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REVIEW: STRUCTURATION THEORY AND INFORMATION SYSTEMS RESEARCH

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Review: Structuration Theory and Information Systems Research

Abstract

The work of the contemporary British sociologist Anthony Giddens, and in particular his structuration theory, has been widely cited by Information Systems researchers. This paper presents a critical review of the work of Giddens and its application in the Information Systems field. Following a brief overview of Giddens's work as a whole, some key aspects of structuration theory are described, and their implications for Information Systems research discussed. 225 Information Systems articles, published in leading journals and conferences between 1986 and 2002 that have used Giddens's work are identified and coded into 11 categories. The papers in each of these categories are then analysed in the light of the preceding description of Giddens's work and the structure of structurational research in the Information Systems field assessed. Conclusions are drawn on the ways that Giddens's ideas have been used in Information Systems research.

INTRODUCTION

The contemporary British sociologist, Anthony Giddens, is one of the world's most cited sociologists (Bryant and Jary, 2001). In particular, his structuration theory continues to be drawn on in a wide range of theoretical and empirical studies in the IS field (Jones, 1999; Jones, 2000).

This paper provides a critical appraisal of structuration theory and reviews its use in IS research. After setting structuration theory in the context of Giddens's work, some of its key features are described, drawing on Giddens's own writings. Particular issues in the use of structuration in an IS context are highlighted and inform the subsequent analysis of the use of structuration in the IS field.

STRUCTURATION THEORY IN THE CONTEXT OF GIDDENS'S WORK

Having previously published two significant critical studies of classical sociology, *Capitalism and Modern Social Theory* (1971) and *The Class Structure of the Advanced Societies* (1973), focusing on the work of Durkheim, Marx and Weber, Giddens first set out structuration theory in *New Rules of Sociological Method* (Giddens, 1976, second edition 1993) and elaborated it in three further books: *Central Problems in Social Theory* (Giddens, 1979), *A Contemporary Critique of Historical Materialism* (Giddens, 1981, second edition 1994) and *The Constitution of Society* (Giddens, 1984)[1]. Giddens has also been an active participant in debates on his work and significant further discussion and reflections on structuration may be found in Giddens (1983) and chapters in Held and Thompson (1989), Clark *et al* (1990), Bryant and Jary (1991) and Giddens and Pierson (1998).

Although Giddens has claimed (Bryant and Jary, 2001: 6) that his work has been one continuous project, his subsequent writings have largely moved away from explicit discussion of structuration theory. Thus *The Consequences of Modernity* (Giddens, 1990), *Modernity and Self Identity* (Giddens, 1991) and *The Transformation of Intimacy* (Giddens, 1993) focus on the changing character of modernity at the societal and, later, individual level. These ideas, especially relating to globalisation and Ulrich Beck's concept of the "Risk Society" (Beck, 1992), were further explored in a contribution to *Reflexive Modernity* (Beck *et al*, 1994) and in *Runaway World* (Giddens, 1999) and

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[1] These will be referred to below as NRSM(2), CPST, CS and CCHM(2) respectively

On the Edge: Living with Global Capitalism (Giddens, 2001). Most recently Giddens's increasing engagement in practical politics, as an advisor to the British government from 1997, has been expressed in his books *Beyond Left and Right* (1994), *The Third Way* (1998) and *The Third Way and Its Critics* (2000). The main focus of this review will therefore be on works in the IS field drawing on Giddens's writings between 1976 and 1991, although IS studies citing other works will also be considered as they relate to issues discussed in these works.

STRUCTURATION THEORY

In discussing structuration theory in relation to IS research it should be emphasised at the outset that it is a general theory of social organisation rather than a theory specific to IS. Moreover, apart from some comments on the knowledge society and digital economy in his recent work, Giddens makes almost no reference to IS in his writings (or, indeed, to the specifics of social and organisational changes in which IS might be implicated). A primary of objective of structuration, Giddens has stated (Gregory, 1984), has been the establishment of an ontology of human society. That is, as Craib (1992:108) puts it, structuration aims to "tell [] us what sort of things are out there in the world, not what is happening to, or between, them". It therefore deals with social phenomena at a high level of abstraction rather than their particular instantiation in a specific context; offering a way of seeing the world rather than an explanation of its mechanisms. Combined with the dense, and occasionally elliptical, style of Giddens's writing this means that it can be difficult to grasp the significance of structuration theory in the IS context. It would therefore seem important to sketch out some of the key features of this theory and their possible implications before considering the ways in which it has been used by IS researchers.

A Brief Sketch of Giddens's Theory

Structuration theory may be seen as an attempt to resolve a fundamental division within the social sciences between those who consider social phenomena as determined by the influence of 'objective', exogenous social structures and others who see them as products of the action of human 'agents' in the light of their subjective interpretation of the world. Giddens attempts to 'square this circle' by proposing that structure and agency be viewed, not as independent and conflicting elements, but as a

mutually interacting duality. Social structure is therefore seen as being drawn on by human agents in their actions, while the actions of humans in social contexts serve to produce, and reproduce, the social structure. Structure is thus not simply an exogenous restraining force, but is also a resource to be deployed by humans in their actions: it is enabling as well as disabling.

More specifically, Giddens identifies three dimensions of structure, drawing, it may be argued, on Durkheim, Marx and Weber, which he terms signification, domination and legitimation. These are linked with corresponding dimensions of agency, described as communication, power and sanctions, through *modalities* of, respectively, interpretive schemes, facilities and norms as shown in Figure 1.

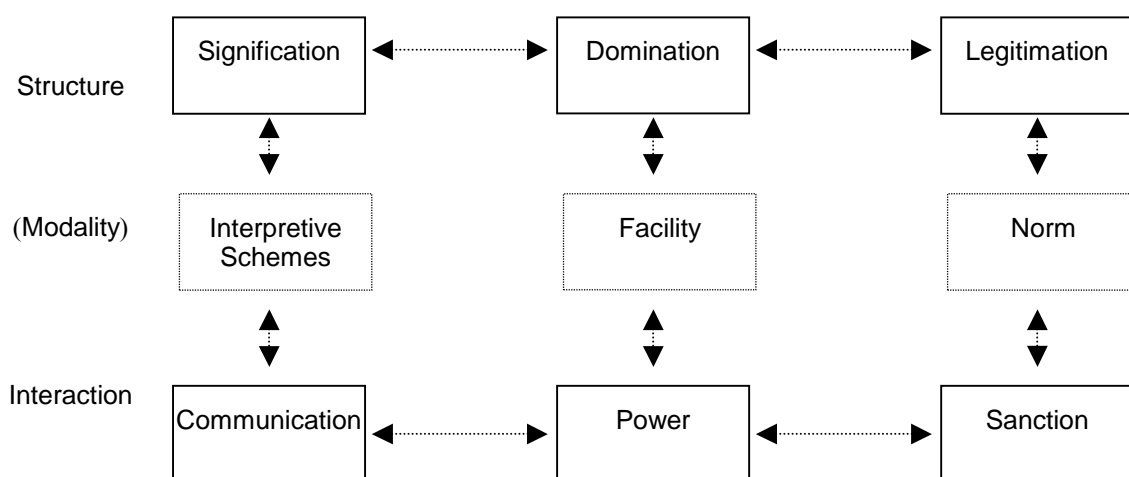| Structure	Signification	Domination	Legitimation
(Modality)	Interpretive Schemes	Facility	Norm
Interaction	Communication	Power	Sanction

Figure 1: The Dimensions of the Duality of Structure (after CS: 29).

Modalities can thus be seen to as the locus of interaction between the knowledgeable capacities of actors and the structural features of social systems. It should also be stressed that the splitting of the duality of structure into these three dimensions is simply an analytical device; in practice, they are inextricably interlinked. For example the operation of norms depends upon power relationships for their effectiveness and are deployed through symbolic and linguistic devices.

An everyday example may help to illustrate the central concept of structuration theory, albeit at the cost of presenting it in a rather more mechanistic way than might be desirable. Thus, the clothes that people wear to work reflect the influence of social structures that are reproduced by individual's

conformance with accepted practice. We may expect, for example, that people working in an office will typically wear, more or less formal, business attire, such as a suit or smart casual clothing. When encountering somebody in a work setting we draw on structures of signification that inform our understanding of that person's role. So, if we meet a person in a white coat in a hospital we are likely to assume that they are a doctor (at least in many settings), or, in a laboratory, that they are a scientist. Clothes do not simply indicate who a person is, but also convey important messages about the powers that they hold. Thus police officers' uniforms enables them to influence people's behaviour in ways that would be unlikely to be successful if they were in plain clothes, while in a military setting, sometimes subtle differences in people's uniforms are important indicators of rank that are significant in that context, whether or not they are recognised by civilians. There are also structures of legitimation that define the appropriate dress code in particular settings, the transgression of which may invoke sanctions. Organisations may differ, for example, in the degree of formality expected in employees' dress, and even "dress-down Fridays" may be subject to clear limits on how "casual" attire may be: polo-shirts OK, perhaps, Hawaiian shirts unacceptable.

As may be evident from this example the structures underlying dress codes are not implacable or immutable. They are sustained by their ongoing reproduction by social actors, but can be changed. So long as employees continue to follow the dress code then its influence on the behaviour of new recruits is likely to be maintained. If certain individuals or groups challenge the code, then, over time, new structures, no less influential, may develop. Individuals are thus seen as possessing the capability to transform structures.

Giddens emphasises that social structures do not exist independent of human action, nor are they material entities. He describes them as "memory traces" (CS: 17) and argues that they exist only through the action of humans. This leads to a view of human beings as being in a constant state of reflexive monitoring of their situation and to the omnipresent potential for change. That we may not be aware of this monitoring or of the continuous opportunities for change is ascribed by Giddens to the existence of two types of consciousness: practical and discursive. The former relates to our ability to act in a knowledgeable way and the latter to our incomplete explanations for those actions. We therefore, as Polanyi (1967) argues, know more than we can say.

In addition, humans cannot determine exactly the way in which structures are produced and reproduced. Giddens therefore draws attention to the unacknowledged conditions and unintended consequences of intentional action. For example, the structures of signification associated with a white coat, may be traded on by a cosmetics salesperson or an actor in a commercial to suggest that they have technical expertise, or more seriously by a fantasist who pretends to be a doctor. The reproduction of accepted behaviour therefore helps to promote other, potentially undesirable, behaviour as an unintended consequence.

Key Issues in Structuration Theory

From this brief outline of Giddens's ideas a number of key issues may be identified that give structuration its distinctive character. An examination of these issues may help to clarify the underlying assumptions of structuration theory and serve as a basis for assessing the way in which it has been used in IS research and its future potential[2]. Capturing the essential character of structuration, however, is not a simple matter, as may be illustrated by its identification by different authors as both post-modern (Macintosh and Scapens, 1991) and irredeemably modernist (Meštrović, 1998; Wilson, 1995).

A particular difficulty in characterising structuration is the quantity, density and specificity of Giddens's writing. Thus, over the past 30 years Giddens has written more than 30 books. This provides a considerable challenge to those wishing to understand his thinking and has also offered plenty of opportunity for subtle re-statements of the main tenets of his argument and responses to his critics. Careful attention needs therefore to be paid to the discussion of ideas across the range of Giddens's oeuvre rather than relying on single statements as sufficient to describe his position.

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[2]It should be emphasised that space limitations of a review of this sort mean that the ensuing discussion can only touch on some of the central debates around structuration theory rather than provide a systematic critical appraisal of the theory as a whole. There is, however, already a large literature on Giddens's work including at least a dozen books (including Bryant and Jary, 1991, 1997, 2001; Clark *et al*, 1990; Cohen, 1989; Craib, 1992; Giddens and Pierson, 1998; Held and Thompson 1989; Meštrović, 1998; Tucker 1998). Interested readers are therefore encouraged to consult these sources for a fuller discussion of the topics raised and to read Giddens's own writings to assess the validity of the analyses they present.

The density of Giddens's writing comes from two aspects in particular: the diversity of his sources and his fluency of expression. Thus his work frequently engages with a wide range of detailed theoretical debates often providing, in the process it must be said, a concise and telling summary of others' contributions. Having set out these ideas he then presents a rich elaboration of his own position with considerable awareness of the subtlety of possible criticisms. Tracing the argument through this complex and allusive text can therefore be a challenge and a concise exposition, even in Giddens's own words, is not easily arrived at. To add further difficulty, Giddens often adopts deliberately idiosyncratic definitions of certain key terms in order to differentiate his position.

The elusiveness of Giddens's writings has not escaped the notice of his critics. For example Bernstein (1989: 27) describes him as "foxlike" and notes his tendency, in the face of difficult problems, to "introduce a plethora of distinctions and schemas" which, while illuminating, often fail to be sufficiently specific about the criteria of their applicability. For this reason, this review will make perhaps more than usual use of quotations, both from Giddens and those who have drawn on his work, to help readers to reach their own conclusions.

The Character of Structuration Theory

In Giddens's own view, the origins of structuration theory represented a reaction to the perceived deficiencies of the prevailing schools of sociological thought. The first of these is positivism (or what Giddens calls "naturalistic" sociology, NRSM(2):1), in particular functionalism (especially as developed by Parsons), but also structuralism and post-structuralism. These approaches, particularly functionalism, he argues, are "strong on structure, but weak on action" (NRSM(2): 4), underplaying the importance of human agency, and imputing purposes, reasons and needs to society rather than to individuals. On the other hand, Giddens is also critical of interpretative sociologies, such as Schutz's phenomenology, Garfinkel's ethnomethodology and post-Wittgensteinian language philosophy, which, he argues, are "strong on action, but weak on structure", having little to say on issues of "constraint, power and large-scale social organisation" (NRSM(2): 4). Structuration is thus seen as a means of breaking out of this unsatisfactory dualism of action and structure and also that between individual and society.

Another significant feature of structuration concerns methodology, where, as Bryant and Jary (1991) note, Giddens adopts a post-empiricist and anti-positivist stance. This denies the existence of universal laws of human activity and emphasises the centrality of the interpretative endeavour, describing social science as "irretrievably hermeneutic" (NRSM(2): 13), that is, interpretative. Giddens (1991:219), however, does not reject the potential contribution of "technically-sophisticated, hard-edged" research. Indeed in (CS:xxx) he specifically states that "I do not try to wield a methodological scalpel … there is [nothing] in the logic or the substance of structuration theory which would somehow prohibit the use of some specific research technique, such as survey methods, questionnaires or whatever." Rather, he argues that "the intellectual claims of sociology do not rest distinctively upon [hard-edged research]. All social research in my view, no matter how mathematical or quantitative, presumes ethnography." (Giddens, 1991:219). Thus, however mathematical or technically-sophisticated its methods, social research is based on detailed study (and interpretation) of specific social settings.

The Duality of Structure and its Status

For Giddens the duality of structure refers to the "essential recursiveness of social life, as constituted in social practices: structure is both medium and outcome of the reproduction of practices" (CPST: 69). His emphasis is therefore on structuration as an ongoing process rather than structure as a static property of social systems. In order to drive this home Giddens adopts quite specific and non-standard meanings for certain key terms (CS: 25):

STRUCTURE(S)	Rules and resources, organised as properties of social systems. Structure only exists as 'structural properties'.
SYSTEM(S)	Reproduced relations between actors or collectivities, organised as regular social practices.
STRUCTURATION	Conditions governing the continuity or transformation of structures, and therefore the reproduction of social systems.

Two types of resources are distinguished: allocative, which involve "transformative capacity generating command over objects, goods or material phenomena" and authoritative, which involve

"transformative capacity generating commands over persons or actors" (CS:33). The particular meaning of rules in this context is also the subject of extended discussion (CS:17-23) in which Giddens distinguishes between the "rules of social life [which are] techniques or generalisable procedures applied in the enactment/reproduction of social practices" and "formulated rules", such as those of a game or a bureaucracy, which are "codified interpretations of rules rather than rules as such" (CS:21). As an illustration of such "formulated rules", Giddens cites the mathematical formula $a_n = n^2 + n-1$. As he stresses, this does not mean that "social life can be reduced to a set of mathematical principles" (CS: 20), but that the formula provides a rule for how to carry on in any given situation (n) and that an individual may be able to state the formula without understanding its meaning or observe a sequence of numbers that obey it without being able to describe the principle involved.

Although at first sight this distinction might seem to provide some clarification, Thompson (1989) is typical of a number of critics in arguing that it "generates more confusion than it dispels and ... tends to obscure some important issues", drawing attention to ambiguities of the term 'rule' and Giddens's concern with a general notion of structure at the expense of specific features of social structure. Giddens (1989) does not accept these criticisms, however, arguing that they reflect a misunderstanding of his usage and that structuration is capable of explaining both individual and institutional features of social life

One particular implication of Giddens's conceptualisation of structure is that it is "a 'virtual order' of transformative relations ... that exists, as time-space presence, only in its instantiations in [reproduced social] practices and as memory traces orienting the conduct of knowledgeable human agents" (CS:17). This is true, Giddens argues, even in the case of the apparently material allocative resources (such as land) which "might seem to have a 'real existence'" but which "become resources only when incorporated within processes of structuration" (CS:33). This is an important point in the context of IS research since it implies that, as Giddens sees it, structure does not exist in material artefacts, such as technology, but only in human memory traces and through social practices. As he puts it, therefore, in one of his very few direct statements on the topic, "[t]echnology does nothing, except as implicated in the actions of human beings" (Giddens and Pierson, 1998: 82).

Structuration thus mediates not between objectivist and subjectivist accounts of social practices, but between hermeneutic, functionalist and structuralist accounts of the relationship between structure and agency (CS: 26). Indeed, in proposing that structure is in the minds of social actors and only given substance through their actions, Giddens adopts a specifically subjectivist position that has lead some critics to identify him as an idealist.

Although New (1995) challenges this criticism, arguing that Giddens's view that structure is causally generative implies that it is real, and Layder (1987) suggests that Giddens's anti-objectivism is both unnecessary and theoretically problematic, implying that structuration need not be incompatible with realism, it remains the case that, as Giddens himself presents it, the rules and resources constituting structure exist only in the agents' heads. To talk of structure being inscribed or embedded in artefacts is therefore inconsistent with Giddens's views, as it fixes in technology one half of the duality of action and structure, the inseparable linkage of which is a central feature of structuration theory.

Critics of Giddens's treatment of agency also question the view that social order is produced and reproduced entirely through individual action. Focusing on the dependency of social structure on agency, some, such as Harré (1983), suggest that in well-ordered institutions, such as monasteries, social rules may dominate social reproduction and that individual structurational agency is thus insignificant or even absent[3]. Others argue that all aspects of structure may not be equally amenable to agency, suggesting that there may be a "differentiated (and thus limited) topography for the exercise of agency rather than an endlessly recursive plain" (Storper, 1985:419), or that some structural constraints may be "relatively independent" (Layder, 1987).

Practical and Discursive Knowledge and Unintended Consequences

Giddens views human agents as essentially knowledgeable about their actions. He argues that this may include "unconscious sources of cognition" (CPST: 5) as well as those at level of practical consciousness embodied in what actors know "about how to 'go on' in the multiplicity of contexts of social life" (Giddens, 1983) and at the discursive level, at which they are able to provide explanations for them (CS:7). They are thus seen to be continuously engaged in reflexive monitoring of conduct,

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[3] Although individuals may be considered to have exercised agency in choosing to join such institutions in the first place.

rather than as the "cultural" or "structural dopes ... of stunning mediocrity" (CPST: 52) suggested by traditional views of structure as merely constraining action. This has important implications for the understanding of social action, as we have seen, as "every member of society must know … a great deal about the workings of that society by virtue of his or her participation in it" (CPST: 250). Giddens uses the term "discursive penetration" to describe this awareness of social actors of their engagement in social reproduction and production. This leads, he argues to a "double hermeneutic" whereby the concepts that sociological observers describe are already constituted as meaningful by social actors and can themselves become elements of the actors' understanding of their own condition.

This knowledgeability of social actors might seem to suggest that they are always in control of action. Giddens avoids this, however, by emphasising the unacknowledged conditions and unintended consequences of action. Thus "the production or constitution of society is a skilled accomplishment of its members, but one that does not take place under conditions that are either wholly intended or wholly comprehended by them" (NRSM(2): 108). This implies, Giddens argues, that universal laws in the social sciences are "markedly implausible" (CS: 345), if not impossible. Social generalisations can therefore, at best, only be 'historical', i.e. temporally and spatially circumscribed.

Agency and Constraint

Structuration theory has been the subject of significant criticism by a number of authors who contend that, unacknowledged conditions and unanticipated consequences notwithstanding, it assumes an inappropriately voluntaristic view of human agency (e.g. Bhaskar, 1979). This comes from Giddens's contention that structure is not simply constraining, but is also enabling, and that, except in situations where they have been drugged and manhandled by others, human agents always "have the possibility of doing otherwise" (Giddens, 1989: 258). Thus "the seed of change is there in every act which contributes towards the reproduction of any 'ordered' form of social life" (NRSM(2): 108).

His critics, however, suggest that it does not make sense to argue that structural constraint simply places "limits upon the feasible range of options open to an actor in a given circumstance" (CS: 177).

Individuals, such as a landless peasant at the start of the capitalist era, they argue, had effectively only one feasible option if they wished to survive, to sell their labour-power. Archer (1990) therefore proposes a morphogenetic approach in which constraint and action operate sequentially, while Layder (1985: 146) argues for a notion of structural power that is "not simply a negotiable outcome of routine and concrete interactions and relationships" in the specific context.

This is a particular issue, Barbalet (1987) argues, when considering material artefacts (potentially significant in relation to a structurational theory of information systems as we have noted), which Giddens suggests cannot be social structural resources in power relations. Storper (1985) makes a similar point in arguing that "the *durée* of the material, although not imposing absolute constraints on system change, does mean that at any moment not everything is possible."

Giddens, however, does not accept these views, suggesting that the alternative to his conception is a form of determinism. All sanctions, he argues, no matter how oppressive and comprehensive, even the threat of death, carry no weight without the acquiescence of those threatened with them, in this case the individual's wish not to die (CS: 175). Power is only effective, therefore, to the extent that actors subject to it allow it to influence their actions. Giddens's voluntarist view of power as being instantiated in action rather than a type of act (such as people being made to do things against their will) or a resource (such as land or money that someone can possess) to be drawn on, provides a distinctive approach to a central issue in organisational analysis.

Giddens's model of power is also relational. Like Foucault (1979) he proposes a dialectic of control in which "all forms of dependence offer some resources whereby those who are subordinate can influence the activities of their superiors" (CS: 16). The operation of power relationships therefore relies upon the compliance of subordinates. Giddens's writings in this area, however, have been notably less influential than those of Foucault, perhaps reflecting the problematic character of his voluntarist assumptions.

Time, routines and time/space distanciation

Time, for Giddens, is one of the central, but frequently neglected, topics of social science and each of his major writings gives considerable attention to it. In particular, he identifies (CCHM(2): 28) three "intersecting planes of temporality" involved in every moment of structuration - *durée* (the reversible temporality of daily experience), Heideggerian *dasein* (the irreversible temporality of the life-cycle, being-unto-death) and Braudel's *longue durée* (the reversible temporality of institutions). In this way, he argues, structuration ties together the individual and institutional levels of social practice and points to the recursive nature of social life.

Although Giddens gives greater emphasis than many social theorists to time, some aspects of his treatment of the topic have been criticised. Adam (1990), for example, questions his suggestion that social time may be reversible and whether his claims about the time-space distanciation of power relationships apply outside modern industrialised societies. Bergmann (1992) and Nowotny (1992) also argue that Giddens neglects the constructed nature of temporality.

The idea of structure being continuously produced and reproduced through action leads to another significant aspect of structuration, that of routinisation. Giddens argues that routine is "integral to the continuity of the personality of the agent ... and to the institutions of society" (CS:60). In particular, individuals acquire ontological security through their engagement in predictable routines and encounters. Because these encounters are also constitutive of social institutions they enable the continuity of social life, the classic sociological 'problem' of how social order is sustained.

Giddens permits a distinction between two levels of integration, or "regularised relations of relative autonomy and dependence", between social practices. The first is defined as "social integration" and refers to "systemness on the level of face-to-face interaction", while the second, "system integration", refers to "systemness on the level of relations between social systems or collectivities" (CPST: 76). While this serves to differentiate between the micro and macro spheres of sociological analysis, in explicitly relating social integration with face-to-face interaction, it also highlights the importance of space and presence in social relations. From an IS standpoint social and system integration would seem particularly significant in view of the role of IT in the changing temporal and spatial character

of modern organisations. Interestingly, this is recognised by Giddens in one of the very few references to IT in his structurational writings where he notes that: "… mediated contacts that permit some of the intimacies of co-presence are made possible in the modern era by electronic communication…" (CS: 68). IS may mean that social integration is possible without co-presence.

Structuration Theory in Relation to Empirical Research

A major concern for the use of structuration theory in the IS field is its relevance to empirical research. Some critics, such as Gregson (1989), for example, have suggested that it operates at too high a level of generality to provide guidance in specific empirical settings. Giddens does not accept this claim, however, and indeed has made a number of attempts to spell out what he sees to be the potential contribution of structuration theory to social research. In CS (pp281-284), for example, he provides a 10-point summary of the key features of structuration (see Table 1) that, he argues, suggest "guidelines for the overall orientation of social research".

In Giddens (1989:300) he describes four features of a "structurationist programme of research." These include a focus upon "the orderings of institutions across time and space", rather than the study of 'human societies'; analysis of "social systems in terms of shifting modes of institutional articulation"; continual "sensitivity to the reflexive intrusions of knowledge into the conditions of social reproduction"; and orientation to "the impact of its own research upon the social practices and forms of social organization it analyses"). In Giddens (1991: 311) he simplifies the 10 principles in CS to just three: contextual sensitivity, the complexity of human intentionality and the subtlety of social constraint. Then (p313) he mentions four aspects of structuration "most generally relevant to social research": reproduction of practices, dialectic of control, discursive penetration and the double hermeneutic. In CS (Chapter 6), Giddens (1983) and Giddens (1991: 213- 218) he comments on various attempts by researchers to use structuration in empirical research projects.

1	All human beings are knowledgeable agents
2	The knowledgeability of human agents is always bounded on the one hand by the unconscious and on the other by the unacknowledged conditions and unanticipated consequences of action
3	The study of day-to-day life is integral to the analysis of the reproduction of institutionalised practices
4	Routine, psychologically linked to the minimising of unconscious sources of anxiety, is the predominant form of day-to-day social activity

5	The study of context, or of the contextualisation of interaction is inherent in the investigation of social reproduction
6	Social identities, and the position-practice relations associated with them, are 'markers' in the virtual time-space of structure
7	No unitary meaning can be given to 'constraint' in social analysis
8	Among the properties of social systems, structural properties are particularly important, since they specify overall types of society
9	The study of power cannot be regarded as a second-order consideration in the social sciences
10	There is no mechanism of social organisation or social reproduction identified by social analysts which lay actors cannot also get to know about and actively incorporate into what they do

Table 1: "Aspects of structuration theory that impinge most generally upon problems of empirical research in the social sciences" (CS: 281-284)

At the same time, Giddens frequently states that structuration is not intended as a concrete research programme (Giddens, 1983: 77; 1992: 310) and that his principles "do not supply concepts useful for the actual prosecution of research" (Giddens, 1990: 312). He is also critical of those who "have attempted to import structuration theory *in toto* into their given area of study", preferring those "in which concepts, either from the logical framework of structuration theory, or other aspects of my writings, are used in a sparing and critical fashion" (Giddens, 1991: 213). Another favoured description of the role of structuration in empirical research is the use of principles derived from it as "sensitising devices" or to "provide an explication of the logic of research into human social activities and cultural products" (Giddens, 1991: 213).

As Archer (1990) puts it, therefore, structuration is "fundamentally non-propositional", or, as Craib (1992:108) argues, "it does not give us anything to test or to find out". Thus Gregson (1989: 245) describes structuration as a "second-order theory" concerned not with "theorizing the unique (i.e. with explaining the events or contingencies of particular periods or places), but with conceptualising the general constituents of human society". This is effectively acknowledged by Giddens (1989: 295) in his distinction between theory, as a generic category, and *theories*, or explanatory generalisations. Structuration, he argues, is clearly of the first type. A number of authors have therefore suggested that structuration is best considered as a meta-theory, a way of thinking about the world rather than as an empirically testable explanation of social behaviour. Weaver and Gioia (1994), indeed, propose it as *the* integrating meta-theory for organisational studies, a view criticised by De Cock and Rickards

(1995) who question whether structuration, or any other theory, is able to transcend all positions without assumptions of its own.

Summary

The key features of structuration theory, their implications and some of the potential issues that they raise, especially in the context of IS research, are summarised in Table 2.

Feature of structuration theory	Implication	Potential issues
Duality of structure	Structure and action are inseparable and co-existent	Structure exists only through action. It never pre-exists action.
Structure is a "virtual order of transformative relations"	Rules and resources exist only in their instantiation and as memory traces orienting conduct	Material resources, such as technology, influence social practices only through their incorporation in processes of structuration
Essential recursiveness of social life	Structure is produced and reproduced in every instance of action	Social phenomena are temporary regularities in an ongoing process
Agents always have the possibility to do otherwise	Structural constraint simply places limits upon the feasible range of options open to an actor in a given circumstance	Compliance with structural constraint implies choice to do so
Agents are knowledgeable about their actions and continuously reflect on their conduct	Agents are aware of their condition and reflect on it	Agents may not be discursively aware of their knowledge
Unacknowledged conditions and unintended consequences	Production and reproduction of society is not wholly intended or comprehended by social actors	Social generalisations are temporally and spatially circumscribed
Routine is integral to the continuity of the personality of the agent .. and to the institutions of society	Individual identity and social institutions are sustained through routine	The seed of change is there in every act which contributes towards the reproduction of any 'ordered' form of social life
Time space distanciation	Societies "stretch" over spans of time and space	The importance of face-to-face interaction for social integration and the capability of technologies to facilitate integration "at a distance"
Double hermeneutic	Concepts that sociological observers describe are already constituted as meaningful by social actors and can themselves become elements of the actors' understanding of their own condition	Social actors can reflexively appropriate the researcher's understanding of their condition

Table 2. Key features of structuration theory, their implications and some possible issues for IS research.

ANALYSING THE USE OF STRUCTURATION THEORY IN THE IS FIELD

Having identified a number of issues in relation to the use of structuration theory in the IS context, these may now be compared with the way in which the theory has been used in IS literature. As the basis for this comparison a search was undertaken to locate as many articles, written in English[4], as possible that have used Giddens's ideas to study IS phenomena.

Four main methods were used to carry out this search. The first was to consult previous review articles (which are themselves included in the current analysis, but none of which are as comprehensive); second was an online search of ABI/Inform and EBSCO Business Periodicals using the search terms Giddens AND Information*; third a manual review of hard copies of a number of significant IS journals; and lastly; an analysis of the proceedings of IFIP WG8.2 and ICIS conferences. Further references were also sought through analysis of bibliographies of the articles themselves. The coverage of these searches is shown in Table 3.

Journal	Years searched
Accounting, Management and Information Technologies / Information and Organization	1991 – 2002
Computer Supported Cooperative Work	1992 – 2002
European Journal of Information Systems	1991 – 2002
The Information Society	1996 – 2002
Information Systems Journal	1994 – 2002
Information Systems Research	1990 – 2002 (issues 1-3)
Information Technology and People	1990 – 2002 (issues 1-3)
Journal of Organizational Computing	1996 – 2002 (issues 1-2)
Journal of Strategic Information Systems	1992 – 2002
Management Information Systems Quarterly	1977 – 2002
Scandinavian Journal of Information Systems	1990 – 2002
International Conference on Information Systems proceedings	1986 – 2002
IFIP Working Group 8.2 conference proceedings	1979 – 2002

Table 3. Journals and conference proceedings searched

Two important extensions of structuration theory in the IS context were evident from the literature: Orlikowski's structurational model of technology (Orlikowski and Robey, 1989; Orlikowski, 1992) and Adaptive Structuration Theory (AST) (DeSanctis and Poole, 1994; Poole and DeSanctis, 1990, 1992). Articles citing these papers either on their own, or in combination with Giddens were therefore also included in the search.

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[4] Structuration has recently begun to attract attention in the French IS literature (see, for example the proceedings of the 5th Association Information et Management conference at www.aim2000.univ-montp2.fr/fr/index.html). We are also aware of articles in other European languages.

The total number of IS papers using Giddens's ideas, either directly or via Orlikowski's work or AST, identified by these methods was 225. This total does not include working papers, articles in conference proceedings other than ICIS or IFIP WG8.2 or articles citing Giddens, Orlikowski or AST in cognate subjects such as accounting, geography or organisation theory without a specific IS content, except where they appeared to have made a distinctive contribution to the development of structurational IS research. Another 39 papers discussing Giddens's ideas were identified in edited books, or presented at conferences such as the European Conference on Information Systems or the Hawaii International Conference on Systems Sciences for which complete proceedings were not available.

Giddens was also mentioned in more than 120 further IS papers, but without any significant discussion of his work. For example, these include papers referring to Giddens as a constructivist social theorist or as a potential alternative source of theoretical insight in the context of studies using other theories. They are of interest to the present study, however, to the extent that they may be taken as indicative of awareness of Giddens in the IS literature, even if substantive use is not made of his ideas.

While the search sought, as far as possible, to be systematic, it is not claimed that it provides a complete survey of the use of Giddens's ideas in the IS literature as there may be significant articles in journals, conferences, or other sources not covered by this search. Its purpose is therefore primarily illustrative of the types of IS research that have used structuration theory and the ways in which they have used it, rather than to draw firm conclusions about the absolute numbers or proportions of papers.

In order to identify patterns within this literature, the papers were independently coded by each author into a number of categories. Following a number of iterations comparing and refining the coding schemes, agreement was reached on the classification of the papers into eleven categories as shown in Table 4. The distribution of papers among these categories over time is shown in Table 5 (a full listing of references is given in Appendix 1) and the key features of the research in each category are described in the following sections. Again, the allocation of papers to these categories is not

claimed to be definitive. As is discussed below, the boundaries between a number of the categories are a matter of emphasis rather than absolute difference. Moreover, given the acknowledged limitations of the search method, the primary focus is necessarily on the broad pattern of structurational research within the IS field rather than the specific numbers.

Category	Definition
Early applications of structuration theory	Papers published before 1995 analysing the duality of structure in empirical IS cases (whether explicitly or as a meta-theory)
Later applications of structuration theory	Papers published in 1995 or after, analysing the duality of structure in empirical IS cases (whether explicitly or as a meta-theory)
Secondary applications of structuration theory	Papers analysing structurational processes in empirical IS cases, but primarily drawing on secondary sources, e.g. Orlikowski (1992) or Walsham (1993), rather than Giddens
Use of structuration theory concepts	Papers using structuration theory concepts other than the duality of structure (e.g. constraint, time-space distanciation) in the analysis of IS topics
Use of concepts from Giddens's other writings	Papers using concepts from Giddens's writings after 1990 (e.g. modernity, trajectory of the self) in the analysis of IS topics
Reviews and comparative studies	Papers critically discussing the use of structuration theory in IS research, including where part of a broader review
Use of structuration theory with other theories	Papers combining structuration theory with other theories (e.g. Actor Network Theory, Activity Theory) in the analysis of IS topics
Adaptive Structuration Theory foundations	Papers describing the original development of Adaptive Structuration Theory
Application of Adaptive Structuration Theory	Papers applying Adaptive Structuration Theory, with little or no modification, in the analysis of empirical IS cases
Extensions of Adaptive Structuration Theory and concepts	Papers proposing and applying modifications to Adaptive Structuration Theory in the analysis of empirical IS cases
Duality of Technology	Papers describing the development of Orlikowskis's Duality of Technology model

Table 4. The classification scheme used to categorize the papers.

Category	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Total
Early applications of ST in IS	0	0	0	1	0	0	2	1	1	6	7	2	0	0	0	0	0	0	0	0	**20**
Later applications of ST in IS	0	0	0	0	0	0	0	0	0	0	0	0	6	2	3	0	1	5	6	5	**28**
Secondary applications of ST in IS	0	0	0	0	0	0	0	0	0	0	1	5	1	1	6	2	5	1	1	5	**28**
Use of ST concepts in IS research	0	0	0	0	0	0	0	1	3	1	0	5	2	0	3	4	2	2	1	2	**26**
Use of concepts from G's other writings	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2	1	2	2	7	**16**
Reviews and comparative studies	0	0	0	0	1	0	0	1	1	1	1	0	1	1	1	3	1	1	3	0	**16**
Use of ST with other theories	0	0	0	0	1	0	0	0	0	2	1	4	4	2	2	1	5	2	0	3	**27**
AST foundations	1	0	1	1	0	0	1	1	2	1	0	2	0	0	0	0	0	0	0	0	**10**
Application of AST	0	0	0	0	0	2	1	0	0	1	4	3	2	4	3	2	3	4	0	1	**30**
Extensions of AST and concepts	0	0	0	0	0	0	0	0	0	1	1	2	0	1	1	2	3	2	1	5	**19**
Duality of Technology	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	0	1	0	0	**5**
	1	*0*	*1*	*2*	*2*	*2*	*4*	*4*	*8*	*14*	*15*	*23*	*17*	*13*	*20*	*16*	*21*	*20*	*14*	*28*	**225**

Table 5. The distribution of papers among the categories over time.

TYPES OF STRUCTURATIONAL RESEARCH IN THE IS FIELD

Early applications

Apart from one early outlier (Barley, 1986), it appears that structurational papers addressing IS topics began to be published in any numbers somewhat later than in other management-related fields, such as organisational behaviour and accounting, where substantial discussion of structurational research was already evident in the 1980s. The emergence of structuration theory in the IS field appears to have been linked to papers such as Hirschheim, Klein and Newman (1987) and Lyytinen and Hirschheim (1989) advocating the study of IS development and use as social action and to the growing interest in interpretative methods in certain quarters (eg Boland 1985, Walsham, 1993). Parallel developments in the Communication Studies field, especially around the then new area of computer-mediated communication, also gave rise to an interest in structuration (Poole and McPhee 1983, 1985; Poole, Seibold and McPhee 1986) that subsequently lead to the development of AST, discussed further below.

The main focus of the papers classified as "early applications of ST in IS" is typically on illustrating the core concepts of structuration theory in an IS context, especially the structure/agency dimensions and their interaction through modalities as shown in Figure 1. Papers in this category include Walsham and Han's (1993) study on IT strategy implementation, Boland and Greenberg's (1992) study of information systems development and Lyytinen and Ngwenyama's (1992) analysis of Computer Supported Cooperative Work.

From a theoretical standpoint, some of these studies may be seen as exemplifying the somewhat mechanistic "application" of structuration theory, against which Giddens cautioned (1991: 213); following Giddens's description rather too literally and uncritically, and identifying each theoretical element in turn. Their significance, in terms of structurational research in the IS field, however, lies in their position as early adopters (c.f. Rogers 1962), demonstrating the relevance of structurational concepts in the understanding of IS phenomena and opening the way to later studies. Indeed, certain of these papers, especially those of Barley (1986), Orlikowski (1992), and Walsham and colleagues (Walsham and Han, 1993, Walsham and Waema, 1994) and the related chapters in Walsham's 1993

book (Walsham, 1993), appear to be the primary source of exposition of structurational concepts for a number of subsequent studies, especially those classified here as secondary applications.

Later Applications

The group of articles identified as "later" applications are distinguished from the "early" applications solely on the basis of the date of their publication. The choice of 1994 as the cut off point between the two simply reflects a slight decline in the number of articles at that date rather than any particularly significant demarcation between the content of the two sets of articles. It is also possible that some of these "later" applications may actually have been written before some of the "early" studies, but their appearance may have been delayed by publication time lags. Despite the somewhat arbitrary nature of the division, however, it seemed helpful to distinguish between the "early" studies published at a time when structuration theory was not yet widely recognised in the IS field and "later" studies published when structuration's relevance was more generally accepted (at least in certain quarters) and for which the "early" application literature provided a comparatively easily accessible point of reference. Articles in this category include Karsten (1995) on groupware implementation, Crowston *et al* (2001) on the real estate industry, and Cendon and Jarvenpaa (2001) on IT implementation in a medical library.

Some of these later papers largely reiterate claims made in the earlier studies, regarding the relevance and applicability of structuration in the IS field. In other cases, however, they may be argued as extending the literature, by applying structuration theory to explore phenomena relating to new types of IS (groupware), or in new contexts (medical libraries), or industries (real estate). Moreover, perhaps reflecting the growing familiarity of structurational concepts in the IS field over time, some of these papers offer rather more subtle readings of structurational processes in IS contexts than the early studies.

Secondary Applications

Whereas the distinction between the "early" and "late" applications was purely chronological, the distinction between these two types of study and the "secondary" applications reflects an assessment of whether the use of structurational concepts is reasonably close to Giddens's own formulation, or,

intentionally or not, involves selective or modified versions of structurational thinking. The "secondary" character of these studies also often reflects their dependence on some of the studies included in the "early" applications literature, especially Orlikowski (1992) and Walsham (1993), for their interpretation of structuration theory, thereby losing some of the subtleties of the original analysis. A number of these studies also reproduce what may be argued to be misreadings of Giddens by the earlier authors (see discussion of Orlikowski, 1992, below), especially in treating technology as a structure in its own right. Articles in this category include Brooks's (1997) study of Computer Aided Design, Purvis *et al*'s (2001) study of knowledge management, and Pinsonneault and Kraemer's (2002) discussion of downsizing.

This "secondary" literature often appears to be motivated by a concern to "translate" structurational concepts into a form seen to be more readily applicable in the IS field: to provide a mapping between structurational and IS language. While this may have helped to stimulate interest in structuration in the IS field, the rather literal "translation" adopted in some of these studies, for example treating similarities of terminology in structuration and IS research as evidence of deeper correspondence, may also have promoted a somewhat distorted picture of Giddens's work within the IS field. Thus, as these papers themselves become sources for later studies, without reference to Giddens, structurational IS research may increasingly diverge from the original concepts of the theory.

Use of Structuration Theory Concepts

The papers in this category are primarily distinguished by their focus on particular concepts within structuration theory. Structuration typically forms the background to the analysis, but all aspects of the theory may not necessarily be invoked. In comparison to the "early", "late" and "secondary" applications, their use of structuration is therefore more selective, although a clear demarcation between "application" and "use of concepts" is not always easy to define. For example a study focusing on a particular aspect of structuration may be informed by the whole theory, although not explicitly identifying itself as "applying" it. Given their usually explicit selectivity in the use of structuration, these studies are perhaps closer to the sorts of research that Giddens (1991:213) appears to favour, although it may be argued that there is some variation in the degree to which they are "sparing and critical" in their use.

As a general theory of social practice, structuration theory addresses a wide range of significant, inter-related concepts relevant to the study of IS phenomena. Within the IS literature, however, the coverage of these has been quite uneven with eleven papers on the temporal/spatial ordering of social practices (e.g. Sahay, 1997), ten on power and the dialectic of control (e.g. Elkjaer et al, 1991), three on discursive/practical consciousness (e.g. Hemingway, 1998), and two on constraint (e.g. Nandhakumar and Jones, 1997). It is difficult to judge, though, whether this imbalance is: because IS researchers have considered the under-represented concepts, such as constraint, to be less important than time/space organisation of social practices or power; because there has been no widely-accessible exposition of these concepts, providing guidance for a more systematic programme of analysis; or simply because the total number of studies is, as yet, too small for all concepts to have received similar coverage. Whatever the reasons for the relative neglect of certain aspects of structuration, these would seem to offer opportunities for a richer exploration of the range of implications of Giddens's ideas in the IS field.

Use of Concepts from Giddens's Other Writings

These papers focus on concepts developed in Giddens's writings of the 1990s, in particular his analysis of modernity. Although reference is sometimes made to earlier works, and structuration may be mentioned, this is typically a secondary concern. Given that many of the authors have also written directly on structuration in other papers, however, then these works are usually informed by structurational concepts and serve to demonstrate how these ideas can underpin work analysing IS in relation to contemporary social change in a variety of areas. Studies in this category include: Nicholson and Sahay (2001) on time-space and globalisation, Barrett and Walsham (1999) on self-identity and Scott (2000) on the reflexive modernity. The analysis suggests that the number of these papers has been increasing over time, although they still remain a small proportion of the total.

Reviews and Comparative Studies

Given the relatively short history of structurational research in the IS field, the literature has already attracted quite a number of reviews, surveying the use of structuration theory in the IS literature[5]. A

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[5] Poole and DeSanctis have recently written an extensive review of structuration in IS research that is available at https://doc.telin.nl/dscgi/ds.py/Get/File-

number cover the whole IS field, and sometimes more broadly, while others restrict themselves, often as part of a more general review of research on a particular IS topic such as Group Decision Support Systems, to structurational research in a specific geographical area or specific parts of the literature. For example Iivari and Lyytinen (1998) explore structurational IS research in the Scandinavian context, while Contractor and Seibold (1993) critically review early GDSS studies using AST. Since the more general reviews form a direct reference point for the current analysis, they will be discussed in rather more detail than papers in other categories.

Walsham and Han (1991) was one of the earliest reviews and is perhaps the most widely cited. This outlined "key elements" of structuration theory, surveyed its use in six papers in some detail, and identified three potential applications of structuration in the IS field: "operational studies", "use as a meta-theory", and "use of specific concepts". Reflecting the limited amount of published structurational work in the IS field at the time it was written, Walsham and Han primarily discuss the early contributions of Barley and Poole and DeSanctis and working papers by Boland and Orlikowski and comment on the use of structuration in related fields, such as management. Their focus is also, necessarily, more on how structuration might contribute to IS research, than on evaluating how it had actually been employed.

The aim of the review by Rose (1998), in contrast, is specifically to "evaluate the contribution of structuration theory to the IS discipline". After a description of key features of the theory, the use of structuration in 13 papers in the IS field is analysed in terms of whether their purpose is to theorise, to analyse, or to operationalise. It is argued that structurational IS research is predominantly of the first two types, but that "in an applied discipline [such as IS], more direct ways of guiding practice are crucial". Some strategies for achieving this, such as "translating" structuration into a language more "familiar and acceptable to the IS community" and developing structurational "tools, techniques, frameworks, method and methodology", are suggested.

Jones (1999) would appear to be the most comprehensive review to date, covering more than 50 articles in the IS and related research fields and assessing them against a description of Giddens's

position in terms of their focus on reconstructing structuration to accommodate technology, their application of structuration, either wholly or partially, using structuration as a meta-theory or attempting to link it with other theories. It is suggested that research in the IS field needs to move on from simply "applying" structuration: to explore new solutions to the unresolved issues of accounting for technology in structurational terms, perhaps drawing on ideas from other theories; and to address previously neglected aspects of structuration and Giddens's later work as they relate to IS phenomena. Such research, it is suggested, should be informed by careful and critical reading of Giddens's work, to ensure that it does not lose sight of central concepts on which his work is based.

Two papers by Pozzebon and Pinsonneault (2000, 2001) identified three distinct patterns of usage of structuration theory in IS research, based on an analysis of 22 papers, and assessed their methodological strategies following the typology of Langley (1999). Pozzebon and Pinsonneault's three categories comprised Adaptive Structuration Theory and what they describe as "mutual shaping" and "actor's organising", depending on their interpretation of whether the papers see organisations as being "not only shaped by IT, but [ ] also strongly influenced by social and political processes and by the actions of members of the organisation" (Pozzebon and Pinsonneault, 2001: 207), or adopt a more voluntarist position. They suggest that mutual shaping is more faithful to Giddens and note the irony that a theory intended to transcend differences has become appropriated within positions that largely reinforce them. While, as was noted earlier, a close reading of Giddens would suggest that his complete rejection of any objectivist element in his ontological position arguably places him in the "actors' organising" category, Pozzebon and Pinsonneault's identification of different approaches to the use of structuration in the IS literature and attempts to relate this to methodological strategies are a valuable contribution to clarifying the influence of structuration in IS research.

Other papers in this category do not attempt to review structurational IS research in detail, but discuss such studies as typifying a particular conceptualisation of IS, often in comparison to other theoretical approaches. Berg (1998) for example, contrasts the treatment of technology in structurational research with that offered by Actor-Network Theory; Robey and Boudreau (1999), discussing non-deterministic approaches to understanding the relationship between IS and

organisational change, identify structuration as one such approach that is "pervaded" by dialectical reasoning; and Dobson (2001) compares structuration with Critical Realism.

Taking a broader, more detached and critical stance, the studies in this category provide a valuable perspective on structurational IS research, although sometimes their evident motivation by a particular agenda can create a rather imbalanced assessment of the field. Nevertheless, in drawing attention to possible limitations of structuration theory and the way in which it has been used in the IS research, they provide useful insight and overview of problems and opportunities for the development of the field.

Use of Structuration Theory with Other Theories

Reflecting some of the difficulties in using structuration theory in an IS context discussed above, a number of attempts have been made to link structuration theory with other theoretical approaches, especially, as Monteiro and Hanseth (1995) put it, to "take technology seriously". Contributions in this area include attempts to combine structuration with Soft Systems Methodology (e.g. Rose and Lewis, 2001), Actor-Network Theory (e.g. Jones, 1998; Monteiro, 2000; Rose and Truex 2000; Walsham and Sahay, 1999). Garnsey and Kelly (1995) also identify commonalities between structuration and enactment (Weick, 1979), seeing both as examples of constitutive process theories. This connection is made more explicitly by Boland and Greenberg (1992), Davies and Mitchell (1994), and Orlikowski (1996, 2000), focusing on the situated and emergent character of practices around IS. Whether any of these syntheses adequately overcome the difficulties of using structuration to understand IS phenomena without losing sight of its key features is open to debate.

Extensions of Structuration Theory: Adaptive Structuration Theory

Adaptive Structuration Theory (AST) Foundations

In a series of 10 papers published between 1982 and 1994, Poole and De Sanctis sought to extend Giddens's structuration theory to address the mutual influence of technology and social processes. This approach, which they called "Adaptive Structuration Theory", is described as being based on a number of propositions (DeSanctis and Poole, 1994:125). These include that: "social structures serve

as templates for planning and accomplishing tasks"; "designers incorporate some of these structures into the technology" with the result that the structures may be reproduced or modified, "thus creating new structures within the technology".

AST suggests that "the social structures provided by an advanced information technology can be described in two ways: structural features of the technology and the spirit of this feature set" (DeSanctis and Poole, 1994: 126). Examples of structural features for a Group Support System are identified as voting algorithms and anonymous recording of ideas. These are said to bring meaning and control (equated with Giddens's signification and domination dimensions) to group interaction. A particular advanced information technology can therefore be "described and studied in terms of specific structural features" (ibid).

Poole and DeSanctis's concept of spirit, which they derive from the dictionary definition of the term, is described as the "general intent with regard to values and goals underlying a given set of structural features" and is said to equate to Giddens's legitimation dimension of structuration. This "property of a technology as it is presented to users" can be identified, it is argued, by "reading" the philosophy of the technology based on an analysis of: "(a) the design metaphor underlying the system; (b) the features it incorporates and how they are named and presented; (c) the nature of the user interface; (d) training materials and on-line guidance materials; and (e) other training or help provided with the system". Because IT is only one source of structure for groups, DeSanctis and Poole (1994) argue, it is therefore necessary to consider other sources of structure such as work tasks and the organisational environment in analysing the use of a particular technology.

Another important concept in AST is that of "appropriations". These are described as the "immediate visible actions that evidence deeper structuration processes" (DeSanctis and Poole, 1994: 128) and are seen as equivalent to Giddens's modalities of structuration (Poole and DeSanctis, 1990). Groups, it is explained, may choose to appropriate structural features through a variety of "appropriation moves", for example by directly using technology structures, or making judgements about them; they may appropriate technology "faithfully" or "unfaithfully", they may appropriate the features for "different instrumental uses or purposes"; and display a variety of "attitudes" such as "comfort", "respect" and "challenge" as structures are appropriated.

Through the use of AST, it is suggested, it will be possible to develop propositions of the form: "**Given** advanced information technology and other sources of social structure n_1 to n_k **and** ideal appropriation processes, **and** decision processes that fit the task at hand, **then** desired outcomes of advanced information technology will result" (DeSanctis and Poole, 1994: 131 - emphasis in original). If group interaction processes are inconsistent with technology's structural potential, however, then the outcomes will be less predictable and generally less favourable. This is said to illustrate the "dialectic of control between the group and the technology". DeSanctis and Poole (1994) suggest that AST is therefore able to overcome the limitations of previous structurational approaches, which, they argue, gave only weak consideration to IT, were exclusively focused at the institutional level, and relied on purely interpretative methods.

Applications of AST

These papers comprise the outputs from more than a decade of studies applying AST in a number of domains, but especially in Group (Decision) Support Systems (GDSS/GSS) and Computer Mediated Communication (CMC). Only papers explicitly identifying AST as the theoretical basis for the study are included. Examples of such papers include Gopal, Bostrom and Chin (1996), Chidambaram, (1996), and Miranda and Bostrom, (1993/1994), a number of which have appeared in leading IS journals. Typically, these seek to explore how features of a GSS affect how much and in what way it is used, often through laboratory-based experiments. They also frequently adopt a positivist epistemology, employing statistical analysis of quantitative findings to test hypotheses.

Extensions of AST

In contrast to the papers classified as "applications of AST", which adopt the approach of DeSanctis and Poole (1994) largely without modification, a number of other papers have sought to adapt and extend AST for example by developing new or revised methods for gathering and analysing data. Chin *et al* (1997), for example, developed a scale to measure faithfulness in the use of electronic meeting systems, while Chudoba (1999) developed a macro-level coding scheme for textual data to distinguish patterns that occur in groups using a GSS and Tan and Hunter (2002) propose the use of repertory grid approaches. Again, many of these studies involve laboratory-based experiments.

AST has also been linked with other theories, such as self-organising systems theory (Contractor and Seibold, 1993) and negotiation theories (Nyerges and Jankowski 1998). It has also been supplemented with a variety of techniques from other fields, such as idea generation techniques in GSS (Nagasundram and Bostrom 1994-1995).

AST and Structuration Theory

AST has been an important influence on the awareness of structuration theory in IS research, with about a quarter of the papers covered in this review adopting it in one way or another. In seeking to modify structuration to address IS research and its introduction of new constructs, such as features and appropriation, AST would therefore appear to have been successful in operationalising structuration in a way that is appealing to IS researchers.

At the same time, however, as Banks and Riley (1988), Iivari and Lyytinen (1998), Jones (1999) and Pozzebon and Pinsonneault (2001) note, there are some significant differences between AST and Giddens's formulation of the theory. For example, AST's view of "structure within technology", its identification of other independent "sources of structure", and its concept of a dialectic of control between "the group and the technology" would seem inconsistent with Giddens's position that structure is virtual, existing only in its instantiation; that it does not have independent sources, but is the indivisible medium and outcome of the reproduction of practices; and that the dialectic of control is between [human] agents. Similarly, in adding concepts, such as "spirit" and "appropriation", to Giddens's original scheme, Poole and DeSanctis would appear to reify what for Giddens are purely analytical constructs.

The extent of the divergence between AST and structuration theory is illustrated in the empirical research that has been inspired by AST. From the initial contingency type propositions of technology "impacts" that DeSanctis and Poole (1984) identified as the objective of AST, to the extensive programme of causal modelling that has been based on it, few of the studies would seem to reflect Gidden's views on the plausibility of universal social laws (CS: 345) or the "irretrievably hermeneutic" (NRSM(2): 13) character of social research.

This is not to say that AST research is invalid, but simply to point out that, in its programme of predictive, deterministic research, AST is pursuing a very different agenda from that which motivated Giddens's original objectives in developing structuration theory, of which the rejection of positivism was a central feature. To dismiss AST, moreover, would be to overlook its pioneering role in introducing Giddens's ideas in the IS field, its promotion of a receptivity among IS researchers to complex social theory, and its continuing inspiration of a significant stream of research. Whether or not it conforms to Giddens's conceptualisation of structuration, itself a matter of interpretation rather than unequivocal judgement, therefore, its importance in the context of structurational IS research is undeniable.

Extensions of Structuration Theory: Duality of Technology

An alternative approach to adapting structuration to the IS context that has also been influential on subsequent research has been that of Orlikowski, and in particular her Duality of Technology model of 1992.

Orlikowski (1992: 403) defines technology as "material artefacts (various configurations of hardware and software)", but also claims that this does not imply an "exclusive focus on technology as a physical object". Rather, it is argued, the "analytic decoupling of artefacts from human action allows ... material artefacts [to be conceptualised] as the outcome of coordinated human action and hence inherently social". This leads to the first premise of the Structurational Model of Technology that "technology is created and changed by human action, yet it is also used by humans to accomplish some action". This is termed the "duality of technology".

Technology is thus seen as "interpretively flexible", although it is argued that this is often neglected in the traditional IS literature, which treats technology largely as a "black box". In part, this is seen as being due to the "time-space discontinuity" of design and use of IS which "typically" occur in different organisations (those of the vendor and customer). It is also stated, however, that "interpretive flexibility is not infinite", being constrained by the material characteristics of the technology and the institutional contexts of its design and use, and the power, knowledge and

interests of the relevant actors. Thus "initial designers of a technology have tended to align with managerial objectives ... with the result that many technologies reinforce the institutional status quo, emphasizing standardization, control and efficiency" (p409).

Orlikowski's Structurational Model of Technology (Figure 2) depicts the relationships between institutional properties, human agents and technology. Thus technology is identified as the "product of human action" (arrow a), coming into existence and being sustained through human action, and being constituted through use. Only through the appropriation of technology by humans, therefore, does it exert influence. Technology, however, is also "the medium of human action" (arrow b). It conditions, rather than determines, the performance of social practices, both constraining and enabling them. The influence of institutional properties on human agents (arrow c) is a more conventional component of structuration, although Orlikowski also slants this towards technology in emphasising how the form and function of a specific technology will "bear the imprint" of the social and historical conditions under which it is built and used.

The last relationship, of technology on institutional contexts (arrow d), reflects the influence of technology in reinforcing or transforming the institutional properties of organisations. For example it is argued that "when users conform to the technology's embedded rules and resources they unwittingly sustain the institutional structures in which the technology is deployed". It is also emphasised, however, that the different relationships may vary in their relative strength over time and may be in contradiction with one another, thus precluding determinism and creating points of tension and instability that may give rise to change and transformation.
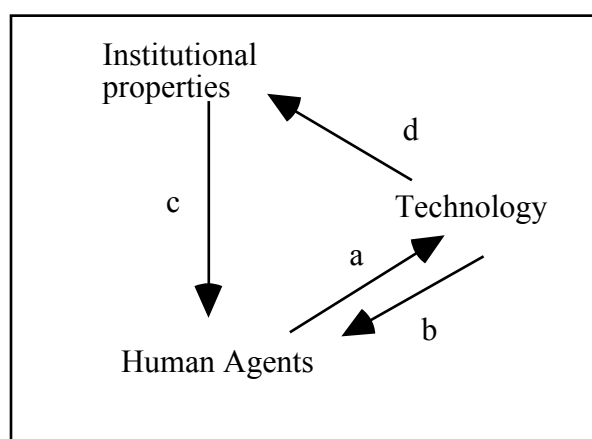
Figure 2: The Structurational Model of Technology (Orlikowski, 1992)

The model is applied to an analysis of the case study of the introduction of CASE tools in the Beta software consultancy (Orlikowski, 1991). In this, reference is made to knowledge and norms of interaction being "embedded in" the tools, and the way in which this "directs the manner in which problems are interpreted and work is conducted" (p417), and to the reinforcement of "Beta's shared reality, assumptions and values" (p418). In the discussion it is also suggested that time may reduce interpretive flexibility as the interpretation and use of technologies becomes habitualised, and it is proposed that further research might be directed toward analysing how "different organisational forms may engender certain kinds of technologies, and how these technologies in turn may reinforce or transform the structural configurations" (p423).

As described in Orlikowski (1992), however, there are a number of aspects of the model of technology that fit uneasily with some of the essential principles of structuration. Thus, although she proposes that her model avoids seeing technology in exclusively material terms and emphasises its social construction, her incorporation of technology as a material artefact is inconsistent with the ontological status of the structure/agency duality as Giddens defines it. From Giddens's standpoint institutional properties are "memory traces" which are inseparable from the human agency with which they are mutually constituted, and material phenomena are resources only when drawn upon in processes of structuration. Technology as both material entity and existing outside the duality of structure and agency is therefore anomalous in this context.

The material character of technology also creates difficulties for the concept of interpretive flexibility. For example, there would seem to be limits to the interpretive flexibility of some material properties of information technology such as screen resolution, or processing speeds. Because his primary focus is on social phenomena, this is not generally an issue that Giddens needs to confront. From a structurational perspective, however, it might be argued that a human actor could perceive more detail than was represented by the screen resolution, or consider the system to be working fast or slow independently of the processor speed. So long as these structures are "virtual", in the mind of the agent, and instantiated in their actions then the material properties are not significant. If it is

argued, however, as Orlikowski does, that technology is distinctively material then it does not fit in this schema.

Further problems arise with the concepts of knowledge, norms and rules and resources "embedded" in technologies, since, from a structurational perspective, these only exist in the instance of action by knowledgeable agents. To suggest that structure may be somehow fixed into the technology is to separate it from agency and hence to turn Giddens's carefully-constructed duality back into a dualism. It might also suggest that this structure fixed in the technology could be transplanted with predictable effects into another context, for example that Beta's structures of domination, legitimation and signification could be coded into the CASE tools such that their use in other organisations would reproduce the structures in some way independently of the agency of their social actors. If CASE tools are used in similar ways in different organisations, then from a structurational perspective, this is not because of structures embedded in the technology, but because actors in the different organisations draw on broader social structures (of the market economy, of employee relationships in the software industry).

A similar separation of agency and structure is also evident in the model's rather sequential view of the relationship between structure and action, and to some extent in the case description, despite the discussion of the simultaneous, and potentially contradictory, interaction between the different relationships of technology and structure. More generally, although it could be argued that the emphasis on technology in the model is a necessary simplification, particularly as represented in Figure 2, it gives an undue prominence to technology, making it the dominant element in terms of interaction, with three relationships, and the only one with a reciprocal relationship. In structurational terms, however, technology is a minor aspect of social practice, if indeed it is considered at all. Moreover, bearing in mind the way in which structuration has been misunderstood in other contexts, such a representation risks further misinterpretation.

Interestingly, many of the above criticisms appear to be acknowledged in Orlikowski's recent writing on structuration (Orlikowski, 2000) in which she adopts a "practice lens", proposing the notion of "technologies-in-practice" to refer to the structures of technology use enacted by social actors as they interact with particular technological artefacts over time. In this way she avoids the problem of

seeing technology as embodying structures, which are then appropriated by users during their use of it. From a practice lens perspective, Orlikowski argues that technology structures are emergent and enacted, not embodied and appropriated. Thus, rather than starting with the technology and examining how actors appropriate its embodied structures, this view starts with human practice and examines how it enacts emergent structures through recurrent interaction with the technology at hand. This lens includes consideration of the material properties of technology by viewing technologies-in-practice as both shaped by and shaping the use of material artefacts.

THE STRUCTURE OF IS STRUCTURATION RESEARCH

In the light of this literature the development of structurational IS research as a whole can be seen as having three main strands as shown in Figure 3: use of structuration theory ideas in IS research, development of an IS-specific version of structuration theory and critical engagement with structuration theory. In addition to illustrating the chronology of the emergence of different types of structurational research in the field, differences in their placement on the vertical axis also seeks to indicate the extent to which approaches are consistent with Giddens's original work, that is, to illustrate the extent to which the use of structuration theory in IS research matches Giddens's original conceptualisation.

1.   Use of Structuration Theory Ideas in IS Research

Following the initial identification of structuration theory as a suitable theory for the study of IS, research in this stream started with the relatively straightforward application of structuration theory "*in toto*". Over time, however, some IS researchers appear to have become more selective in their use of structurational concepts, and also to draw on concepts from Giddens's later writings. While this research generally shows an increasing sophistication in the use of structuration theory, and its application to a broader range of IS issues, the reliance on secondary literature in some cases has lead the work to move away from Giddens's original conceptualisation.

2.   Development of an IS-specific Version of Structuration Theory.

The second strand of research relates to studies that have sought to address Giddens's lack of attention to IS by developing an IS-specific version of structuration. This was pioneered by Poole and DeSanctis with AST and by Orlikowski (1992) with her Duality of Technology. While these approaches have been valuable in introducing structurational concepts to an IS audience and, in the case of AST in particular, initiating a substantial programme of IS research, neither, at least in their original formulation, would seem – as yet – to provide a satisfactorily consistent account of the role of technology in structuration processes.

3. Critical Engagement with Structuration Theory

The third strand of research, which is focused on critical engagement with structuration in an IS context, has perhaps reflected this continuing difficulty in developing a consistent structurational account of IS. Initially focused on reviews of the use of structuration in IS, highlighting its potential, but also weaknesses and gaps in this work, later research in this vein has proposed combining structuration theory with a number of other theories as a means of remedying the perceived deficiencies and a number of attempts have been made to develop hybrid approaches. None of these, however, has, so far at least, received widespread recognition as a solution to the perceived difficulties.

In summary, therefore, while IS was somewhat later than some other areas in picking up on Giddens and structuration theory, there is now a substantial body of structurational literature in field. Despite a number of significant efforts, however, it seems that there are still some major issues in using structuration in the IS context. Unless this is to become a pretext for dismissing structuration as a theoretical *cul de sac* for IS researchers, therefore, it would seem that further work, particularly theoretically-oriented, is necessary to take this structurational IS research forward. Some possible directions for this work are discussed in the next section.

Strand 3: Critical engagement
with structuration theory

Use of structuration theory with other theories

Critical/comparative reviews of ST in IS research

Other writings of Giddens

Use of ST concepts and concepts from Giddens's other writings

Strand 1: Use of
structurational ideas
in IS research

Structuration theory applications in sociology and organisation theory

Giddens's Structuration Theory

Early ST applications in IS research

Later ST applications in IS research

Practice Lens

Duality of technology

Strand 2: Development of
an IS-specific version of
structuration theory

Secondary application of ST in IS research

Adaptive Structuration Theory

Extensions of AST and concepts

Applications of AST

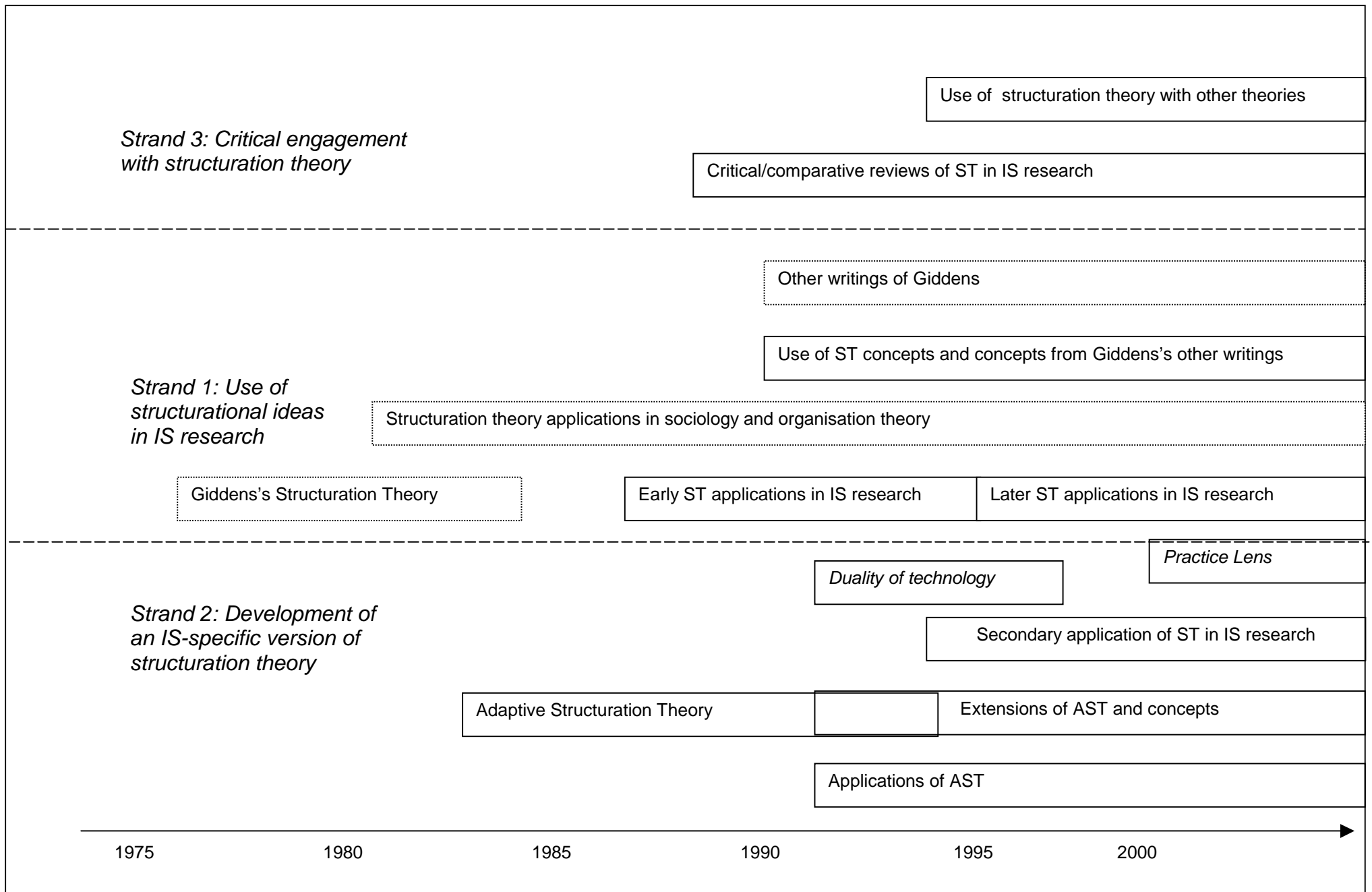1975   1980   1985   1990   1995   2000

Figure 3: The structure of structuration research in the IS field

AN AGENDA FOR STRUCTURATIONAL IS RESEARCH

This analysis has shown that the work of Giddens, and especially his structuration theory, has supported a rich range of IS research. Moreover, contrary to the claims of critics such as Gregson (1989) and Archer (1990), the alleged complexity, obscurity and non-propositional character of this work, has not prevented it use in many empirical studies in the IS field.

At the same time, however, the analysis has also highlighted a number of issues in the way in which Giddens's ideas have been used in the IS field to date that suggest opportunities for the future development of structurational IS research. One of the more striking features of existing structurational research, for example, as Figure 3 illustrates, is its relative lack of coherence or cumulative development. This is evident not just in the emergence of separate, frequently non-communicating, streams of research, but also in the persistence, more than 15 years after the publication of the first structurational articles in the IS field, of papers whose primary contribution would seem to be in demonstrating that structuration concepts can be "applied" to the study of IS phenomena. While, as the analysis has shown, these papers sometimes add to the literature by addressing new domains or exploring more subtle insights, the suitability of structuration as a vocabulary for understanding IS phenomena should, if previous research is accepted as valid, by now be a matter of record. Taking this work forward, therefore, would seem to require greater awareness of the existing literature and further attention to exploring new and neglected aspects of Giddens's work, rather than simply showing that the ideas can be applied in IS contexts.

A second issue relating to the use of Giddens's ideas in IS research, is the uneven coverage of different aspects of his work. This is not just a matter of the relative neglect of his later works, but also, as was noted, of the imbalance in the use of concepts from the structurational literature. Since it is in these later works that Giddens addresses recent social changes, in which IS are increasingly implicated, and the structurational concepts would appear relevant to a variety of significant IS

phenomena, the relatively limited coverage of these aspects of his work would seem to present a particular opportunity for IS researchers, that is also in keeping with Giddens's recommendation of selective use of his work.

Another aspect of structuration theory that would seem deserving of more attention in the IS literature is its linkage of individual micro-level action and macro-level institutional processes. In this it may support efforts, as advocated by Orlikowski and Barley (2001), to broaden the scope of IS research from its traditional focus on phenomena associated with computer-based information systems at the individual, group and organisational level, to address the broader institutional and social developments in which IS are increasingly implicated.

A perhaps even more ambitious objective for structurational IS research would be to contribute to the development of a consistent theoretical account of the IT artefact, of the type that Orlikowski and Iaconno (2001) have identified as lacking in the IS field. Although, as has been noted, structuration theory has already been drawn on in a number of significant efforts in this direction, none would appear, so far at least, to have come up with a wholly convincing structurational account of technology. This is not to suggest that such an account, based solely on Giddens's work, may necessarily be achievable, indeed this review has highlighted a number of significant obstacles that would need to be overcome in doing so. As a broad-ranging, ontologically-focused, theory with a strong emphasis on agency and practice, however, structuration would seem a potentially fruitful source of insight in developing a theory of the IT artefact, the pursuit of which would seem a significant opportunity for structurational IS research.

CONCLUSIONS

Giddens's ideas have been discussed in more than 250 IS papers to date. Whether this makes him the most widely-cited social theorist in the IS literature, as Jones (2000) showed him to be in the IFIP

WG8.2 conference proceedings, is not possible to say without equivalent analyses of citations of the work of other theorists, but it certainly indicates a significant level of interest in Giddens's work in the field and attests to the presence of a substantial body of IS researchers seeking to give serious attention to social theory (*cf.* Orlikowski and Barley 2001). That the numbers of citations is generally continuing at a high level, more than 15 years after the first IS-related paper drawing on structuration theory, also suggests that this is more than a passing interest, a temporary fashion.

It should be recognised, however, that these approximately 250 papers constitute only a small percentage of the total published in the IS literature over the past twenty years and that a substantial proportion of the references come from papers by a relatively small number of authors. Care needs to be taken, therefore, in making claims about the significance of Giddens's work in influencing IS research. Nevertheless in broad terms, Giddens, and structuration theory in particular, would appear to have made contributions in three main areas.

The first of these has been the concept of the duality of structure, which has been drawn on in many of the IS papers identified in this review in support of efforts to transcend traditional dualisms in the field. Second has been the influence on emergent, constructivist accounts of IS where structuration's emphasis on the ongoing production and reproduction of structure through situated social practice has informed a range of interpretive IS studies. Third has been the more selective input of particular concepts, both from structuration theory and Giddens's later writings, in alerting IS researchers to phenomena, such as the operation of constraints, or the disembedding of social relations.

Each of these areas may be seen as illustrating different types of relationship between IS research and social theory. Thus, in terms of the duality of structure, it has been adopted by many IS researchers, even when "applying" structuration theory, primarily as a high-level concept that provides a rationale for avoiding determinist accounts of IS, of either the social or technical variety. This may be seen as IS research borrowing a broad concept from social theory in order to find new ways of understanding phenomena, with social theory, in this case structuration, lending weight to these efforts.

A second contribution of the duality of structure grew out of the recognition that technology is not easily accommodated within a structurational framework, prompting efforts, notably by DeSanctis,

Poole and Orlikowski to develop IS-specific versions of structuration to try to overcome this, although it has been argued in this paper, that the resultant approaches, AST and the Duality of Technology, differ significantly from Giddens's concept. In terms of the relationship between IS research and social theory, therefore, this may be seen as illustrating the reconfiguration of social theoretic concepts from an IS perspective, with some divergence from their original formulation.

The emergent, practice-based strand of structurational IS research is arguably more in tune with Giddens's writings and a number of these studies, especially Orlikowski's "practice lens" (perhaps the most substantial contribution to date), demonstrate significant efforts to work through the implications of his ideas in the IS context. As the various attempts to conceptualise consistently the social and technical aspects of IS drawing on other theories, such as Actor Network Theory or Critical Realism, suggest however, it is not clear whether a satisfactory structurational account of technology has yet been achieved. As an illustration of the relationship between IS research and social theory, though, such studies may be seen as showing how IS researchers can engage closely with social theory on its own terms and seek to apply its insights within their own field.

The third area of contribution, that of use of concepts from structuration and Giddens's other writings, demonstrates two further ways in which IS researchers may relate to social theory: selective use and contributing back. While this selectivity may refer, as Giddens himself has suggested to a general stance towards the application of theory, for IS researchers it may also imply a particular focus on aspects of social phenomena that are foregrounded by use of IT, for example: time-space distanciation with the use of computer mediated communication, or the nature of risk when an expert system is used to assist in decision making. Moreover, while it does not avoid the need for careful appreciation of the original understanding of concepts, the focus of such selective attention is, by definition narrower and hence potentially less demanding of research resources: exploring time/space ordering of particular social practices may be more manageable than addressing general social structuration. What this review has indicated however is that this has been a relatively neglected aspect of the use of Giddens's ideas by IS researchers, especially with the respect to his later works. Yet it is perhaps in this area that the greatest opportunity lies for IS researchers to contribute back to social theory. To the extent that social theorists discuss phenomena in which IS are implicated, IS researchers would seem well-placed to provide expertise for these analyses. Thus, as Orlikowski and

Barley (2001) have argued with respect to organisation studies, the interaction between IS researchers and social theorists can become more of a two-way exchange.

The contributions of Giddens to the IS field could therefore be summed up in very similar terms to those used by Whittington (1992) in discussing the influence of Giddens on management studies in the early 1990s. "Giddens", Whittington (1992: 698) argued, "has been exercising a growing influence on management studies. However it is strange, both that his directly relevant work on organisations and management seems to have been neglected and that his more general structurationist perspective has [often] been interpreted in a [rather] limited sort of way". "To this extent", Whittington concluded (1992: 707), "Giddens has still not been fully put into action".

That such claims might still be a fair description of the use of structuration in IS research ten years later, however, does not mean that much has not been accomplished already. Significant contributions have been made in seeking ways to incorporate technology within a structurational perspective, even if a generally accepted resolution has yet to be achieved, and there remain significant opportunities for IS researchers to "put Giddens into action" across a broad spectrum of research topics. In this, as Whittington (1992:700) notes, "there is no need for theological purity", indeed Giddens himself encourages the "sparing and critical" use of his ideas. In seeking to offer a critical examination of these ideas it is hoped that this review may have contributed to taking this task forward.

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