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STRUCTURATION THEORY IN THE IS FIELD: AN ASSESSMENT OF RESEARCH STRATEGIES

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ABSTRACT

Giddens' structuration theory is increasingly used in studies assessing IT-based organizational change. However, few studies, if any, have focused on how to empirically apply this "meta-theory". In this article, over twenty IS studies published in the last ten years which used structuration theory were reviewed. We extend previous research by analyzing the strengths and weaknesses of different methodological strategies adopted by IS researchers using structuration theory. The main contribution of this article is a repertoire of methodological strategies to empirically apply structuration theory in the IS field.

1. INTRODUCTION

Different theoretical streams have been opposed in the IS field over the last two decades. *Technological imperative* and *strategic choice* models can represent two opposing ends of a continuum (Orlikowski, 1992). According to the former, organizational change is shaped by technology, viewed as an autonomous and formal constraint on organizations. Variables can be objectively measured and the outcomes predicted. It assumes a determinist/positivist stance. At the other end, strategic choice assumes that the primary and most important source of organizational transformations is not the technology but, rather, human agents' choices and decisions. Generally, from such a perspective, a voluntarist/interpretive approach is adopted. Such objective-subjective duality is representative of the conceptual debate that animates the IS field as well as social sciences.

Giddens (1984) challenged the opposition based on the premise of mutual exclusivity of objective and subjective dimensions of reality, and proposed an integrative meta-theory -- the theory of structuration. This theory recognizes and accommodates both subjective and objective dimensions of social reality and assumes a duality of structure and action. Since 1984, when the central work on structuration theory appeared, a number of IS and management researchers have adopted Giddens' propositions. However, a recent study

about the use of structuration theory analyzed fifteen years of IS research according to Burrell and Morgan's (1979) categories (i.e., according to their ontological, epistemological, methodological, and human nature assumptions) and indicated that researchers in this field applied Giddens' ideas in three different ways - *adaptive structuration*, *mutual shaping* and *actor's organizing* perspectives (Pozzebon and Pinsonneault, 2000). These patterns not only point out that the same theory can be interpreted and applied in different ways but above all that they often follow opposing perspectives. The recognition of these routes is not a matter of affirming the supremacy of one interpretation over the others but of being aware about each one, becoming familiar with their strengths, weaknesses and potentialities in terms of understanding or theory development.

The recognition of different ways of interpreting a theory enhances the theorists' abilities to make research choices and to produce good results. As studies about technology-based organizational change have increased in importance during the last few decades, the investigation of new avenues of research becomes more relevant. Furthermore, these new avenues of research have and should progressively embrace methodologies and paradigms borrowed from other disciplines (Robey and Boudreau, 1999). To this end, the purpose of this paper is to extend the discussion of the use of structuration theory in the IS field, focusing on methodological issues. Recently, Orlikowski (2000) expanded earlier work on structuration, developing a practical lens to examine how people interact with technology. Our intent is to complement such a practical lens, developing methodological strategies to apply it. Briefly, assessing the different ways that IS researches have been using structuration theory, and comparing them with existing ways used in other areas of management (Langley, 1999), our contribution to the field is a repertoire of methodological strategies, each one with its inherent weaknesses and strengths in terms of theories producing or facilitating understanding about the interaction IT-organizations.

This paper addresses these questions and is structured as follows. First, we briefly summarize previous work about the utilization of Giddens' theory of structuration in the IS field, presenting three patterns of usage (Pozzebon and Pinsonneault, 2000). Following this, we present the conceptual framework adopted to analyze the different patterns relying on Langley's (1999) strategies for theorizing from process data. Then, we analyze the strategies used by IS researchers to apply structuration theory, trying to assess the implications of their methodological choices. From the discussion of these implications we propose a repertoire of methodological strategies for theorizing technology-based organizational change using a structurational perspective.

2. PATTERNS OF USE OF STRUCTURATION THEORY IN IS RESEARCH

Giddens' theory of structuration attempts to synthesize the classical categories of structure and agency in a dialectical framework. The primary contribution of structuration theory is the articulation of these constructs as temporal levels of analysis for understanding how social institutions are produced and re-produced over time. Giddens defines social systems as visibly patterned interdependent networks of actions, where change in one part results in change in others (Holmer-Nadesan, 1997). The theory of structuration suggests that human actions simultaneously condition and are conditioned by institutional properties in social contexts.

The three primary modalities are key concepts Giddens defined for understanding mutual interaction: interpretive schemes, resources, and norms. Interpretive schemes are vehicles for the communication of meaning. Resources are allocated by human agents and become the basis for individual power. Once legitimized, they contribute to structures of domination. Norms are rules and conventions that constrain behavior within acceptable limits and emerge from patterns of recurrent interaction between human agents based on personal notions of what is sanctioned. Mutual interaction via the three modalities between the realm of human action and the institutional realm constitutes the process of structuration (Stein, 1996).

From the perspective of structuration theory, organizational change is the joint effect of the actions of individuals interacting with institutional structures like business strategies, communication vehicles and information systems. These structures both enable and constrain the daily actions and thought processes of people, but do not wholly determine them. Individual choices are not independent of the structures within which they take place but they can move toward maintaining, reinforcing, changing or even destroying them.

Such an interplay between individuals and structures was conceived as the duality of structure and is one of the sources of reasoning leading to the acceptance that the organizational changes that emerge in similar situations are not completely predictable. In summary, Giddens' theoretical formulations provide a useful framework for exploring the ongoing interactions that inform the organizing process.

The meta-theory developed by Giddens has been extended to consider explicitly the role of IT. Orlikowski (1992) and Orlikowski and Robey (1991) are among the first to use structuration theory for studying the interaction between IT and organizations. They proposed the structural model of technology in which the dual nature of IT is at the heart of the structuration process. In this model, organizations are not only shaped by IT but they are also strongly influenced by social and political processes and by the actions of members of the organization. Sahay (1997) suggests that the increasing use of structuration theory results from two evolutionary and convergent trends in IS. On one hand, there is an emphasis toward the use of more integrative approaches in which understanding how IT gets integrated into work and organizational systems is key. Starting from the formulation of the concept of the duality of IT (Orlikowski, 1992), use of structuration theory has expanded and increased in richness and complexity. Examples of this are studies on radical changes (Orlikowski, 1993), adaptative structurational theory (DeSanctis and Poole, 1994), emergent causality (Robey and Sahay, 1996) and analyses of the time-space dimension, (Sahay, 1997, Walsham and Sahay, 1999). On the other hand, there is an increasing acceptance of interpretativism as a basis for these investigations (Klein and Myers, 1999; Walsham, 1995). The studies of Robey and Sahay (1996) and Barret and Walsham (1999) are clear illustrations of the convergence of these two trends.

The identification and analysis of IS studies1 which used a structurational perspective lead Pozzebon and Pinsonneault (2000) to recognize similarities and differences in how IS researchers have interpreted and applied Giddens' ideas. Their analysis is based on the four dimensions proposed by Burrell and Morgan (1979): human nature, ontological, epistemological and methodological assumptions. Accordingly, Giddens' structuration theory has been applied in three different ways in the IS field: adaptive structuration, mutual shaping, and actor's organizing perspectives. Table 1 presents examples of empirical studies on each pattern.

Adaptive Structuration	Mutual Shaping	Actor's Organizing
Chidambaram (1996); Fulk (1993); Gopal et al.(1992-1993); Kahay (1997); Miranda and Bostrom (1993-1994); Miranda and Bostrom (1999); Nagasundaram and Bostrom (1994-1995); Watson et al. (1994).	Barley (1986); Boczkowski (1999); Kakola and Koota (1999); Orlikowski (1993, 1996); Orlikowski and Hofman (1997); Orlikowski and Yates (1994); Tyre and Orlikowski (1993); Sahay (1997); Stein (1996).	Barret and Walsham (1999); Newman and Robey (1992); Robey and Sahay (1996); Sahay and Walsham (1997).

Table 1: *Three patterns of usage of structuration theory in the IS field*

In summary, they suggest that numerous articles using the *adaptive structuration perspective* assumes a soft-determinist position whereas the *actor's organizing perspective* tends to rely on a more voluntarist approach to studying IT. The *mutual shaping perspective* appears to be more faithful to Giddens, integrating both approaches. Shifting the analysis to the epistemological dimension, the classical opposition positivism-interpretivism emerges clearly. The mutual shaping and actor's organizing perspectives largely refute the regularities and predictions inherent to positivist assumptions, whereas the adaptive structuration group largely applies them. The methodological and ontological dimensions are coherent with the epistemological one. Mutual shaping and social/actor's organizing perspectives exhibit ideographic methods and nominalist ontology, whereas the adaptive structuration perspective exhibits a nomothetic method coherent with its realist ontological beliefs. Perhaps ironically, the meta-theory, which is intended to overcome classic oppositions, ends by being interpreted and applied in such opposing ways. In the next section, we aim to

1 Two main sources were used to identify relevant articles. First, the ABI-Inform database was explored using [IT or IS] and [Structuration Theory] as keywords. Second, a manual search of the main journals (ISR, MISQ, JMIS, ASQ, AMJ) was conducted to complete the literature review and identify other relevant papers on the topic.

pursue this investigation further, by examining each pattern in greater depth, identifying the strategies of collecting and analyzing data and determining the main strengths and weaknesses of each one.

3. STRATEGIES FOR THEORIZING FROM PROCESS DATA

In the previous section, a summary of previous work on the use of structuration theory as a lens through which to understand IT and organizations was presented and differences in how this theory has been applied was briefly identified. What new knowledge do we gain from such an analysis? In what direction does our contribution advance the IS field? The recognition of different usage patterns of structuration theory is useful up to a preliminary point, but it is not enough. We intend to go further in this investigation, examining each pattern in greater depth. In this section, we adopt a conceptual scheme to examine the methodological strategies used for theorizing IT-phenomena in each pattern.

Strategy	Fit with process data complexity	Specific data needs, key anchor and sensemaking	"Good Theory" Dimensions
Grounding Strategies			
Grounded Theory	Adapts well to eclectic data and ambiguity. May miss broad high-level patterns.	Needs detail on many similar incidences. Key anchor: incidents, categories Sensemaking: meaning and patterns	High in accuracy, moderate simplicity. May be difficult to go from substantive theory to more general level.
Alternate Templates	Adaptable to various kinds of complexity. Different templates capture different elements.	One case is enough. Degrees of freedom come from multiple templates. Key anchor: theories Sensemaking: mechanisms	Each theory can be simple and general. Together they offer accuracy, but simplicity and generality disappear with theory integration
Organizing Strategies			
Narrative	Fits with ambiguous boundaries, variable temporal embeddedness and eclecticism.	One or a few rich cases. Can be helped by comparison. Key anchor: time Sensemaking: stories, meanings, mechanisms	High in accuracy, lower in simplicity and generality.
Visual Mapping	Deals well with time, relationships, etc. Less good for emotions and interpretations.	Needs several cases in moderate detail to begin generating patterns. Key anchor: events Sensemaking: patterns	Moderate levels of accuracy, simplicity and generality.
Replicating Strategies			
Temporal Bracke-ting	Can deal with eclectic data, but needs clear temporal breakpoints to define phases.	One or two detailed cases are sufficient if processes have several phases used for replication. Key anchor: phases Sensemaking: mechanisms	Accuracy depends on adequacy of temporal decomposition. Moderate simplicity and generality.
Quantifi-cation	Focuses on events and their characteristics.	Needs many similar events for statistical analysis: one or a few dense cases is best. Key anchor: events, outcomes Sensemaking: patterns, mechanisms.	High simplicity, potentially high generality, modest accuracy.
Synthetic	Needs clear process boundaries to create measures. Compresses events into typical sequences.	Needs enough cases (5+) to generate convincing relationships. Moderate detail needed for internal validity. Key anchor: processes Sensemaking: predictions	Modest accuracy. Can produce simple and moderately general theories.

Table 2: *Seven strategies for theorizing from process data (Langley, 1999)*

Most of the time, IT-phenomena are characterized by changes over time. Dynamic phenomena are basically related to process data. Langley (1999) describes the challenge presented by process data and identified strategies for approaching them. She defines process data as the messy data collected in real organizational context, which deal with sequences or events and may involve multiple levels and units of analysis. First of all, Langley identifies two essential routes for theorizing: variance approach and process approach. Recalling Mohr's conceptualization for explaining strategic change, she clarifies that variance-theories provide explanations for phenomena in terms of relationships between dependent and independent variables, whereas process-theories provide explanations in terms of the sequence of events leading to an outcome. Understanding patterns of events emerges as central to developing process theory. The question to be answered, consequently, goes beyond conceptualizing events and detecting patterns among them. In other words, a process approach is key to investigating dynamic phenomena such as IT-based organizational change. Focusing on process approaches, Langley identifies seven strategies for making sense of process data, which are analyzed in terms of their capacity to generate theory that is accurate, parsimonious, general and useful. We found in such a repertoire of strategies a powerful analytical tool with which to analyze the methodological choices made by IS researchers using a structurational perspective.

Table 2 above describes each strategy and the relative data needs of each approach both in terms of depth (process detail) and breadth (number of cases), as well as the extent to which each strategy deals with each of the process data characteristics mentioned above. In addition, it is suggested that each strategy tends to favor different types of process understanding. Some strategies seem best adapted to the detection of patterns in processes, whereas others seem more appropriate to penetrate into driving mechanisms. Some are more oriented toward the meaning of processes, whereas some are more concerned with prediction (Langley, 1999). These concerns will be discussed in greater depth below. In effect, we are interested in the suitability of the strategies applied by IS researchers to investigate IT-based organizational changes using structuration approaches.

4. STRATEGIES APPLIED BY IS RESEARCHERS USING STRUCTURATION THEORY

Based on Langley's repertoire of strategies previously described, our analysis goes on to identify the methodological strategies embedded in each pattern of usage of structuration theory in IS research. For each group of studies (*adaptive structuration*, *mutual shaping* and *actor's organizing)*, we identify the methodological strategies adopted and we compare these strategies with the research purposes and the main results achieved, outlining the more important strengths and weaknesses of each research design. Based on these insights, we organize a repertoire of methodological strategies for the application of structuration theory.

4.1 Identifying Methodological Strategies

The first step was to identify the methodological strategies used by IS researchers when investigating IT-human action interactions using a structurational perspective. We began with the classification into two broad approaches: process or variance. Basically, we found that (a) adaptive structuration studies clearly use variance approaches, whereas mutual shaping and (b) actor's organizing studies can be characterized as using a process approach.

(a) Adaptive structuration studies embrace variance approaches: Adaptive structuration studies try to make sense of the interaction between IT and human action in terms of relationships between dependent and independent variables. With the exception of one which applies survey (Fulk, 1993), all studies of this group rely on experimental investigation to test multiple hypotheses (Chidambaram, 1996; Gopal et al., 1992-1993; Kahay, 1997; Miranda and Bostrom, 1993-1994, 1999; Nagasundaram and Bostrom, 1994-1995; Watson et al., 1994). We concluded that, using an adaptive structuration framework, the use of a technology can be depicted as an input-process-output framework, where input and output variables are measured by means of scales and the other factors are controlled by the researcher in the experimental conditions. In brief, causal

models (Watson, Ho and Raman, 1994) and hypotheses testing (Miranda and Bostrom (1999), laboratory experiments (Chidambaram, 1996) and statistical techniques of data analysis (Gopal et al., 1992-1993) are illustrative of the deterministic logic of this perspective.

(b) Mutual shaping and actor's organizing studies embrace process approaches: All mutual shaping and actor's organizing studies fall into the process approach group. They deal with explanations that do not entail the identification of dependent or independent variables. Instead, these studies are concerned with the recognition of the sequence of events and patterns in certain spatial-temporal dimension (Barret and Walsham, 1999; Newman and Robey, 1992; Orlikowski and Hoffman, 1997; Sahay, 1997; Stein, 1996; Tyre and Orlikowski, 1993).

Next, regarding Langley's seven strategies, we recognized six in our sample of studies[2]. The strategies we recognized remain divided into three major groups: (i) grounding, (ii) organizing and (iii) replicating. The main features of each group are presented below:

(i) Grounding strategies: data-driven (grounded) or theory-driven (templates): Essentially, we identified two grounding strategies applied by IS researchers: one representing an inductive form of reasoning (data-driven), called grounded strategy; and another representing a deductive form of reasoning (theory-driven), called template strategy.

The first strategy, grounded strategy, closely corresponds to the grounded theory strategy described by Langley (1999). A number of studies (Orlikowski, 1993; Robey and Sahay, 1996; Barret and Walsham, 1999) share the structured steps that identify grounded theory methods: the systematic comparison of small units of data and the gradual construction of systems of categories that describe the phenomena being observed. Orlikowski (1993), for instance, uses a form of content analysis where the data are read and categorized into concepts that are suggested by the data. This technique aims to identify possible categories and their properties and dimensions by examining and organizing data into recurring themes, which are the candidates for a set of categories. These categories are linked to a number of associated concepts, trying to make connections between sub-categories to construct a more comprehensive scheme. In the same direction, Robey and Sahay (1996) analyze data in four distinct steps: coding, splitting and interpreting data into themes, aligning themes with relevant social groups, and contrasting themes between two sites. Similarly, Barret and Walsham (1999) describe data analysis processes involving data preparation, which identified and later combined statements with similar meanings in order to categorize the data from all the interviews and observations. They read and sorted statements into categories suggested by the field data. Once this analysis was completed for each group of interviews, it was followed by an analysis between these groups to determine whether the categories generated by each group's data reflected common themes. The theoretical development of making sense of key issues and themes grows with continued data collection and analysis.

The second grounding strategy described by Langley is alternate templates strategy. Instead of grounding a coding scheme based on data analysis and thus produce categories and concepts, alternate template strategies draw theory from outside the data. In our analysis, we found studies whose strategy relies on a coherent set of prior theoretical premises on which to build their data analysis, but there is no confrontation among different theories or templates. In fact, a single template is applied, i.e., one single coherent set of premises. For this reason, we call this strategy just template and not alternate template. We illustrate this group with Lowstedt (1993), who uses four previously defined dimensions to analyze data collected from three cases, and Scarbrough (1995), who uses an alternative model to Williamson's transactions costs theory to describe strategies of social closure.

(ii) Organizing strategies: narrative and visual mapping: On the whole, all studies here categorized as process approach make use of narrative strategies. Some studies rely essentially on narratives to organize and explain the results (Sahay and Walsham, 1997; Robey and Sahay, 1996), whereas other studies present the

2 Minor adaptations were made to the denominations of three strategies: grounded theory was called grounded, alternative template was labeled template and synthetic was changed to comparative. These differences reflect subtle idiosyncrasies inherent in different samples of studies investigated.

results of their studies in the form of frameworks, typologies or taxonomies and use narratives as a complementary way of explaining their findings (Orlikowski, 1993; Lowstedt, 1993; Scarbrough, 1995).

Visual mapping is clearly used as the main strategy by Boczkowski (1999). He describes the relationship between technological and social elements interacting over time by representing the sequences of events graphically.

Broadly speaking, mutual shaping studies are more inclined to combine visual mapping techniques with narrative explanations whereas actor's organizing studies rely essentially on narrative explanations. Adaptive structuration studies organize their discussions and results based on statistical procedures, which are presented both graphically and descriptively. However, adaptive structuration studies do not fall into process theory studies: narrative and visual mapping strategies, as described by Langley (1999), do not correspond to their method of building theory and of presenting their results.

(iii) Replicating strategies: temporal-bracketing (within cases) and comparative (between cases): Finally, two patterns of replicating strategies, temporal-bracketing and comparative were recognized, which are used complementarily most of the time. Not all studies apply comparative strategies, but all studies use some kind of temporal-bracketing strategy to analyze temporal sequences of events.

Lowstedt (1993) and Robey and Sahay (1996) are examples of studies whose essential strategy is comparative. Attempting to understand similarities and differences, they investigate more than one case. Orlikowski (1996) is one example of temporal-bracketing strategy only, whereas Barley (1986), Orlikowski (1993) and Barret and Walsham (1999) are examples where temporal-bracketing and comparative strategies are combined.

Barley (1986), Barley and Pamela (1997), Orlikowski (1996) and Barret and Walsham (1999) provide detailed descriptions of how to conduct an empirical investigation using the logic of temporal bracketing strategy. Orlikowski (1996) outlines a practice-based perspective as a way of analyzing changes over time. Barley (1986) and Barley and Pamela (1997) focus on identifying and analyzing scripts, which, according to the authors, is an approach that enables systematic empiricism. Barret and Walsham (1999) conduct a longitudinal and intensive study in which they observed and collected data on changing contexts, perceptions, and actions over time.

In summary, we have identified different strategies used by IS researchers who attempt to apply structuration theory. We have pointed out that, essentially, mutual shaping and actor's organizing perspectives correspond to the process theory approach, whereas adaptive structuration perspective relies on the variance modality of research. Regarding Langley's seven strategies, we recognized six strategies in our sample of articles and we divided them into three major groups: grounding, organizing and replicating. Our analysis will follow with a comparison among those research strategies, the research purposes and the nature of findings and results achieved by each article and each pattern, trying to assess the suitability of different methodological choices to effectively apply structuration theory in IS studies.

4.2 Comparing Strategies, Research Purposes and Type of Results Produced

Different research purposes reveal different rationales or perspectives. For instance, looking at the same phenomena, the purpose of one researcher may be to predict the outcomes of the process, whereas another's could be to understand the mechanisms that make the process evolve. We aim to interrogate the degree to which there is a kind of coherence between the theoretical foundation (structuration theory), the purpose of the study (to predict, to understand and so on) and the research strategy. We believe that such coherence is one way to understand why studies produce results or findings that achieve their initial purposes or fail to do so.

We recognized two major groups of purposes: (k) one oriented toward the meaning of the process and (kk) another more concerned with prediction.

(k) Studies oriented toward the meaning of the process: Mutual shaping and actor's organizing studies are more concerned with the meaning of the technology-based process of change (Orlikowski, 1996; Sahay and Walsham, 1997; Scarbrough, 1995). Their general purpose is to understand the interaction between information system and people involved. We observed that most studies with mutual shaping and actor's organizing perspectives share a secondary but not less important objective: to recognize similarities and differences between processes, explaining apparently inconsistent findings or unexpected outcomes (Lowstedt, 1993; Robey and Sahay, 1996; Orlikowski, 1993).

Although mutual shaping and actor's organizing perspectives share the essential purpose of understanding the process, we were able to distinguish subtle distinctions. The first group, mutual shaping, is more concerned with recognizing elements that shape organizational change or permanence. They aim to identify the critical elements that shape organizational changes (Orlikowski, 1993), to investigate the structuring of practices (Orlikowski and Yates, 1994) and to recognize organizing and emerging organizational changes (Lowstedt, 1993). These researchers recurrently share expressions such as "patterns of interaction", "mutual shaping", "organizing framework" and "structuring processes". On the other hand, the second group, actor's organizing, is more concerned with making sense of information technology from the interpretations of the people involved in the process being investigated. They look for an in-depth understanding of why people think or act in particular ways (Sahay and Walsham, 1997), with conceptual schemes for understanding the introduction of new technologies (Barret and Walsham, 1999) and with users' interpretations of IT consequences (Robey and Sahay, 1996). Their common vocabulary also encompasses expressions such as "patterns of interactions", "organizing framework" and "structuring processes" but there is a key idea here that does not appear in the previous group of studies: the "interpretive meaning" of IT.

Regarding the results produced, we observed that mutual shaping and actor's organizing studies tend to be more descriptive, producing outcomes that take forms like *typologies, taxonomies, framework, conceptual schemes and even narrative explanations.* Viewed in more detail, actors' organizing studies, regarding their deeper interpretive nature, rely most of the time solely on narrative explanations (Sahay and Walsham, 1997; Robey and Sahay, 1996; Barret and Walsham, 1999). Mutual shaping studies, instead, combine narrative explanations with visual representations of the patterns recognized, producing typologies (Lowstedt, 1993) and taxonomies (Scarbrough, 1995). Frameworks and conceptual schemes are found in both groups (Orlikowski, 1996; Sahay and Walsham, 1997). We found a consensus between mutual shaping and actor's organizing studies regarding their major contribution: the production of an in-depth process understanding. Among the limitations of the studies, those recognized by their own authors, the low power of generalization and the need for further studies in similar and different contexts were the most recurrent.

(kk) Studies oriented toward prediction: Adaptive structuration studies are oriented toward prediction. A summary of the purpose of most of these studies is to predict outcomes or consequences of the interaction between technology and organizations, testing hypotheses derived from research models (Chidambaram, 1996; Kahay, 1997; Miranda and Bostrom, 1999). They aim to explain the impact of technology (Gopal et al., 1992-1993; Miranda and Bostrom, 1993-1994). Over the last decade, the term "impact" has characterized IT studies more or less close to technological determinism approaches. Are those purposes aligned with Giddens' premises as originally presented in structuration theory?

The results of these studies, most of the time, are presented in the form of *statements about tested models and hypotheses*. Using expressions applied by the authors of these studies themselves, the main outcomes include "limited" test of the model (Gopal et al., 1992-1993), "few" conclusive statements (Miranda and Bostrom, 1993-1994), hypothesis "partially" supported (Kahai et al. 1997) and some "unexpected" outcomes (Fulk, 1993). The major strength claimed by these authors is generalization. Among the weaknesses, they recognize the risk of studying ongoing processes without longitudinal research designs; the frequent use of experimental conditions, which have no history and create an artificial context; the difficulty (or impossibility) to control behavioral variables; and the absence of external variables, which should be taken into account.

The purpose established	**Type of results achieved**	**Type of approach adopted**	**Type of strategy identified**	**Examples of studies**	**Strengths and weaknesses revealed**
Oriented toward the meaning of the process: They seek to understand interaction by identifying elements that shape organizational change or permanence.	Typologies and taxonomies; Frameworks and conceptual schemes; Narrative explanations	Process Approach	Grounded	Orlikowski (1993)	Strengths: In-depth understanding of process Weaknesses: low level of generalization, however analytical generalization is sometimes claimed ("grounded" approach). Such a need for generalization leads to the need for further studies in contexts similar to and/or different from the original setting(s)
			Template	Scarbrough (1995)	
			Narrative	Orlikowski (1993)	
			Visual Mapping	Boczkowski (1999)	
			Temporal-Bracketing	Orlikowski (1996)	
			Comparative	Orlikowski (1993)	
Oriented toward the meaning of the process: They seek to make sense of the interaction by understanding interpretive meanings of technology.		Process Approach	Grounded	Robey and Sahay (1996)	
			Template	Lowstedt (1993)	
			Narrative	Sahay and Walsham (1996)	
			Temporal-Bracketing	Barret and Walsham (1993)	
			Comparative	Barret and Walsham (1993)	
Oriented toward prediction: They seek to explain the impact of IT by testing hypotheses derived from causal research models	Statements about tested hypothesis and causal models.	Variance Approach	Laboratory experiment	Chidambaram (1996) Miranda and Bostrom (1999)	Strengths: potentially high generalization Weaknesses: the attempt to study dynamic phenomena without longitudinal design, without the context and trying to experimentally control behavioral variables.

Table 3: *Summary of methodological strategies analysis (IS studies using structuration theory)*

5. DISCUSSION

Our purpose in this section is to extend the discussion about the use of structuration theory in the IS field, focusing on methodological issues. One of the most important limits related to structuration theory is the difficulty of empirically applying the ideas developed by Giddens. The institutional forces and the social actions that constitute the process of structuration occur simultaneously and are often inseparable in practice. However, for analytical reasons, they have often been studied sequentially. According to Barley (1986) and Orlikowski (1992), the difficulty of specifying how institutions and actions are related and evolve over time often leads scholars to analyze both dimensions separately. We assume that, keeping in mind Giddens' basic premises about the duality of structure, such a question is essential to the development of this theoretical current in the IS field. How do we incorporate mutual influences of human action and information technology into research efforts? Furthermore, having identified the strategies actually being applied, is it possible to suggest more suitable strategies to apply structuration theory on IS research?

Addressing these subjects, Langley (1999) proposes the temporal bracketing strategy as a direct reference to Giddens' structuration theory, viewed as a classic example of a perspective involving mutual shaping. According to Langley, at the heart of structuration theory is the idea that the actions of individuals are constrained by structures but that these actions may also serve to reconstitute those structures over time. Because mutual influences are difficult to capture simultaneously, it is easier to analyze the two processes in

a sequential method by temporarily "bracketing" one of them. The decomposition of data into successive periods enables the examination of how actions in one period lead to changes in the context that will affect action in subsequent periods.

Basically, adapting Langley's (1999) analysis of the bracketing strategy to the study of IT in organizations means that scholars should start by observing the initial organizational context, attending to how the introduction of a new technology or system affects the pattern of interaction among organizational members and how these patterns evolve. The identification of the moment when the change takes place becomes the point of departure for the structuring process. Data gathered about the process are analyzed and compared across successive periods. Periods are the units of analysis for replicating the emerging theory, which allows a compelling understanding of the role of technology in the evolution of structure. The identification of recurring themes allows the transformation of a fluid mass of data into a series of more discrete but connected blocks. In phases, data are used to describe the processes as fairly stable or as linearly evolving patterns and to examine how the context affects these processes as well as their consequences on future contexts. Discontinuities lead to replication of the analysis in a new phase and so on.

The literature review revealed that all researchers characterized as mutual shaping and actor's organizing patterns use some kind of temporal bracketing strategy to analyze temporal sequences of events. Sometimes these researchers *rely only on the bracketing strategy* (when they are oriented toward the meaning or understanding of process) and other times *they combine the bracketing and comparative strategies* (when, in addition, they seek the recognition of similarities and differences between processes). Orlikowski (1996) and Barret and Waslham (1999) provide detailed descriptions of how to conduct an empirical investigation using the logic of the temporal bracketing strategy. Orlikowski (1996) outlines a practice-based perspective as a way of analyzing changes over time. Barret and Walsham (1999) suggest a longitudinal design in which data are observed and collected in changing contexts, perceptions, and actions over time. In addition, the reader can find in Barley (1986) and Barley and Pamela (1997) a detailed description focused on identifying and analyzing scripts, which, according to the authors, is an approach that enables systematic empiricism.

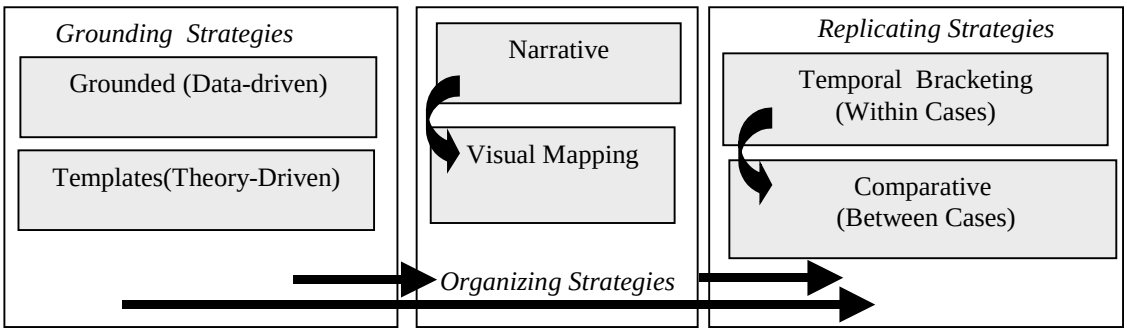

Figure 1: *Repertoire of strategies for theorizing process data from a structuration perspective*

Several combinations among the strategies illustrated above are possible and suitable. Except the grounding strategies, where choice is almost always exclusive (the researcher might adopt a data-driven or a theory-driven approach, but not often a combination of both), all other strategies can be combined creatively. "The choice of strategies is more than just a case of desired levels of accuracy, simplicity and generality and more than just a case of picking logically linked combinations; it is also a question of taste, of research objectives, of the kind of data available and of imagination" (Langley, 1999, p: 707).

In addition, our analysis revealed that a considerable number of studies neither use the temporal-bracketing strategies nor share the choice of any modality of process theory research. They are positioned in the variance approach. Langley (1999) considers that quantitative data analyzed with statistical techniques is not exactly the most appropriate way to study ongoing process, but she recognizes that quantitative studies contribute to a more dynamic understanding of organizational evolution and ends by asserting that they can be complementary to qualitative studies.

Briefly, according to structuration theory, incorporating mutual influences of human action and information technology into research efforts requires some kind of methodological bracketing, although a combination with other strategies can be even more beneficial. We believe that the synergy between the strategies illustrated in Figure 1, organized around some kind of temporal bracketing logic, can allow IS researchers to meet the premises and purposes stated by structuration theory.

6. CONCLUSIONS

The increasing number of studies using the structuration theory in the IS field might be a promising avenue to better understand how technologies interact with organizations. We believe that the enterprise carried out by this study makes a contribution to the advance of the field providing a repertoire of methodological strategies to investigate IT-based organizational changes. Although it is hard to suggest which methodological design is the more appropriate, it is possible to recognize the limitations and potentials of each one. The strategies suggested in Figure 1 and compared in Table 3 are two tools now available to researchers in the IS field. Further research should increase our understanding, exploring ways to combine more efficiently those strategies or how to complement them with strategies of a more quantitative nature. We believe that presenting structuration theory as a suitable research avenue, discussing the implications of the different patterns of usage and recognizing and evaluating the different strategies for theorizing technology-based organizational changes, presents an important debate in the IS field. Our findings here point toward a view of the use of structuration theory, but such an opinion is still evolving in face of further studies and discussions.

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