 2.

One of the main tenets of Structuration Theory is that structure does not only constrain action but that action is simply impossible without structure. Specifically, structure does not put limits on an otherwise free action but, in a way, shapes action from the inside, similar to the role of a skeleton in a body. While Giddens extensively describes and illustrates this role of structure, he treats the second aspect of

Figure 1. Example of an IOIS type consisting of three aligned pairs of practices



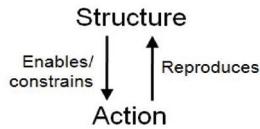
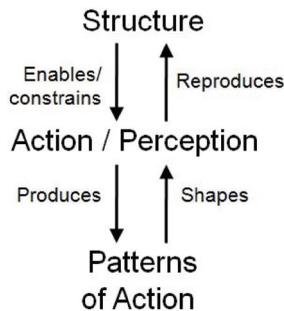
this relationship—the reproduction of structure through action—in a much more cursory fashion. His most detailed illustration of how he proposes that action reproduces structure refers to language. By uttering grammatically correct sentences—he claims—one reproduces the structure of language, i.e., its grammar (1984, p. 8). Referring to the concept of communities of practice, Giddens' basic scheme can be extended as depicted in Figure 3 to more explicitly account for the reproduction process.

We think that this extension is consistent with Structuration Theory as well as with theories of social practices. According to Giddens', structural change occurs through "reflexive monitoring of action" (p. 191). In so far as one monitors the actions of others, reflexive monitoring of action becomes a social process. Through perception of patterns of behaviours, actors can infer the structural properties which have – supposedly – guided the actions of others. This 'reconstruction' (the reproduction of structure) thus takes place in and through the process of perception by observers who then

use these structures to guide their own actions (which will be observed by others and so on). The theory of social practices, as formulated by Lave and Wenger, views the reproduction of structure as a process of participation in which actors observe and imitate each other because they are mutually engaged in a common endeavour; this process (social learning) is viewed as "a source of social structure" (Wenger, 2002, p. 96). Note that the concept of 'perception' does not necessarily or even generally imply a process of intentional thought activity; rather, the process of perception can be sub-conscious in the sense that certain observed events 'automatically' (i.e. through a learnt reaction template) result in certain actions (cf., Michaels & Carello, 1981).

Incorporating Material Aspects into the Model

It has been noted that often IS studies fail to specify the role or the place of information technology in their conceptual frameworks (Orlikowski & Iacono, 2001). Above, we have

Figure 2. *The duality of structure*Figure 3. *Extending the duality of structure*

shown that this is also true for earlier attempts at applying Structuration Theory to the study of information systems. In order to overcome this weakness of Structuration Theory when applying it to our framework we draw on a proposal by Child (2000) who developed a framework for studying organisations across national cultures. Child, in turn, based his framework on a distinction between material and ideational forces introduced by Max Weber and suggested that these two forces influence institutions which then constrain and enable social action. The main idea of this framework is that cultural factors affect institutions through ideational forces while material forces represent some economic and thus universalistic constraints.

Child suggests that both ideational and material forces have an indirect and a direct effect on action; indirectly, they affect action through shaping institutions while also directly affecting action through task contingencies—in the case of material forces—and value preferences—in the case of ideational forces. Earlier attempts to apply Structuration Theory have struggled with the idea of rules being ‘inscribed’ in technologies (see above); application of the Child-framework

shows that rules, in the sense of social rules, are not ‘hard-wired’ in technology but refer to a separate category of structure, viz. social rules; however, material structures still affect action, but in a different way which can be seen when combining Child’s ideas with the model of practices developed above. Patterns of action can then be differentiated into patterned flows of things, patterns of normative behaviour and patterns of expressing and defending ideas (discursive patterns). These types of patterned behaviour can be related to the definition of practices by Reckwitz, quoted above, according to which a practice is a repeated performance of movements of things, body movements and ‘movements’ of understandings.

Linking aspects of structure to these different types of patterns clarifies the social dimension of material structures and ideational structure (while the social dimension of norms is immediately obvious). Observation of moving bodies and things not only make material structures visible but also informs about their physical properties such as when a driver observes other cars racing by on a winter day. From this, he might (possibly wrongly) conclude that the

street is not slippery. Another example is people moving along a hardly visible path indicating where exactly the path runs. Thus, observation of moving things (including human bodies) indicates existence and physical characteristics of material structures which then shape action, i.e., reproduction of material structure does not refer to their maintenance from a planner's or operator's point of view but to the perception of the physical characteristics of an actor's environment which guides that actor's behaviour.

Similarly, observation of discursive patterns reveals to the knowledgeable actor (socially) valid cause-effect or means-ends relationships which then guide his or her actions. Again, reproduction here refers to the perception of ideational structures rather than to some form of objective, externally existing law (law of nature), i.e., to the socially mediated ideational structure which is reproduced through – possibly reflective – monitoring of discursive patterns (whether or not such external and objective laws of nature exist). Our expanded model is depicted in Figure 4.

Enabling and constraining influences of material structures are therefore mediated by the perception of actors who reconstruct such affordances of material structures by observing the movement of things (including data and human bodies) along these structures. Such observation informs about the physical aspects of material structures, not about social rules being 'inscribed' in them. While it may be possible for an individual actor to generate such flows of things him- or herself, generally actors will rely on flows which have been initiated by others too thus reducing uncertainty and risk which stems from relying on these structures. In addition, specialization of work in modern work systems normally implies that physical flows initiated by one actor are not only visible to that actor but to others also.

IOIS Practices

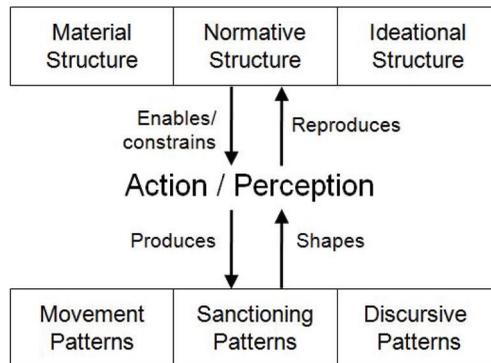
Thus far, IOIS have been defined as sets of aligned practices which jointly support one or several automated information processing tasks

and which reside in different organisations but it has not yet been discussed how the alignment of practices comes about. Levina and Vaast (2005) have recently shown how alignment of practices in separate but connected organisations can occur based on the emergence of a boundary spanning competence. They claim and demonstrate empirically that the emergence of a boundary spanning competence "is associated with the emergence of a new joint field which unites agents in their pursuit of a common organisational interest ..." (p. 337). Levina and Vaast also claim that the activity of boundary spanning can itself become a practice, a process which has been described in detail by Wenger as *boundary practice*.

If boundary spanning activity is targeted at aligning interdependent practices in separate organisations so that they jointly support some automated information processing functions, this boundary spanning activity becomes an IOIS development activity. Such activities typically concern the development and adjustment of interface standards within formal or informal standardisation bodies. To the extent to which such activities are routinized, they themselves become practices. For example, most standardisation organisations have clearly specified rules of proposing, discussing and deciding upon standardisation proposals as well as traditions of interpreting and implementing these rules. Indeed, the definition of formal standardisation bodies consists of the very existence of such formal rules which, if adhered to, are reproduced in standardisation practices.

Generalizing the idea of institutionalised boundary-spanning activities, we distinguish between two types of practices with regard to IOIS, (1) component or constituent practices the alignment of which form an IOIS if they jointly support some automated information processing function(s) and if they reside in different organisations (in the following, Level I practices); (2) practices concerned with creating standards and infrastructures for Level I practices (in the following, Level II or IOIS practices since their objects are IOIS). Level I practices reside on the

Figure 4. A Framework for describing practices



organisational level, i.e., they are reproduced within an organisational unit bounded by its practices, while Level II practices exist only on the level of an organisational field which could be an industry or any other collective of individual organisations (see Figure 5).

The relationship between Level I and Level II practices might be conceptualised as a form of governance, i.e., Level II practices govern Level I practices in the sense that they define the constraints under which these can evolve. That, however, presupposes some type of authority or power which can be used to impose these constraints on Level I practices. This would introduce an alien element into the framework which has, so far, no theoretical basis (Porra, 1999). An alternative—bottom up—conceptualisation of that relationship, however, is possible which draws only on theoretical elements already included in the notion of practice. If Level I practices contained rules and resources which legitimize and facilitate incorporation of standards and infrastructures developed by Level II practices, there would be no need for ‘imposing’ such constraints. Such a situation would exist if, for example, use of industry standards in an organisation would be normatively accepted, if, in addition, stories and arguments were widespread which explain why use of industry standards benefits the organisation and if systems existed which would facilitate incorporation of updates of industry standards. Thus, the components of our model of practice

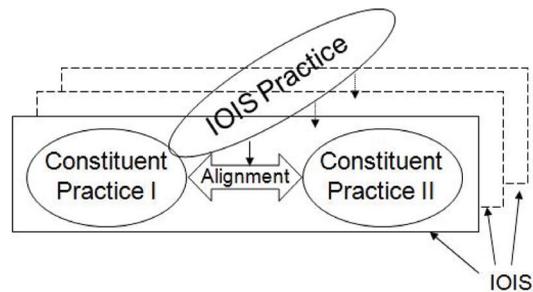
contain the very elements which link Level I practices to Level II practices.

As pointed out above, Structuration Theory does not locate structures on one specific level of analysis but assumes that any given structure can be implicated in organisational phenomena on multiple levels of analysis. It is because of this feature of Structuration Theory that we had decided to base our framework for studying IOIS on Structuration Theory. However, that characteristic of Structuration Theory also makes it difficult to distinguish between levels of social activity; our concepts of Level I and Level II practices allow us to make that distinction empirically. Subsequently, the structural properties implicated in Level I and Level II practices may then be identified and related to one another for analytic purposes.

DISCUSSION AND CONCLUSION

We have started our theoretical discussion with formulating and justifying three requirements that any theoretical framework for explaining IOIS variance should meet. These were: (1) It should support identification of and distinction between essential properties of IOIS; (2) it should explain why (properties of) IOIS persist in the face of environmental change, i.e., the resilience of IOIS; (3) it should offer a way of describing IOIS on the organisational as well as

Figure 5. Level I (constituent) and Level II (IOIS) practices



on the collective level, i.e., the level of various types of collectives of organisations such as networks, associations or industries.

All three requirements are met by our theory-based model for describing IOIS. According to that model, IOIS are identified (and thus bounded) as sets of mutually aligned practices which jointly support one or more automated information processing functions and which are distributed across two or more organisations. Types of IOIS can then be distinguished by the practices of which they consist and as distinct constellations of aligned practices. In addition, on the level of practices, IOIS can be distinguished by the structural properties implicated in Level I and Level II practices, i.e., with regard to their material, normative and ideational structure. Finally, the very existence/non-existence of Level II practices can be used for classification purposes. We consider this to be a truly novel method of identifying and categorizing IOIS as it is based on social processes involved in the reproduction of IOIS rather than technical characteristics or economic purposes of IOIS.

The framework explains resilience of (structural properties of) IOIS in so far as it is possible to empirically describe (trace) the way that structural properties of IOIS are reproduced. It includes pointers to the types of behavioural patterns that the researcher should attempt to identify which can serve as a basis for structural reproduction. It also demonstrates that reproduction occurs through the way these patterns are perceived and enacted by agents and has thus

methodological implications for the study of IOIS. Again, we are not aware of a theoretical framework of IOIS which addresses the question of resilience of structural properties and are therefore confident that this model will be helpful in furthering the empirical study of IOIS.

The framework supports the distinction of the organisational and the collective level and provides the requisite concepts for describing IOIS on both these levels. This is achieved through development of the concept of Level I and Level II practices.

We have developed this framework for the purpose of explaining variance of IOIS. It serves this purpose in several ways. First and foremost, it offers a theory-based method for identifying and classifying IOIS. For example, differences between IOIS may be identified on the level of individual practices with regard to structural properties implicated in them, on the level of constellations of practices and with regard to whether or not Level II practices have emerged. On each level, explanatory hypotheses accounting for differences can then be developed. For example, differences in ideational structures of Level I and Level II practices may be related to cultural influences while differences in material structures may point to the influence of economic factors in an industry (both types of influences where suggested by Weber as mentioned above); differences in constellations of practices may be related to industry structure while differences with regard to existence of Level II practices

may point to the influence of the institutional structure of an industry.

However, the framework does not yet address a number of issues important to the study of IOIS. Prominent among these is the issue of explaining evolutionary change of IOIS. Questions would have to be raised such as how can it be explained that some practices steadily increase in importance while others decrease. Another set of questions would be concerned with issues of path dependency; for example, is it the case and if so how can it be explained that sometimes several practices are reinforcing each other, thus creating a path which 'locks in' a group of organisations or even a whole industry?

Another shortcoming, which might also be related to the issue just discussed, concerns the relationship among structural dimensions within our practice model. It might be argued, for example, that new practices emerge first as new ideas which then take on a more solid structure in the form of social rules which ultimately 'harden' into material structures. In the opposite direction it may be argued that new technologies (material structures) need to be legitimized and rationalized in order to become parts of new practices. Both hypotheses, however, would be rather ad hoc and a more systematic treatment seems to be warranted.

Yet we propose that providing a theory-based method for identifying and categorizing IOIS is also the basis for understanding evolution of IOIS. Thus, our framework should assist in further developing the theoretical apparatus for studying IOIS over time. For the time being, however, the framework can be used for describing existing IOIS in a consistent manner and based on a theory which does not have to rely on 'reading history backwards' by deriving the rationales for creating a certain organisational structure from the purposes which that structure serves at the time of its study.

ACKNOWLEDGEMENT

The first and the last author would like to acknowledge support by the Deutsche Forschungsgemeinschaft (grant number 1328/2-2).

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ENDNOTES

- ¹ Cf., the reports by e-business W@tch (e.g., 2003 and 2005) which contain sector specific studies and extensively illustrate the variance of IOIS solutions and differences of IOIS adoption across industries and countries.
- ² Williamson (2000) recognizes the need for a multi-layer analysis and introduces a model of four layers of institutional analysis and design (embeddedness, institutional environment, governance, resource allocation); however, Transaction Cost Theory is positioned on the third layer only.
- ³ An earlier attempt by Walsham (1993) has suggested to associate information systems with the so-called modalities which, in Giddens' (1984) exposition of Structuration Theory, mediate between structure and action. Importantly, Walsham (and later similarly Jones, 1997) has rejected the proposal to conceptualise information systems as (aspects of) structure on the grounds that structure, in the strict reading of Structuration Theory, exists only as memory traces as we have mentioned above. As we are going to offer a different solution for this problem below, we find it more practical to associate information systems with structure and patterns of action rather than with modalities.

- ⁴ While Reckwitz draws, among others, on Giddens and Bourdieu, he claims that structure is not confined either to the minds of actors nor to the patterns created by their behaviour which may be interpreted to constitute a deviation from Giddens; Wenger (2002), in his exposition of the concept of *communities of practice*, emphasizes the emergent nature of structures and positions his concept relatively closer to Giddens' than to Bourdieu's notion of structure (p. 96). Below, we will make a proposal how to reconcile the slightly inconsistent notions of structure in practice theory and in Structuration Theory.
- ⁵ This notion of practice bears some resemblance to the concept of organisational routines in evolutionary economics (Nelson & Winter, 1982). The main difference with practice theory is that evolutionary economics assumes that organisational routines can be 'adopted' based on an economic calculus while, in practice theory, practices have to be learnt through a social process.
- ⁶ From a process perspective, such alignment would be conceptualised as process integration.
- ⁷ Note that Wenger, in the context of his theory of communities of practice, would conceptualise the reproduction of structure as an ongoing process of negotiation of meaning.
- ⁸ Cf., Wenger (2002) for an in depth analysis of how newcomers learn new practices. Note that illustrating reproduction based on practice theory by the case of newcomers to a practice is due to didactical purposes only; as pointed out by Wenger: "... the introduction of newcomers is merely a version of what practice already is. ... communities of practice reproduce their membership in the same way that they come about in the first place." (2002, p. 102).

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