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S. Corea

Warwick Business School, steve.corea@wbs.ac.uk

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A SOCIOTECHNICAL SYSTEMS FRAMEWORK FOR MAPPING ACTION AND RESTRICTION IN THE USE OF IT

Corea, Stephen, Warwick Business School, University of Warwick, Coventry CV32 5NR,
UK, steve.corea@wbs.ac.uk

Abstract

The sociotechnical systems approach emphasises the need to manage or to resolve the inconsistencies and conflicts that arise with the use of IT systems in organisations. This theoretical paper introduces an analytical framework to further develop this approach, by augmenting its ability to represent the complex social contextualisation of IT systems in terms of various human and functional aspects. This framework is used to systematically clarify the behavioural properties of organisational action (e.g. legitimacy, power, knowledge) around the use of information technologies, from a standpoint of both positive and negative dimensions. The utility of this analytical framework is demonstrated through a brief case example of the context of legitimacy surrounding an organization's adoption of outsourced call centre operations. This paper equips sociotechnical systems theory towards incorporating a more inclusive account of the social dynamics surrounding the use of IT in different organizational contexts.

Keywords: sociotechnical systems, behavioural, semiotics, IT use, social, legitimacy, power, alignment

1 INTRODUCTION

The sociotechnical systems theoretical approach has been a narrow but influential stream of work in the IS field (Mumford 1999, Bikson 1996). Past studies in this approach have focussed mainly on the challenges of securing successful IT based changes in the workplace. Their main contribution has been in raising awareness of the benefits of active participation by stakeholders in the systems development process (Lin & Cornford 2000). However, key proponents of this school of thought have issued calls for it to be freshly developed, to address current concerns and challenges (Griffith & Dougherty 2001, Mumford 1997). There is a need to theoretically recast this older approach, to deal with the complex social nature of organisations and IT (Garrety & Badham 2000, Lin & Cornford 2000).

The aim of this theoretical paper is to redevelop the conceptual lens of sociotechnical systems (STS) theory for investigating the socially-embedded use of IT systems in organisations. It introduces a new framework, termed 'IS modalisation', that fundamentally embodies a sociotechnical systems model of analysis. The theoretical underpinning of this framework is drawn from the ideas and work of a major French semiotician, Greimas (1987), regarding the structural organisation of human behaviour[□]. The paper is structured as follows. The next section reviews STS theory and its need for further conceptual development. Following this, the new framework is introduced, and its application partially illustrated through a brief case example. Its utility for augmenting the STS approach is subsequently discussed.

2 SOCIOTECHNICAL SYSTEMS (STS)

The IS sociotechnical systems (STS) approach advocates that the effective integration of human and technological components of organisational workflows requires designers or managers to pay explicit attention to the needs and interests of stakeholders (Mumford 1999). This IS approach is based upon sociotechnical systems theory (Eijnatten 1993), which in its original formulation viewed the nature of an organisation as made up of two reciprocally influencing parts: a social sub-system, representing the roles, beliefs, values and interests of organisational members; and a technical sub-system, comprising technologies, procedures and production mechanisms (Emery & Trist 1960). Traditional STS theory held that successful performance relies on how well an organisation's social and technical sub-systems are aligned with respect to each other and the environment (Pasmore 1995). It promoted the need for separate but joint evaluation of those two sub-systems of an organisation.

Recent theorising in the sociotechnical systems school however, has strongly questioned this division into discrete social and technical sub-systems as a basis of analysis (Eijnatten 1993), as it contradicts the essence of organisations as integral functional entities, and prevents a coherent understanding of performance dynamics. Moreover, IT systems challenge the presumed analytical exclusivity of those sub-systems by being simultaneously social and technical in nature (Grint & Woolgar, 1997). They are technical by being instrumental for specific ends, but they are also inherently social, since they involve functional arrangements which reproduce social orderings or values, and since their use is subject to interpretation (Orlikowski 2000). The key need to reformulate this older theoretical basis of analysis in

[□] Some justification is necessary here, for turning to semiotics to augment sociotechnical systems analysis in IS research. Greimas was similar to other European semioticians who, based on the direction set by their founder, Saussure, worked on the perspective that semiotic theory is not restricted to the study of communication only, but deals with the more global phenomena of culture and social practices (Eco 1973). Gottdiener (1995 p. 17) observes that "Greimas extended his interpretive paradigm to include *the structure of social action*, creating a general semiotic approach to all of culture" [italics added]. Greimas' (1987) ideas were thus seen as relevant, since as Orlikowski and Robey (1991) have argued, IS studies should be informed by a theory of social organisation. Greimas' (1987, 1983) work was also seen as pertinent because STS theory has been criticised for failing to address the complex nature of significance in organisations (Silverman 1970).

STS thinking also draws strength from strong criticism it has received for insufficiently addressing the complex nature of significance in organisational functioning (Ciborra 1987, Silverman 1970).

These requirements guided this theoretical effort to develop the STS approach in two ways. Firstly, it indicated the need to replace that nominal mapping of social and technical sub-systems during analysis with more pertinent behavioural categorisations, as well as to treat technology based organisations as sociotechnical rather than socio-technical systems i.e. to pursue a common rather than a joint form of analysis. Secondly, it pointed to the need to equip the STS approach with a theoretical framework that can handle the structuring of significance in human action. On the other hand however, it was also seen as necessary to preserve fundamental traits of traditional STS analysis, as follows.

The form of theoretical analysis which has long characterised the STS approach involves framing the nature of technology based practices in terms of key inconsistencies or conflicts (Pasmore 1995). STS design is pivoted on reconciling incongruous priorities and requirements in IT enabled work practices (Mumford 1999). Thus, a central aim of a sociotechnical systems model of analysis may be seen as the discrimination of tensions or contradictions that shape the performance of IT based activity. Further development of this emphasis is crucial, given the existing lack of conceptual resources for addressing the conflicts or dilemmas surrounding the use of IT systems (Truex 1991). In addition, STS analysis is fundamentally based upon systems theory, that entails an integrative, inter-relational approach (Klein 1996). A framework is presented next to extend this approach but also preserve these cardinal features.

3 FRAMEWORK: IS MODALISATION

A central concept in this framework is *modalisation*. Modalisation is defined as the modification of an organisation's capacity to carry out desired actions, or achieve a desired state[□] (i.e. modification of the ability to act or to be). The focus here is on information systems modalisation: the modification, via the use of IT, of organisational capability. Organisational action is seen as being shaped along multiple modalities, where each modality denotes a particular behavioural dimension by which such action is altered or mediated by various social and technological factors or resources. Common social factors by which organisational action is modalised include power, legitimisation, motivation and knowledge. The use of IT systems or tools represent technological resources by which organisational action is modalised. It is to be noted that, in general, there are both positive and negative modalities (i.e. both positive and negative behavioural dimensions in organisational capacity for action). For example, the use of IT may facilitate or impede the actions of staff (Orlikowski 2000) i.e. IT enables action vs. IT constrains action. The framework presented here supports the discrimination of various modalities by which to analyse organisational functioning around the use of IT systems.

3.1 Theoretical Foundations

For Greimas (1987), human actions or socio-cultural practices can be ordered into incompatible and compatible behavioural dimensions (or properties) by structuring them as systems of signification (i.e. systems of significance, meaning or value). He formulated an analytical schema (Figure 1), known as the 'semiotic square' (Jameson 1987 p. XIV, Greimas 1983) to express this structuring of significance.

[□] The notion of modalisation, introduced here as an organisational or IS related concept, is adapted, in an analogous sense, from the notion of modalisation used in semiotic/linguistic studies (Greimas 1987 chap. 7), where it refers to the modification of a basic linguistic statement of being or action (e.g. Bob is rich) by a modal expression like 'wanting', 'having to', 'being able to', 'knowing how to' (e.g. Bob wants to be rich) that alters its meaning-effects. Thus by analogy, an organisation's ability to be a certain desired state (or to carry out a certain action) is modified by certain social and technological features or resources (e.g. power, legitimisation, IT use) that have modal value i.e. they affect organisational competence instrumentally. The adaptation of concepts from linguistic theory to inform studies of IT use and organisational action, as seen here, has been carried out by IS researchers before (e.g. Stamper 1997, Klein 1996, Taylor 1993, Liebenau & Backhouse 1990). It is grounded on the insight that social practices are not simply material phenomena, but phenomena with meaning/significance.

(Insert Figure 1 here)

This schema enables a more comprehensive analysis of structural oppositions of significance or value, by permitting an enlargement of their implications (Jameson 1987). The upper corners, S1 and S2, represent ‘contrary’ or opposite positions of the significance of a particular activity or concept, S. A basic example might be S denotes the concept ‘absence of colours’. The two opposing terms making up this concept could then be ‘black’ (S1) and ‘white’ (S2). The lower two corners, –S2 and –S1 (or ‘Not S2’ and ‘Not S1’ respectively) are generated by forming negatives, in a traverse direction, of the opposing terms on the upper axis (S1 and S2). Thus, –S2 would denote ‘non-white’, while its opposite, –S1, ‘non-black’. These represent ‘contradictory’ positions of the terms on the upper corners (i.e. –S1 is the contradictory of S1; –S2 of S2). Together –S2 and –S1 make up opposing positions of –S, which may be seen as denoting the concept ‘presence of colour’. It can be seen that the two lower terms, –S2 and –S1, identify implicative positions not accounted for by the binary oppositions on the upper axis. For example, ‘non-white’ encompasses much more than ‘black’ (i.e. a range of colours). This schema thus permits initial binary oppositions in conceptual understanding or the description of technology-based activities to be enlarged to consider associated positions of significance[□].

Jameson (1987, 1981 p. 254), the foremost commentator on appropriating this schema for interpretive research in the social sciences, points out that ‘logical accuracy’ in labelling its nodes or axes (i.e. “a concern to compare only comparable entities or oppose only terms of the appropriate category”) is not as the ability to capture or frame the polysemic nature of meaning (i.e. the multi-connotative nature of significance) in configurations which engender fresh understanding of IT or social practices. Adapting from Greimas’ (1987) work, in which he maps out various modalities of human behaviour against this schema, this paper adopts this schema to propose an initial set of modalities (i.e. dimensions of action or IT use) likely to be relevant to IS research. These modal systems, described next, compose a preliminary framework that can be used to mount a sociotechnical analysis of IT based work practices. Table 1 lists this initial set of modal systems.

(Insert Table 1 here)

3.2 Modalities of IT Use

A central modal system is proposed here to analyse the use of IT in organisations. This modal system, illustrated by the schema in Figure 2, captures salient behavioural dimensions or outcomes associated with the use of IT tools to support organisational action. Termed as the ‘modalities of IT capacity’ this schema designates the facilitative and inhibitive effects of IT use on work performance. It permits the enabling capacity of IT systems in organisations to be usefully enlarged to encompass a consideration of the preventive capacity of such systems.

[□] Schleifer (1987 p. 25-27), a major commentator on Greimas’ work, presents an alternative version of the configuration of value-positions on this schema. The upper left corner is changed to represent the concept S itself, ‘absence of colours’ (i.e. no colours), while the upper right corner becomes the negation of that concept, Non-S (i.e. all colours). The bottom left corner is then changed to ‘neither S nor Non-S’ (i.e. colourlessness), while the bottom right corner becomes ‘both S and Non-S’ (i.e. colouredness). As Jameson (1987 p. XIV) observes, the schema is *dynamic*: the positionality of significance on the square can be altered to expose alternative layers or ‘ensembles’ of significance.

(Insert Figure 2 here)

The upper corners of the schema denote contrary value polarisations regarding the enabling capacity of IT systems i.e. IT enables action vs. IT does not enable (constrains) action. In other words, IT tools can transform organisational ability to carry out particular actions or achieve certain desired states of performance, or they may fail to support those desired actions or outcomes. The lower two corners of the schema account for the converse side of this enabling capacity: they denote positive and negative values of the 'preventive' capacity of IT tools in organisational contexts. The lower left corner (i.e. IT enables to avoid being inhibited) designates the positive capacity of IT usage to prevent or do away with certain restrictions. For example, the implementation of IT based automatic cheque processing by a bank can eliminate the limitation of inefficiently expending time and effort on processing cheques manually. The right lower corner represents the opposite: the inability to prevent certain restrictive or undesired outcomes from occurring. In other words, the lower right zone denotes various inhibitive or paralysing properties related to IT use in organisational contexts. Two types of inhibitive capacity may be suggested: 'procedural' and 'dispositional'. The first relates to situations where IT systems possess inflexible features, so that the inability to modify or configure them blocks users from desired actions. For example, an ERP system intended to strategically re-engineer a firm's processes could introduce a degree of rigidity in its workflows that curtails its effectiveness. Another example of such inhibitive capacity is when workflows are subjected to disruptions as a result of problems with the reliability of IT systems. The second type of inhibitory capacity involves situations where an organisation, or the integrity of an IT system, is compromised in a certain way. This may occur, for example, when an IT system introduces a capacity for its users or benefactors to take advantage of the company in ways that were not previously envisaged (e.g. mild abuses or pernicious attacks like fraud or security breaches), while not equipping the company with the ability to stop (or repair the effects of) such behaviour.

Various characteristics of the use of IT systems might thus be mapped against this schema to identify positive and negative dimensions of behaviour by which IT alters the ability of an organisation (or that of its members) to act in a particular context. It is to be noted that the labelling of this schema shown in Figure 2 (i.e. 'IT enables to act' etc.) is not prescriptive i.e. it is not fixed but is contingent on the context of the study. This schema can be re-labelled to suit the particular themes of analysis being conducted (i.e. the various nodes or axes can be renamed to express particular aims or criteria being used as the basis of evaluation). Besides the properties or features of technology use, IS research also encompasses social factors that shape IT based work performance. These are explained next.

3.3 Modalities of Action

Organisational action and the use of IT are shaped by various social structures or resources specific to the context (Orlikowski 2000). It is beyond this paper's scope and length to capture all such aspects as relevant modal systems. However, certain important modalities of action can be addressed here as an initial starting set: legitimisation, power and motivation. These are depicted in Figure 3.

(Insert Figure 3 here)

Legitimation is a significant aspect of organisational activity and the use of IT tools (Avgerou 2000). This dimension of organisational functioning encompasses such elements or factors as formal policies or stipulations that govern the behaviour of organisational members. It also includes social institutions, which are ingrained premises, patterns of expectation or regulative structures, that provide the basis of validity for the way organisational members perceive and act in the use of IT tools (Avgerou 2000, Robey & Boudreau 1999). The forces of legitimisation that induce normative or cognitive pressures on social actors to think or act in particularly acceptable ways may be classified in their effects by the

generic dimensions of modality seen in Figure 3a, which are differentiated in a fourfold way (Greimas 1987): (i) having to do/act (i.e. prescription/stipulation); (ii) having not to do/act (i.e. prohibition); (iii) not having not to do/act (i.e. permission); (iv) not having to do/act (i.e. optionality).

Power is another fundamental aspect of organisational work practices based on the use of IT, that can wield considerable influence on their form or outcomes (Markus 1983). One useful way of analytically distinguishing the capacity or effects of power structures on human agency is shown in Figure 3b: (i) causing to do/act; (ii) causing not to do/act ; (iii) not causing not to do/act; (iv) not causing to do/act. The designation of modalities can also be qualified to distinguish different forms of power, such as the distinction between authority and influence (causing to act vs. causing to believe), or between punitive control and persuasion (forcing to do vs. making it attractive to think). Yet another crucial aspect of organisational functioning and change is motivation (Mumford 1999), which denotes the extent that staff members feel congruent with the behaviours required for effective job performance or the use of IT. Employee motivation is a central concern for STS practitioners in the design of technology based environments (Pasmore 1995). Dimensions of modality pertaining to motivation may be characterised in the following way (Figure 3c): (i) wanting to do/act; (ii) wanting not to do/act (i.e. resistance); (iii) not wanting not to do/act (i.e. receptiveness); (iv) not wanting to do/act (i.e. indifference). This may be used to evaluate the extent to which stakeholders have been successfully mobilised for an IT project.

The above described facets of organisational functioning have thus been illustrated as an initial set of modal systems. This framework presents only as a provisional inventory of modalities: one that is not closed, nor organised as a definitive taxonomy. The complex nature of organisational functioning and IT use entails that a comprehensive sociotechnical analysis should also include other aspects not listed here e.g. knowledge, leadership, IT flexibility. This approach permits multi-dimensional specification of the way that IT tools or social competencies affect performance.

4 EXAMPLE OF APPLICATION

It is beyond this paper's length restrictions to present a complete case study based demonstration of all the components of this analytical framework[□]. Nevertheless a brief, partial application is demonstrated next. This example concerns an analysis based upon the modalities of action, and involves a case of IT enabled call centre operations. Call centres represent an archetypical technology based organisational form (Boddy 2000). They rely for their existence on an underlying infrastructure of information and communication technologies, involving significant use of database and other software tools. A central component of this infrastructure is the automatic call distribution (ACD) system, which queues and distributes calls to customer service representatives (CSRs). The ACD system supplies statistical data on call-handling activity, that is used to measure work performance against specified targets.

This analysis draws on the modalities of legitimisation to clarify the contested implementation of IT enabled 'virtual' call centre integration at two call centres. It is particularly important that the utility of this new STS framework is illustrated through an analysis of organisational legitimacy, since a critical limitation of STS theory in the past has been seen to be its inability to address the nature of legitimacy in technology based work environments (Garrety & Badham 2000, Scarbrough 1995).

This mini-case example concerns the call centre based customer service operations at the British Broadcasting Corporation (i.e. BBC), the UK's national broadcasting company. The BBC restructured its customer service operations in 1999, by building a new call centre (Centre A), which responds to 'unsolicited' calls from audience members regarding inquiries, feedback or complaints on the BBC's TV/radio programmes (about 1 million calls a year). The BBC also has another, older call centre in

[□] One case-based exemplification of this form of analysis (in terms of the modalities of IT use) is found in Corea (2006). A full description of the case study from which the example presented here is drawn will be available in a forthcoming paper by the author.

operation at the same time (Centre B), that handles a separate stream of ‘solicited’ calls invited from its audiences during or after certain TV/radio programmes (about 800,000 calls a year). From 1999, the BBC outsourced the running of its two call centres to a services vendor firm, Services Company (a pseudonym, abbreviated henceforth as ServeCo). In the associated outsourcing contract, the BBC set out five primary objectives and several service level targets for ServeCo to fulfil. One of the objectives was for ServeCo to carry out the integration of the two centres to form a single, ‘virtual’ call centre. Other objectives set for ServeCo included achieving consistency in quality of service response across all channels, and developing the BBC’s ‘accountability’ to its customers i.e. its audience. This latter objective involved meeting certain service targets: (1) to raise audience satisfaction levels from a past average of 66% to 90% by mid-2000, and maintain this after that; (2) to observe targets for length of call (e.g. 2 min 30 sec) and speed of response (e.g. 90% calls answered within 20 sec). These targets only applied to the new Call Centre A, which had been the focus of improvement in the restructuring efforts. No service targets were set for the older Call Centre B, only a general expectation for ServeCo to run it more efficiently. The management staff of the BBC’s customer service department planned and set up these restructured operations and the outsourcing contract. They were thus responsible for overseeing and ensuring ServeCo’s compliance.

On ServeCo’s takeover, the two call centres were integrated at a technological level, permitting them to operate as a single ‘virtual’ call centre. Besides sharing the same customer relationship management (CRM) system, both centres share a common communications infrastructure, which means that calls routed to Centre B could be switched to and handled by the staff at Centre A, and vice-versa, through simple real-time configuration of each centre’s ACD system. This permits suitably trained staff, at one centre to assist their counterparts at the other, by taking on excess calls arriving at the latter when it faces a surge of calls. The aim envisioned by the BBC, in its contractual stipulation for both centres to be integrated, had been for Centre A to provide such support (i.e. help Centre B cope with excess calls that it faces frequently) almost on a daily basis. Centre B experiences alternating periods of excessive and light call volumes, as audience members contact it in mass reaction to certain programmes aired on TV/radio (e.g. on emotive topics). In contrast, Centre A receives a much more uniform rate of call arrivals. Because of these differing traffic patterns, an average of 15,000 calls a month are ‘lost’ at Centre B (i.e. callers hanging up rather than waiting for an answer), compared to less than a 100 at Centre A. The BBC thus intended for ServeCo to set up virtual call centre functionality to reduce this disparity, and increase response rates at Centre B. However, the extent of integration envisioned by the BBC management in their outsourcing contract did not materialise. Instead, it led to conflict over the interpretation of those contractual stipulations. These differences may be ‘mapped’ and clarified with reference to the modalities of legitimisation shown in Figure 4.

(Insert Figure 4 here)

The ServeCo management were seen by the BBC management staff as not releasing enough CSR staff at Centre A to handle the excess calls faced at Centre B, contrary to the prescribed requirements in the outsourcing contract to integrate the operations of the centres and to develop consistency of responses. The BBC management wanted such integration to mean not only full integration at a technological level, but also significant integration at the workflow level i.e. for staff at Centre A to take on excess calls at Centre B as much as possible. The contract’s stipulations, however, appear to have contributed to ServeCo’s reluctance to execute a merging of two workflows to that desired level. It has to do with the way the BBC has measured performance, by setting service level targets (e.g. length of call, speed of response) for Centre A but not for Centre B. This is perceived by the BBC management to have given ServeCo an ‘excuse’ not to pursue a full integration i.e. it undermined their motivation to do so. The nature of calls arriving at Centre A allow for resolution at a quick pace of turnover, and for CSR work activity to be carried out within standard, computer-monitored time-based targets. However, calls handled at Centre B do not fit such a mould. They often involve requests by audience members

for assistance with socially sensitive issues, that take longer than the typical call at centre A to resolve. In addition to this, the requirement for ServeCo to raise customer satisfaction levels at Centre A lent added impetus to their focus on having that centre's staff focus on handling their own stream of calls rather than diverting effort to handle calls from Centre B. Thus, it has been easier or more feasible for ServeCo to maintain prescribed targets by having Centre A concentrate on its own calls (rather than jeopardise the ability to meet those targets by taking on calls from Centre B).

Moreover, from the standpoint of the ServeCo management staff, they had already met that stipulation to join the operations of the two centres by integrating them at a technology level, so as to allow back up coverage in exceptional circumstances. Furthermore, they placed high priority on having to achieve prescribed service targets. Another factor which may have contributed to the tendency of the ServeCo management to keep the two workflows unmixed has been the difficulty they had faced in raising the productivity of staff at the older Centre B (whom they 'inherited' when they took over), in contrast to staff at Centre A (whom they managed from the start). Since the contract had not explicitly prohibited them from keeping the workflows functionally separate, but did prohibit them from falling below the service targets, they felt compelled to focus on those maintaining performance levels at Centre A. The degree to which the workflows of the two centres are integrated on a day-to-day basis was viewed by them as an optional matter, decided at their own discretion. Moreover, ServeCo has been generally successful in meeting the prescribed service targets and customer satisfaction level. The approach they have applied in running the centres has also brought significant benefits to various BBC units (e.g. use of data from the CRM system to raise programme makers' understanding of its audience interests). This success may be seen to have given to them an implicit degree of endorsement or 'permission' for ServeCo to persist in its approach to managing those two workflows. Thus in summary, the context of legitimacy shaping the outsourced management of these operations has been (partly) characterised by the complementary and conflicting perspectives mapped out against the modalities of legitimisation.

The preceding example illustrates the discrimination of modalities of action in the study of technology based organisational functioning. The contested nature of legitimacy surrounding ServeCo's actions in implementing virtual call centre integration for the BBC was clarified in terms of multiple dimensions or nuances. An immediate benefit of the above analysis, for example, is to help practitioners consider carefully (from different angles) the implications or consistency of contractual specifications, in the design of outsourcing relationships. That is crucial, since outsourcing contracts legitimise expected outcomes (Willcocks & Kern 1998). On a broader note, the theoretical utility of this framework for the sociotechnical systems (STS) theoretical approach is discussed next.

5 DISCUSSION

The analytical framework and method outlined hitherto is aimed at theoretically advancing the STS approach in the IS field, in response to recent calls for this improvement (Griffith & Dougherty 2001, Lin & Cornford 2000). It may be seen to achieve this both in terms of augmenting the established features of STS analysis, and in extending (or providing a fresh reconceptualisation of) this approach.

A main postulate of the STS approach is that the effectiveness of IT adoption or use in organisations is contingent on the degree of success which stakeholders achieve in dealing with related inconsistencies, conflicts or dilemmas (Mumford 1996). This framework preserves that central trait of STS analysis: to foreground the contradictions and tensions implicated in the uses of IT tools. Such analytical focus is a significantly under-developed theme in IS research (Truex 1991). Robey and Boudreau (1999) issued a call for IS studies to adopt approaches that "can account for contradiction in observed phenomena" (p. 172) i.e. that ground the explanation of IT based organisational functioning on the identification of inconsistent or conflicting factors. This framework fortifies the ability of STS theory to illuminate IT based practices along such lines, and on the basis of an inter-relational, integrative form of analysis that is characteristic of the systems thinking approach (Klein 1996) which underlies it.

This framework may also be seen as extending the scope or role of STS analysis in several ways. Past STS studies have tended to be under-elaborated in their analysis of the social dimensions of IT use, failing to adequately treat such crucial aspects as power and institutional legitimisation (Garrety & Badham 2000). By supplying a way to conceptualise and review such aspects, this framework helps repair the limitations of traditional STS theory in capturing the complex, social contextualisation of IT use in work environments. This framework also helps extend the scope of application of STS analysis beyond its predominant focus in the past on IS development activity, to include also the *use* of IT tools in organisations (Lin & Cornford 2000). The STS approach, moreover, has been largely characterised hitherto by a normative orientation (e.g. its advocacy of user participation or workplace democracy), rather than aiming at the theoretical comprehension or illumination of IT based practices (Garrety & Badham 2000). This new framework thus helps position this approach as a tool of understanding and insight, besides one of design, as recently called for (Griffith & Dougherty 2001). This framework is geared, nevertheless, towards maintaining the essential posture of STS theory (that arose in the 1960s) as a counter-response to technological determinism in organisational research. This method does not treat IT as an undifferentiated entity, but as having both enabling and inhibitive dimensions, and as implicated in both positive and negative outcomes of organisational action.

This paper's new STS framework applies fundamentally the same common form of analysis to both humans and technologies, treating both in terms of modalities of behaviour i.e. positive and negative dimensions by which they shape or mediate organisational action. This may be seen as enabling the STS approach to offer a unique, behaviour-oriented perspective on the key issue of alignment between organisations and technology. The idea of alignment embodied here replaces the mechanical notion of a 'fit' between separate social and technical elements in older STS theory, which has been criticised as conceptually imprecise and simplistic (Grint & Woolgar 1997). Instead, this framework offers more pertinent behavioural categorisations of human action related to the use of IT (legitimacy, power etc). The idea of alignment presented here, moreover, is unlike that conceived by factor-type models in IS theory, which identify various components of IT use or IS strategy on the one hand, and management and business strategy on the other, that need to correspond (Henderson & Venkatraman 1993). Instead, the notion of alignment implicit to this framework is that of an unresolved state of tension between competing factors or priorities, a strained complex of oppositional dimensions of behaviour. This was illustrated in the example above, where the alignment between the BBC's and ServeCo's approach to utilising IT based virtual call centre functionality involved an uneasy accommodation of conflicting interests and interpretations. This method permits behavioural alignment in IT- based organisational activities to be represented as a dynamic, contested state in constant negotiation by social actors, rather than a static, nominal relationship between structural elements (Truex et al. 1999).

6 CONCLUSION

Despite notable past contributions in the study of technology based environments, the STS approach has been keenly criticised for failing to formulate an adequately robust theoretical basis (Scarbrough 1995; Silverman 1970). The new analytical framework introduced here addresses the need for stronger conceptual elaboration of this IS approach. It supplies conceptual tools for a more inclusive account of social dynamics, while foregrounding inconsistencies or conflicts related to IT use in the workplace.

This framework enables IS researchers or practitioners to usefully discriminate multiple behavioural dimensions of IT use and organisational action, through their representation as systems of modality. A systematic inter-relational form of analysis can thus be undertaken. This preliminary framework offers scope for further development and refinement. Future studies can extend it by case-based empirical substantiation or conceptual expansion, to establish a repertoire of modal schemas for illuminating the use of IT in organisations and society from a sociotechnical systems perspective.

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Tables and Figures

Modal Category	Modal Sub-Systems
Modalities of Action	Legitimation (having to act, etc) Power (causing to act, etc) Motivation (wanting to act, etc)
Modalities of IT Use	IT Capacity (enabling to act, etc)

Table 1: A preliminary framework of IS modalisation

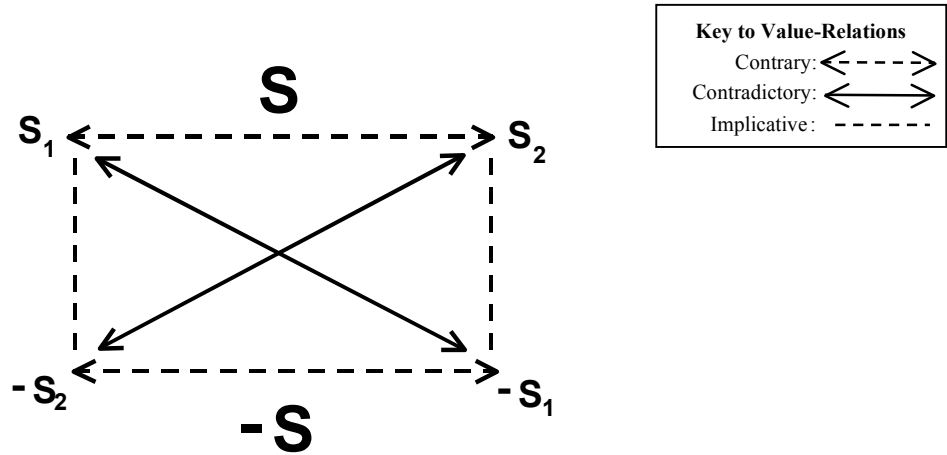


Figure 1: A signification system (Greimas 1987)

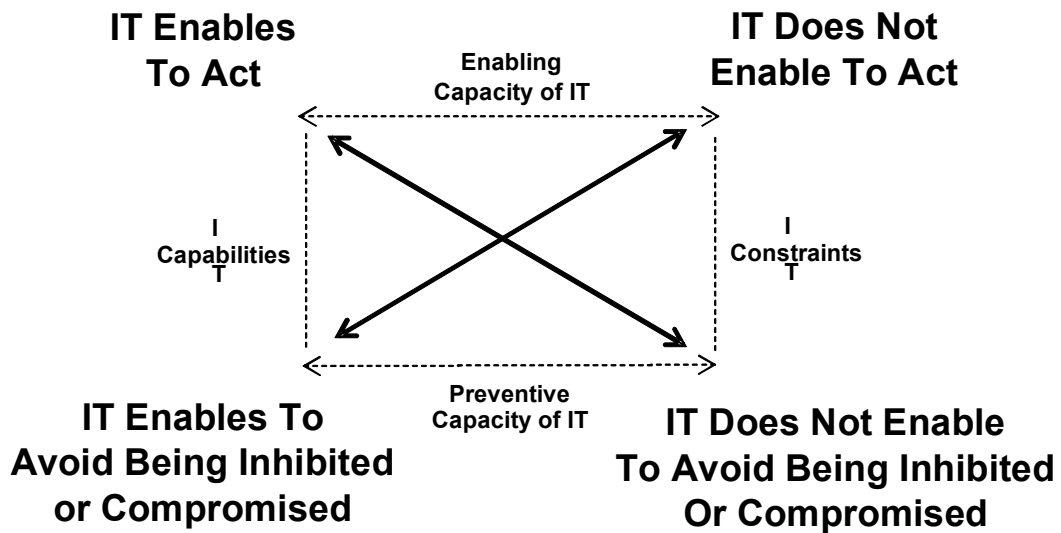


Figure 2: Modalities of IT capacity

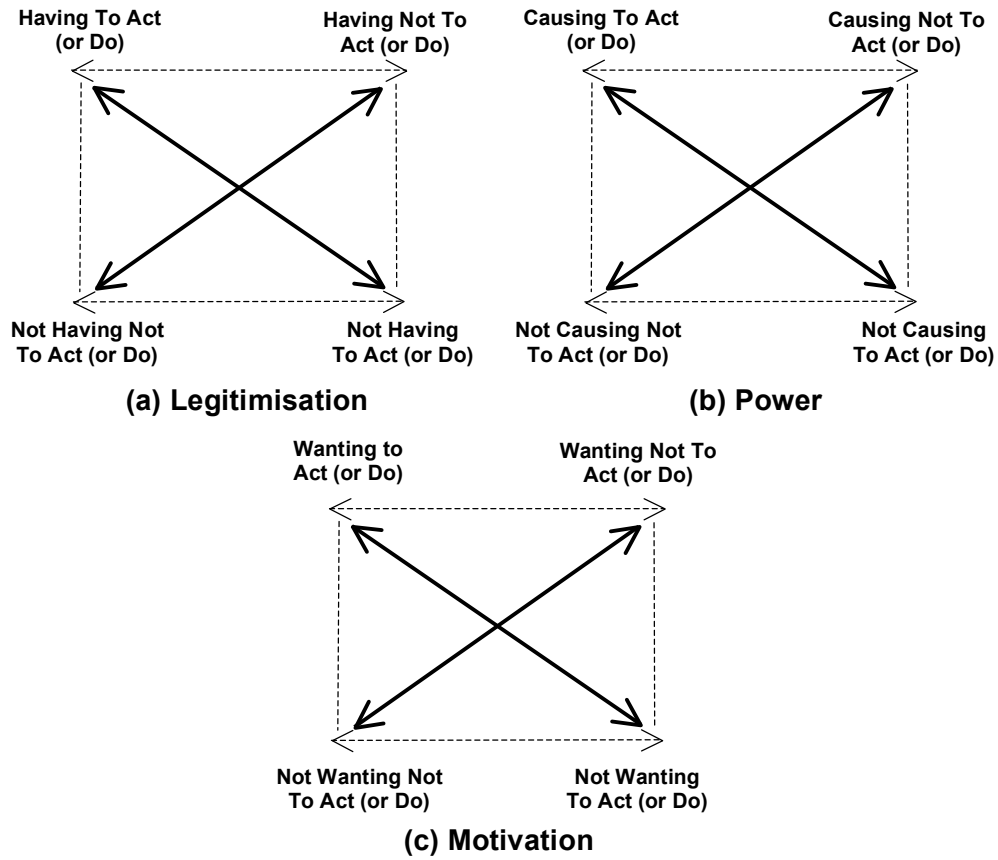


Figure 3: Examples of modal sub-systems constituting modalities of action

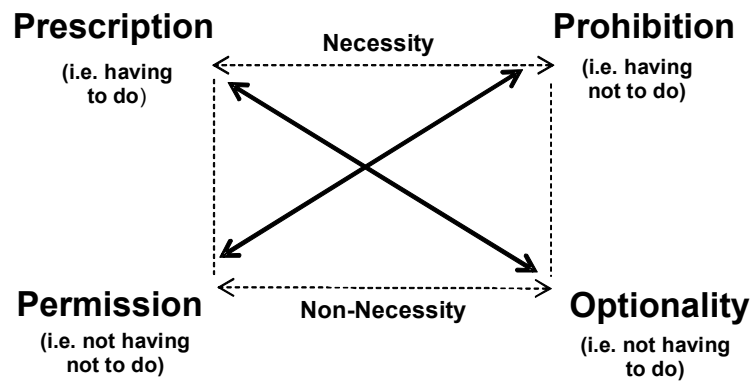


Figure 4: Legitimacy of contractually stipulated actions in outsourced IT enabled call centre operations