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A re-conceptualization of the interpretive flexibility of information technologies: redressing the balance between the social and the technical

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Abstract
Interpretive flexibility – the capacity of a specific technology to sustain divergent opinions – has long been recognized as playing an important role in explaining how technical artefacts are socially constructed. What is less clear is how a system's technical characteristics might limit its ability to be interpreted flexibly. This gap in the literature has largely arisen because recent contributions to this debate have tended to be rather one-sided, focussing almost solely upon the role of the human agent in shaping the technical artefact, and in so doing either downplaying or ignoring the artefact's shaping potential. The broad aim of this study was to reappraise the nature and role of interpretive flexibility but giving as much consideration to how an information system's technical characteristics might limit its ability to be interpreted flexibly, as we do to its potential for social construction. In this paper, we use the results of two in-depth case studies, in order to propose a re-conceptualization of the role of interpretive flexibility. In short, this model helps explain how the initial interpretations of stakeholders are significantly influenced by the scope and adaptability of the system's functionality. Stakeholder interpretations will then, in turn, influence how the system's functionality is appropriated and exploited by users, to allow divergent interpretations to be realized and sustained.
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Introduction

The modern organization is one arena in which the dictum '*there is nothing constant but change*' is particularly pertinent. A key driver of this unrelenting change is the application of information technologies and systems. Information technology (IT) is now a ubiquitous and increasingly critical part of the fabric of the modern organization, supporting its day-to-day operations and all aspects of the decision-making process, as well as its strategic positioning (Doherty *et al*., 2003). It is therefore perhaps not surprising that information technologies and systems have already had a marked impact on the ways in which work is organized, allocated and ultimately accomplished (Markus & Robey 1988; Doherty & King, 1998; Daniel & White, 2005). For example, Davidson & Chiasson (2005) demonstrate how staff in a hospital had to adjust clinical practices to accommodate the use of an electronic medical records systems. Moreover, Doherty & King (2001) suggest that the introduction of technology may

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have significant effects upon the overall design of an organization, in terms of its culture and structure. At the other end of the spectrum, information technologies have also been demonstrated to have a marked influence on the behaviour and motivation of individual members of staff (Zuboff, 1988).

Whether it be at the macro or the micro level (Poulymenakou & Holmes, 1996), there is now almost universal agreement, within the literature, that the introduction of IT is associated with significant organizational change (Clegg *et al*., 1997). However, there are very differing accounts concerning the nature of the relationship. As DeSanctis & Poole (1994; 123) note the literature has become polarized, with commentators either viewing IT as the '*causal agent of change*' or '*an opportunity for change*' (DeSanctis & Poole, 1994; 123). Contributions that view IT as a causal agent of change can be broadly classified as technically deterministic, whilst those that view IT as an opportunity for change reflect a more social constructivist perspective. However, Orlikowski (1992) argues that these competing views of IT present a false dichotomy and that IT should be conceived as a fundamental '*duality*': IT is both shaped through the actions of human agents and the technology will also influence the actions and behaviour of users. Indeed, there has been a growing consensus that information technology is both shaping of, and shaped, by its working environment (Rose & Jones, 2004). The social constructivist side of this equation is supported by the wide variety of evidence that the application of identical technologies, in similar organizational contexts can result in very different organizational impacts (Barley, 1986; Sahay & Robey, 1996). What is less clear is how the technical characteristics of an information system might constrain the ways in which it can be interpreted (Kallinikos, 2004a; Rose & Jones, 2004), and in so doing, how the technology might exert a shaping influence on its host organization. Interpretive flexibility – which can be defined as '*the capacity of a specific technology to sustain divergent opinions*' (Sahay & Robey, 1996; 260) – is one important yet arguably under-researched, concept that might help to explain both how different realities can be shaped from the implementation of the same technology and how its technical characteristics might moderate the extent to which it can be socially shaped. The broad aim of the research, presented in this paper, was therefore to develop new insights into the nature and role of interpretive flexibility, by exploring the development, implementation and use of a standard software package in the UK's network of NHS operated Community Trusts.

Another enduring theme within the information systems' literature relates to the potential of information technologies and systems to either facilitate empowerment or reinforce control (Bloomfield, 1995; Zuboff, 1988). On the one hand, information systems can be viewed as an ideal tool for the monitoring and regulation of employee performance (Torkzadeh & Doll, 1999) and are therefore typically associated with the '*the desire to realise and maintain control*' (Bloomfield & McLean, 2003; 55). On the other hand, there is growing literature that information technologies – through the provision of appropriate information to the desk-tops of employees – might also enable more autonomous ways of working (Psoinos *et al*., 2000). Consequently, we intend to explore how the interpretive flexibility of very similar information systems might either facilitate empowerment or reinforce a control orientation. It was envisaged that by comparing and contrasting these extreme and opposing outcomes, it would be possible to gain a deeper and richer understanding of the nature and role of interpretive flexibility.

The remainder of this paper has been organized into five distinct sections. In the next section, the literature on interpretive flexibility is critically reviewed, before we provide an overview of, and a justification for, the research methods used, in the following section. The subsequent, and most substantive section reports on the impact and implications of the introduction of new information systems at two Community Care Trusts. In the final two sections, we interpret the implications of our findings in the context of the literature.

Theoretical foundations: technical determinism, social constructivism and interpretive flexibility

A persistent theme within the information systems literature concerns the nature of the relationship between technological artefacts and human practices: does technology determine human practice (technical determinism) or is technology constructed through human agency (social constructivism) or is it a mixture of the two? The objective of this section is to briefly re-examine this literature, before exploring the role of interpretive flexibility in moderating the degree to which technical artefacts can be socially constructed.

Technological determinism versus social construction: the continuing debate

Accounts in the literature with regard to the relationship between technological artefacts and human practices differ primarily with regard to '*the direction of causality*' (Bloomfield, 1995, p. 490): is IT shaping of, or shaped by its organizational context? Many other researchers have come to a similar conclusion (Markus & Robey 1988; Orlikowski 1992). Although much has been written about the split between technical and social determinism, it is worth revisiting this debate, as it forms an important backdrop to the research presented in this paper and it also provides a timely opportunity to bring it up to date, with some of the more recent contributions.

In the late 1950s, Leavitt & Whisler (1958) wrote a seminal paper predicting the impact that information technology was likely to have on the structure and role of business organizations by the late 1980s. More specifically, they predicted that information technology was likely to: change '*the role and scope of middle managers*', oblige senior managers to '*take on more of the innovating,*

planning and creating' and encourage '*large organisations to recentralise*'. This paper was one of the first papers that adopted a perspective that could be categorized as '*technical determinism*': a perspective that presupposes '*humans (human behaviour and even the course of history) are largely determined by, rather than having influence over, technology*' (Grint & Woolgar, 1997, p. 7). Consequently, research studies that adopt this perspective treat IT as an '*independent influence*' that exerts a '*unidirectional, causal influence upon humans and organisations*' (Orlikowski, 1992, p. 400). While few current researchers explicitly use the label '*technical determinism*' to describe their studies, many of the contributions that adopt a positivist and quantitative approach have implicitly espoused this perspective, as such studies often seek to reveal social impacts of technology that are universal and generalizeable.

At the opposite end of the spectrum, to the technical determinists, we find a group of scholars who use a radically different form of deterministic logic to argue that technology is a construction of the social conditions from which it is conceived and developed. Such social constructivists argued that new technical innovations are open to more than one interpretation, which will then strongly influence the way in which the embryonic artefact is further developed and modified, until a stable design has ultimately been achieved (Hughes, 1987). This group of researchers and philosophers, therefore, focussed their attention upon the meaning given to technological artefacts by relevant social groups (Pinch & Bijker, 1987). In its most extreme form – often termed '*anti-essentialism*' – social constructivism contends that '*technology does not have any influence which can be gauged independently of human interpretation*' (Grint & Woolgar, 1997, p. 10). In this sense, our understanding of technology is essentially social; '*it is a construction rather than a reflection of the machine's capabilities*' (Grint & Woolgar, 1997, p. 10). The social constructivist view is underpinned by the wealth of empirical evidence that has shown that the application of identical technologies, in very similar organizational contexts, can result in very different organizational impacts (e.g., Barley, 1986; Robey & Sahay, 1996).

While commentators that have promoted a pure brand of either technical or social determinism have played an important role in increasing our understanding of the nature and role of technology, there is a growing disillusionment with such extreme positions. Indeed, there has been a growing consensus that the social/technical binary is a false dichotomy, with the consequence that the vast majority of contributions now inhabit the middle ground, recognising that information technology is both shaping of, and shaped by, its working environment. Perhaps the two most commonly recurring themes relate to the application of either Structuration Theory (Giddens, 1984), or Actor-network Theory (Latour, 1991). In brief, the structurational view (e.g., Orlikowski, 1992; DeSanctis & Poole, 1994) posits an on-going interaction between human agents and technology: structure is embodied in technology through human agency, while in turn human agency is shaped by the embodied structure. The actor-network perspective (e.g., Bloomfield *et al*., 1992) holds that technical artefacts are initially developed, then modified and ultimately applied by building networks of alliances between both human and non-human actors.

The mantra that technology is both shaping of, and shaped by, its social context – or words to this effect – is routinely rehearsed by the vast majority of researchers presenting new or modified contributions to the '*middle ground*' perspective. Unfortunately, despite the significant numbers of contributions to this body of knowledge, we know relatively little about the ability of technology to shape its social context, because most contributors to this debate have adopted a '*user-centric*' position (Kallinikos, 2004a, p. 236), in which the role of technical artefact has typically been down-played, if not completely ignored. More specifically, both the structurational (Berg, 1998) and the actor-network (Rose & Jones, 2004) approaches have been criticized for initially flagging the important shaping potential of the technology, but then allowing the artefact to completely vanish from their discourse. This strong user-centric focus is a prime example of a wider trend within the information systems domain in which the '*IT artefact itself tends to disappear from view*' (Orlikowski & Iacono, 2001, p. 121). Consequently, there is a considerable scope for researchers to revisit this '*middle ground*', but, in so doing, allowing the technical to share centre stage with the social. In this context, one obvious line of inquiry would be to reappraise the finding that identical technologies implemented in similar contexts can result in a variety of social consequences, but this time redressing the balance by exploring how the technologies' material characteristics can be appropriated in diverse ways to shape these different realities. Interpretive flexibility is the one important, yet arguably under-researched, concept that might help us to understand how different realities are shaped. Its nature, role and contribution are introduced and critiqued in the following section.

Interpretive flexibility

A key component of Pinch & Bijker's (1987) original conception of the social construction of technology (SCOT) is the notion of '*interpretive flexibility*'. Interpretive flexibility expresses the idea that technological artefacts are both culturally constructed and interpreted, that is flexibility is manifested in how people think of or interpret artefacts as well as how they design them (Pinch & Bijker, 1987, p. 40). Put more simply, interpretive flexibility is the ability of a technical artefact to represent '*different things to different actors*' (Law & Callon, 1992, p. 24). The original social constructivist view was that as new innovations are developed and introduced, their inherent '*interpretive flexibility*' will allow various social groupings to associate different meanings to the

artefact (Bijker, 1995). Over a period of time, as stakeholders identify problems with the new artefact, modifications are introduced and meanings get embedded into the design of the artefact, until all problems have been resolved, and state of '*closure*' is reached (Pinch & Bijker, 1987, p. 46). Where there are significant differences of interpretation between the stakeholder groupings, Bijker (1987) suggests that a state of closure will only be reached by either: embedding the meaning of the most dominant group of stakeholders; enrolling stakeholders to a compromise or consensus position, or proceeding with more than one design. Consequently, a key tenet of the SCOT perspective is that an artefact's '*interpretive flexibility does not continue forever*' (Kline & Pinch, 1999, p. 133), but will naturally disappear once its design reaches a state of closure.

While in its original form, the concept of '*interpretive flexibility*' was typically applied to the design phase of material artefacts, in more recent years, it has also been used to help understand the design and use of information systems (e.g., Orlikowski, 1992; Kakola, 1995; Sahay & Robey, 1996). However, when reviewing a, definition of '*interpretive flexibility*', in the context of information systems, it becomes apparent there has been a subtle shift in the usage of this term. More specifically, Sahay & Robey (1996, p. 260) define '*Interpretive flexibility*' as the '*capacity of a specific technology* (*or other knowledge system*) *to sustain the divergent interpretations of multiple groups*'. Consequently, interpretive flexibility doesn't terminate once the design of a product has reached a state of closure, as it is argued that information systems can '*sustain divergent interpretations*'. There are potentially two important reasons for this change of emphasis. Firstly, an information system is a particularly flexible type of technical artefact: '*a word-processing system can at once be a powerful tool for desktop publishing and, for a different group of users, merely a fast typewriter*' (Haas, 1999, p. 224). Secondly, the concept of '*closure*' is unlikely to materialize in the context of an information system, as modifications and revisions are likely to be effected at regular intervals throughout its working life (Orlikowski, 2000).

A further important qualification to emerge, from its usage in the information systems domain, is that there must be constraints on the interpretive flexibility of an information system. For example, in making her case for the duality of information technology, Orlikowski (1992, p. 409) notes that the '*interpretive flexibility of any given technology is not infinite*'. One key candidate for placing constraints on interpretive flexibility must be the technology itself, as it has long been recognized that the composition of a technical object constrains the actions of human agents (Akrich, 1992; Orlikowski, 1992). Even in a later contribution, where she argues that almost any technology can be enacted in almost any way in use, Orlikowski (2000, p. 409) still applies the caveat that '*the physical properties of artefacts ensure that there are always boundary conditions on how we use them*'. What is less clear, is how the characteristics of an artefact might limit its potential for being interpreted flexibly, as to date, this has not attracted a significant amount of focused attention (Hutchby, 2001). However, it is not enough to know that an information system's material characteristics will limit the ways in which it can be interpreted. It is also important to have an understanding of how its flexibility can be exploited to shape different realities within these constraints. Even the most flexible technology can appear very rigid if it is deployed without a great deal of thought, experimentation or discussion. The key to exploiting an artefact's interpretive flexibility may well be through active user engagement. As Orlikowski (1992. p. 421) notes '*where technology developers consult with or involve future users in the construction and trial stages of a technology, there is an increased likelihood that it will be interpreted and used flexibly*'. Consequently, it can be argued that for a technology to be interpreted flexibly, it must both offer an appropriate range of functions and capabilities, which can be tailored to the users' needs, and its users must be actively engaged in its constitution.

Over 10 years ago, Orlikowski (1992, p. 424) highlighted the need for more focussed research into '*interpretive flexibility*' when she argued that it would provide important '*insights into the limits and opportunities of human choice and organisational design*'. However, apart from the few contributions already referenced, this call has remained largely unheeded, with very few references to interpretive flexibility, and even less by way of focused empirical accounts, reported within the information systems' literature. Consequently, the nature and role of interpretive flexibility, in the context of information systems adoption, remains a relatively under-researched concept. More specifically, what is still missing is a coherent re-appraisal of interpretive flexibility, which explicitly addresses the constraints imposed by the technological artefact and the mechanisms by which different realities can be shaped and sustained within these constraints. The primary aim of this paper is to redress the balance, by using an empirical exploration of the implementation of two nearly identical information systems in very similar organizational settings, to facilitate a re-conceptualization of interpretive flexibility. Moreover, it was envisaged that through the conduct of this study, new insights might also be realized with regard to a number of long standing debates in the information systems literature, such as does IT empower or control and to what extent is an information system a social construct. A summary of the key themes to be addressed in this paper is presented in Table 1.

The research approach

In terms of our philosophical perspective, this empirical study can be broadly categorized as '*interpretive*' as our aim was to gain '*knowledge of reality*' through the study of social constructions, in particular, language and documents (Klein & Myers, 1999). In particular, this study adopted a dialectic hermeneutic approach (Myers, 1994, p. 58) to help make sense of the information system's

Table 1 A summary of the key research themes

Theme	*Priority*	*Key influences*
To provide deeper and richer insights into the role and nature of interpretive flexibility by explicitly exploring how the technical characteristics of a specific information system might constrain or facilitate its ability to be interpreted flexibly	Primary	Orlikowski (1992); Sahay & Robey (1996).
To provide an account of the relationship between technical artefacts and human agency, which explicitly recognizes the important shaping potential of the technology	Primary	Kallinikos (2004a); Rose & Jones (2004).
To assess the role of user engagement in interpreting and appropriating the flexibility of technology	Primary	Orlikowski (1992)
To review the extent to which IT can be viewed as a facilitator of empowerment, as opposed to a mechanism for reinforcing a control orientation	Secondary	Zuboff (1988); Bloomfield (1995)
To provide new insights into the '*technical determinism*' versus '*social constructivism*' debate	Secondary	Markus & Robey (1988); Grint & Woolgar (1997)
To revisit the debate as to whether information technology is a causal agent of change or simply an opportunity for change	Secondary	DeSanctis & Poole (1994)

implementation process, in which: '*different stakeholders may have confused, incomplete, cloudy and often contradictory views on many issues*'. The aim of the remainder of this section is to provide a review of the context in which the research was located, before reviewing the overall research design, and then describing the targeting, execution and analysis of the case studies.

The research context

The UK's National Health Service (NHS) provides an ideal context in which to study the relationship between technology and the organization, because the NHS is an enthusiastic investor in IT (Economist, 2002), whose staff are generally willing to participate in research projects (Doherty *et al*., 2000). Moreover, because the NHS is such a large and disparate organization, it was envisaged that introduction of a standard package, across a range of locations, might result in a variety of very different interpretations, depending on the composition, experiences and priorities of a given host site. More specifically, we chose to focus our study upon a number of Community Health Trusts, each of which had recently implemented a relatively standard information systems application. Community Trusts, at that time, were primarily concerned with '*meeting the healthcare needs of people who live at home*' (Audit Commission, 1997, p. 4) who did not require the services provided by Hospital Trusts. As such, Community Trusts provided a wide range of services, including: community nursing, health visiting, school nurses, occupational therapy, speech and language therapy and physiotherapy, to a multitude of individual patients, each with very different needs.

It should be noted that following a reorganization of UK's National Health Service that began in April 1999 many of the responsibilities held by Community Care Trusts (such as, developing primary and community health services and commissioning hospital care for their local populations) passed to new Primary Care Trusts (PCT). Consequently, many Community Trusts have either ceased to exist or their roles have been greatly reduced with many staff that previously worked for the Care Trusts now being employed by the new PCTs. A review of the NHS's latest IT strategy (D of H, 2002) suggests that the issues discussed in this paper with regard to Community Trusts are likely to be just as relevant for the recently created PCT.

The specific aim of this paper is to explore the concept of interpretive flexibility within the context of the implementation, use and impact of information systems within Community Trusts. The Community Information Systems Project (CISP) was launched in 1992, with the aim of encouraging Community Trusts to adopt information systems that could both support the information needs of clinicians, whilst at the same time acting as resource management and performance monitoring systems (IMG, 1992). Five years later, a report by the Audit Commission (1997, p. 4) concluded that: '*most Community Trusts are desperately short of data*', and this '*undermines their ability to manage the complex range of services they deliver*'. As a consequence, in the late 1990s there was a significant drive within Community Trusts to improve information management, by either upgrading existing community information systems (CIS), if these existed, or more commonly by acquiring and implementing completely new information systems.

Community Information Systems were being implemented or upgraded against the backdrop of the Government's White Paper for health: '*The New NHS*' (HMSO, 1997). In a way this strategy document sent out mixed messages. On the one hand, it emphasized the need for efficiency and performance monitoring, by highlighting the need for: '*systems to monitor, assure and improve clinical quality*' and the '*promotion of efficiency in all areas of NHS activity*'. By contrast, the White Paper also

used the rhetoric of empowerment, with phrases such as *'local doctors and nurses will be in the driving seat in shaping services*' and '*by empowering local doctors, nurses and Health Authorities to plan services we will ensure that the local NHS is built around the needs of patients*'. It was recognized that against this strategic backdrop, Community Trusts would have some legitimate discretion to interpret and appropriate one of the standard packaged solutions to either facilitate empowerment, particularly in support of clinical decision-making, or to reinforce control, by emphasising performance measurement and resource management activities.

Research design

To gain the necessary in-depth interpretations surrounding the implementation of information systems in Community Trusts, a multiple case study approach was adopted. This has been defined as '*an empirical enquiry that investigates a contemporary phenomenon within its real life context*', which '*relies on multiple sources of evidence*' (Yin, 1994, p. 13). Walsham (1995, p. 78) suggests that in the context of interpretive studies, interviews are arguably the primary data source, as they provide the:

> best interpretations that participants have regarding the actions and events that have, or are taking place (Walsham, 1995, p. 78).

Consequently, the interviewing of a variety of key stakeholders was chosen as our primary data collection method. However, as Darke *et al*. (1998) suggest that data should be collected in a variety of ways, a review of documentary evidence provided by the Trusts was also used to help contextualize and verify the interview responses. Such sources included: published articles, policy documents, internal reports and newsletters. Moreover, a review of national policy documents and interviews with two members of the NHS's IM&T Executive provided important, additional insights into the research context.

The main focus of the interviews was an exploration of how the introduction of CIS had affected Trust employees' working lives, particularly in terms of perceived changes to the levels of worker empowerment or managerial control. In this context, empowerment was defined in terms of the degree to which the system's implementation had been associated with increased participation in the decision-making processes and the design of working practices. A control orientation was conceived as the degree to which the system's adoption was associated with the centralization of decision-making, in the hands of a small number of senior managers. The interviews also explored the approaches that had been adopted to support the acquisition, modification and implementation of each Trust's CIS. A semi-structured interview was adopted, rather than a standardized interview, because of the exploratory nature of the research and the fact that it would not have been possible to create a fully structured guide from current knowledge.

Research targeting and execution

To effectively apply a multiple case study approach, a '*replication*' logic is required, rather than a random sampling logic (Yin, 1994, p. 49). Consequently, when deciding upon which specific Trusts to target, it made sense to focus upon a group of Trusts using a common type of CIS software, to further reduce the potential for variation, and in so doing make the results of the study easier to interpret. In this respect, the results of an exploratory quantitative survey were very helpful as they indicated that one proprietary package should be targeted, as its use was particularly common. In the interests of anonymity, we have termed this package CISYS.

The IM&T managers of a number of Community Trusts, using CISYS, were contacted to explore their willingness to participate in the research, and positive responses were received from these managers at five Trusts. An initial interview was conducted with each of these IM&T managers, at the end of which he/she was asked to provide supporting documentary evidence. It is important, when conducting interpretive research, to seek '*multiple perspectives*' (Klein & Myers, 1999, p. 77) to test for '*conflicting interpretations*', in our case, on the use and impact of information systems at each Trust. To this end, the IM&T manager was also asked to nominate additional members of the Trust to be interviewed. Ideally, we wanted to encourage the participation of at least one senior manager, as well as a number of clinical managers and clinical users, in addition to the IM&T manager. Prior to the interview, each participant was sent a letter outlining the aims of the research project and indicating the specific areas that would be explored through the interviews. Each interview was then conducted, *in situ*, at the Trust and lasted more than an hour. To enhance the validity of the interview process, the informants were asked to supply specific evidence and examples to support their assertions. In the vast majority of cases, each face-to-face interview was complemented by follow-up phone calls that were used to clarify issues and obtain supplementary information. Both the initial interviews and the follow-up phone calls were tape recorded and later transcribed verbatim.

The underpinning philosophy of the analysis strategy was one of dialectic hermeneutics, whereby the researcher's: '*understanding of the whole has to be continually revised in view of the reinterpretation of the parts*' (Myers, 1994, p. 56). Consequently, the researchers would keep re-visiting their interview transcripts and other documentary evidence, and where necessary initiate follow-up phone-based interviews, to help integrate the individual pieces of evidence into a coherent whole (Butler, 1998). To help make sense of the data, interview transcripts and other documents were annotated with '*in vivo*' codes – that is codes derived from phrases used repeatedly by informants (Strauss & Corbin, 1990).

While the interviewing and document analysis was undertaken at five separate Community Trusts, for the

remainder of this paper we are focussing solely on the results from two of these Trusts: one where there was strong evidence that an empowered reality had been shaped and one where the evidence suggested that a control orientation had been imposed. In line with McGregor's (1960) terminology, and to keep the identity of the two Trusts hidden, the control-oriented Trust has been labelled X, while the more empowered Trust has been labelled Y. In Trust Y, three members of staff were interviewed as part of an initial pilot exercise. The same three interviewees, and a further five members of staff were then interviewed more thoroughly during the main data collection phase. In Trust X, four members of staff were interviewed during the main data collection phase. In both Trusts, a rich variety of documents were also collected and critically reviewed to supplement the interview materials. The rationale for the focus on just two Trusts was twofold: firstly, it allows the cases to be reported in sufficient depth and secondly, it follows the established practice of exploring theory through the use of two strongly contrasting cases (e.g., Barley, 1986; Robey & Sahay, 1996). However, it should be noted that while this paper presents a detailed analysis of just two of the Trusts, the evidence from the remaining three Trusts provides added reassurance that our re-conceptualization of interpretive flexibility is not limited to just the two reported cases.

Research findings

In this section, the research findings are reported, firstly for the Trust (Y) in which an empowered reality was evolving, and then for Trust (X) in which the CISYS implementation was perceived to be reinforcing a control orientation. In particular, we seek to focus upon the role of interpretive flexibility, in allowing these two very distinct realities to realized from the introduction of the same package.

The evolution of an empowered reality (Trust Y)

Trust Y provided community, acute and mental health services and operated two community hospitals, which provided health care for the elderly, and one acute hospital. Consequently, the Trust employed a very wide range of professional groups, including: District Nurses; Health Visitors; School Nurses; a full range of PAM Services; Community Psychiatric Nurses; Clinical Psychologists; and Services for People with Learning Disabilities. The District Nurses and Health Visitors composed the largest staff group and they also represented the largest group using the CISYS.

Prior to the implementation of the CISYS, the Trust's information requirements had been supported by a variety of stand-alone computer systems and paper-based filing systems. Consequently, the implementation of the CISYS was viewed as an important mechanism for delivering interconnectivity and improving information flows. However, the prime driver for implementing CISYS was the need to comply with a national strategic directive, which required all Community Trusts to provide a Minimum Data Set (MDS). The MDS was designed to meet the Department of Health's strategic need for all Trusts operating within the NHS, to provide standard information, in a common form. Other important drivers included:

- The provision of better patient-based information for clinical staff;
- To facilitate the sharing of information between different healthcare professionals, in support of the delivery of holistic patient care;
- The provision of enhanced management information for contracting, budgeting and resource allocation.

The system was designed for use by clinical and clerical staff, who entered data directly either through palmtop computers, that are regularly downloaded, or through direct keyboard entry. At the time of the interviews approximately 350 community staff were using palmtop computers, and it was estimated that the roll-out was two thirds complete; consequently, at this time, the system was considered to be partially implemented.

Based upon its core functionality – the capture of data for the 'Minimum Data Set' – the CISYS was initially perceived to be solely a performance monitoring tool. This reading of the system was strongly supported by the tone of the documentation that supported its introduction. For example, as an internal report made clear, the information system had been specifically designed to '*monitor the achievement of the quality and waiting time identified in the Patients' Charter*' (Document: Business Case). Consequently, the majority of stakeholders, particularly the clinical staff, interpreted CISYS as an instrument of control: '*initially the belief was that ''Big Brother'' is watching*' (Clinical User). However, as the project got underway it became apparent that CISYS could sustain divergent interpretations, as its functionality could be appropriated in support of clinical activity and to facilitate more empowered ways of working. As a Senior Clinical Manager recalled, the empowering potential had only been recognized: '*halfway through the implementation, perhaps even following the pilot study*', and she went on to add that: '*we were very aware that we didn't want to just see it as a management tool*'. Indeed, evidence from the interviews suggests that it was only after much discussion and consultation that CISYS was widely interpreted as a vehicle for providing all clinical staff with direct access to the information they needed to inform their clinical decision-making and to improve their working practices. However, while the standard functionality of the CISYS, when supported by a clearly communicated philosophy of empowerment, were important prerequisites for the realization of this vision, it became clear that they alone were unlikely to have delivered an empowered reality. Consequently, clinical and managerial staff were very proactive in exploring ways of exploiting any flexibility, within the system's technical constraints, to reinforce their interpretation.

All packaged information software is delivered with a certain degree of flexibility, which allows it to be tailored – to a greater or lesser extent – to the host organization's requirements. The CISYS package was no exception, but its flexibility was fairly limited. More specifically, the package was designed around the Department of Health's national strategy, and that placed significant constraints on what it must do, as well as what it could and couldn't do. Indeed, there were many mandatory aspects of the systems functionality, such as collecting strategic data for the minimum data set, which had relatively little obvious benefit for the individual users, or the Trust, as a whole. Moreover, the mandatory aspects often had a significant impact upon the Trust's working practices, as the IM & T Manager made clear:

> 'A lot of the problems with the system were the fact that the system works using care objectives and that is not the way our community staff work'.

By contrast, there were many functions that the Trust would have been very keen to develop, such as the introduction of '*free text*' fields to facilitate the capture of even more detailed patient notes, or the introduction of a user-friendly diary time-sheet, which simply could not be accommodated within the system's functional constraints.

However, having recognized that the interpretative flexibility of the CISYS package would allow it to be read as a facilitator of empowerment, Trust personnel were still very keen to tailor its functionality, in support of this vision. As the Information Manager noted: '*we've got to find ways of getting what we need from within its* (the CISYS package's) *limits*'. The main area in which the flexibility of CISYS could be exploited was in relation to the provision of reports. The package, as delivered, provided a menu of standard reports, but the clinical managers considered these to be inadequate for their purposes. Consequently, the IT department – after discussion with clinical managers and users – had to make use of structured query language (SQL) in order to produce tailored reports that provided useful information for clinical purposes. The SQL facility was particularly useful where there was a need for very complex or high-quality reports that would be required on a regular basis. In instances where there was a localized need for fairly simple information, on an *ad hoc* basis, then clinicians were given access to a report writing facility that allowed them to produce non-standard reports on topics that were of particular interest to their particular team. For example, one team leader commented that he was '*looking forward to producing reports that would assess staffing levels and monitor the activities conducted by health professionals with regard to diagnoses and incidents*', as he believed that these would help staff to '*reflect on their existing working practices*'.

Another area in which the Trust had wished to make significant changes related to the capture of data. Unfortunately, there was very little opportunity for IT staff to directly modify data entry routines. However, it was possible to change the data coding structures to ensure that a richer picture of the clinician–patient relationship could be captured. For example, after an initial assessment, every patient was allocated a set of care objectives and a care plan by which it was envisaged that these objectives should be achieved. As the standard look-up tables for care objectives and plans – that came with the package – were fairly limited in scope, the Trust replaced these with its own, far more extensive set of coding structures. In other cases, Trust staff reported appropriating specific fields in data tables – and the corresponding item in a data entry routine – for completely different purposes. For example, the Trust used a redundant data field relating to a patient diagnosis to store data relating to the '*presenting problem*' with which the patient first appears. In the most extreme cases, where there were problems with the flexibility of the data storage structures and data entry routines, the Trust was very proactive in getting the system's functional boundaries changed, by encouraging the software supplier to make more significant changes. As the Pilot Evaluation report makes clear '*there are a number of areas for improvement through small fixes or larger developments, and these are being taken up* (with the supplier)*, as a matter of urgency*'.

There is strong evidence from our data to suggest that it was the high levels of active user engagement witnessed at this Trust, that played the critical role in developing a consensus that the CISYS should be used to facilitate an empowered culture. Moreover, it was through active user engagement that the system's specific requirements were established, as were the ways of exploiting the system's functionality, in support of the desired outcomes. More specifically, through an active process of user involvement, clinicians were able to directly influence systems' priorities, the composition of their data sets and to ensure that reports were tailored to their needs. As a clinical manager noted:

> 'The pro-active involvement of users has been a key element in developing our Trust's information culture. We have emphasised that managers are listening to clinicians' needs and that staff are able to influence change'.

It should be noted that while user involvement was identified as being the primary catalyst for the facilitation of empowerment, at the Trust, it was not seen as being the only trigger. For example, the appointment of a '*clinical development adviser*' – whose brief was to look at clinical issues and encourage the users to develop and improve their clinical practices – was also considered a key element of encouraging more empowered ways of working. Moreover, training and education also played a vital role. While the training related to how users could access the information they required, the education focussed upon the importance of the relationship between data quality and information quality. As a clinical user noted, it was made clear that clinical staff

could only get the information they required, if they ensured that their data entry was accurate and complete.

The evidence gathered from this Trust suggests that there was a strong perception that the implementation of information systems had, and would continue, to facilitate more empowered ways of working. As a Senior Clinical Manager noted:

> I think, the team leaders in particular, have felt empowered to say ''I want a report on 'x'''. They actually want to look at caseload management and different issues. I think a lot more people are becoming aware of how powerful information can be.

In summary, at Trust Y, the system's interpretive flexibility had allowed more empowered ways of working to be initially visualized, and ultimately delivered.

The imposition of a controlled reality (Trust X)

In Trust X, the community services, predominately consisting of District Nurses, Health Visitors and School Nurses, constituted the largest service area within the Trust. The Mental Health Services were largely made up of Community Psychiatric Nurses, Learning Disabilities and Clinical Psychology and several PAM groups. The Trust also operated seven community hospitals providing a range of services including community and acute. As was the case in Trust Y, the District Nurses and Health Visitors comprised the largest clinical staff group, both in terms of the total number of staff employed at the Trust and also those using CISYS.

The situation with regard to the drivers for implementing a CISYS at this Trust were very different to those witnessed in Trust Y. Trust X had been using an early edition of the CISYS for nearly 10 years, but an upgrade was required as the existing system was not '*year 2000*' compliant, nor did it provide the data required to support the minimum data sets. Consequently, while the potential of the package to monitor clinical activity, improve staff clinical effectiveness and to provide better external connectivity were recognized, the upgrade was largely seen as a '*necessary evil*', rather than a desirable choice. At the time of the interviews the majority of staff were already recording their activity on the system, either through palmtop computers (339 staff) or using more conventional keyboard entry (202 staff).

In stark contrast to the discourse of empowerment that was evident in Trust Y, the evidence from this case, suggested that the CISYS's interpretive flexibility was allowing it to interpreted and ultimately appropriated in a very different way. The package was largely viewed as having been imposed upon the Trust, in order to collect data for central purposes, rather than as an artefact that could be appropriated in support of clinical effectiveness and patient care. As one manager noted: '*the staff are not driven by the need to record statistics – their reason for being here is to treat patients and recording information is just something they do as a by-product*'. Moreover, both managers and clinicians perceived that the system was being used to control employee behaviour. Another manager stated that, '*the staff do feel that the system does control them and that's what they don't like*' and a clinical user added:

> when the system came in everybody felt 'Big Brother' was watching you and we had to account for every minute of our time. We had jokes about having to code going to the loo and going for lunch because we had to account for every minute of every day.

Consequently, in Trust X the CISYS package was widely interpreted as an instrument of control, with the control being exercised not only from outside the Trust, but also from within. One clinical manager noted that the introduction of the CISYS had facilitated the development of a '*blame*' culture at the Trust, with the staff fearing that the system would highlight any mistakes that they made, leading to reprimands or even disciplinary action.

As the CISYS package was almost uniformly viewed as an imposition rather than the result of a positive choice, the staff attitude to it was largely one of resigned acceptance. Moreover, it was not generally viewed as an artefact that could be greatly tailored or modified to make it more acceptable to staff. As the IM & T Manager noted '*we* (the Trust) *adopted the system in the form it arrived in from the supplier*'. Indeed, she also noted that the only significant modifications to the software were those initiated by the package's supplier: '*the software company have made changes to the system and, at times, our working practices have suddenly taken a bend*'. Moreover, while IT personnel had customized the package's functionality to generate certain bespoke reports, there was no evidence to suggest that they had followed Trust Y's example of giving clinical staff access to report generators to satisfy their own requirements. Moreover, in sharp contrast to the experiences of Trust Y, the only significant modifications that had been made to coding structures were aimed at reducing the number of codes – to simplify the data collection process – rather than increasing the codes – to improve the information richness. It was also acknowledged – by the Trust's IT personnel – that no attempt had been made to persuade the system's suppliers to modify the package's functionality to suit their requirements.

The system's inability to record clinically relevant data and to produce clinically useful reports was generally attributed to the inadequate levels of active user involvement. As a clinical user noted the system *was* '*generally viewed as not providing any information for front line clinicians*', and when asked to explain this, she noted:

> well inevitably if somebody is setting something up for you, and you're not involved then they might not have an understanding of how your services work, and its difficult for somebody to set the thing up if they don't really know the sorts of things that you do

This lack of user engagement – when coupled with the belief that the system had been imposed on the staff – inevitably

meant that there was very little by way of user ownership: a potentially dangerous situation. As a clinical manager warned:

> without ownership of this data they (clinicians) don't feel they are involved or controlling it, then we are going to have problems with the (data) quality.

This warning proved to be well founded, as a latter evaluation report made clear:

> '*the information provided from the system was at best inaccurate and unreliable.*'

In Trust X, the system was widely viewed as a means of capturing data to provide management – both internal and external – with a source of control information:

> Having the system has made very little difference to them in terms of empowerment or anything else (Clinical Manager).

Consequently, the interpretive flexibility of the CISYS allowed it to be read and appropriated, to reinforce a controlled reality.

Discussion

The study has provided fresh evidence to support Barley's (1986) finding that identical software applications, implemented in very similar organizational contexts, can result in very different organizational impacts. More specifically, the study reiterates Sahay & Robey's (1996) findings that near identical information systems, when applied in very similar organizational contexts, can be used to either facilitate empowerment or to impose a control orientation. However, this paper's most important contribution relates to its primary focus on the nature and role of interpretive flexibility. It has been possible to use the evidence from the case studies to derive a new conceptualization of interpretive flexibility, which explicitly recognizes the important shaping role of technology. This resultant model, as summarized in Figure 1, and described in the remainder of the section, is intended to demonstrate how the material characteristics of the technology influence what it means to users, which will in turn influence how the technology's functionality is appropriated to reinforce the interpretation, when used.

All technologies offer a range of functions and features that will facilitate some activities, while inhibiting others. Based upon the evidence from the CISYS study, it became clear that there were upper and lower limits with respect to the functions that it supported, and that these boundaries constrained the way in which the technology could be interpreted. More specifically, it was possible to discern, what we have termed, '*enforcing constraints*' that make certain elements of the system's functionality mandatory. For example, all Trusts were mandated to use their systems to collect clearly defined data, in order to fulfil their obligations, with regard to the minimum data sets. At the opposite end of the spectrum, it was also possible to identify '*proscribing constraints*' that delineate the functions that do not exist, or for whatever reason cannot be used. For example, the CISYS could not be used to schedule ambulances, provide clinical diagnoses, nor support staff training. However, between these two sets of constraints, there was still clear room for manoeuvre, due to the inherent flexibility of information technologies. For example, the system's report writing and data collection routines could be modified, to a certain degree, to support specific organizational requirements. Together, the '*enforcing*' and '*proscribing*' constraints delineate a system's '*functional boundaries*', which determine the extent to which its functionality can be appropriated to meet the desired outcomes of specific stakeholders (see Figure 1).

Having defined the technological dimension of the model, in terms of its constraints, which govern the extent to which a particular information system can be adapted, it is now possible to review how an information system's interpretive flexibility can be moderated by these material characteristics. In the case of the two Community Trusts, the functionality of the delivered package – which focussed upon the collection of data for external constituencies – greatly affected the initial interpretations of stakeholders that the CISYS was designed to monitor and control clinical activity. However, what was less clear was how amenable the package was to alternative interpretations, as the constraints that delineate the package's functionality were largely passive and not immediately obvious to the stakeholders. Consequently, human agency, was required to identify these constraints and explore the potential for tailoring the system within these functional boundaries. As the system's functionality was explored and became better understood, it was fairly predictable that new interpretations, of the system, might emerge. For example, in the case of Trust Y, this human agency was provided through an active process of user engagement, which allowed a consensus to emerge around a rather different interpretation, namely that the package should be seen as a catalyst to facilitate empowerment. By contrast, in Trust X the lack of user engagement reinforced the initial interpretation that CISYS was an instrument of control. Having interpreted the system in different ways, Trust personnel then exploited the package's flexibility, accordingly, to reinforce their interpretations. The most obvious example of this relates to the modification of the look-up tables for '*care objectives*'. In the case of Trust X, the information was perceived to be for the benefit of external agencies, rather than clinical users, and therefore the number of data items was reduced, to simplify data entry, and thus minimize the system's impact upon clinical working practices. By contrast, in Trust Y, staff were happy to see the same data coding structure being extended, as it was recognized that this extension would improve the richness of the clinical information that they ultimately received, which would, in turn, improve their clinical effectiveness. To summarize, the broken arrows, in Figure 1, reflect how stakeholders are able to review an

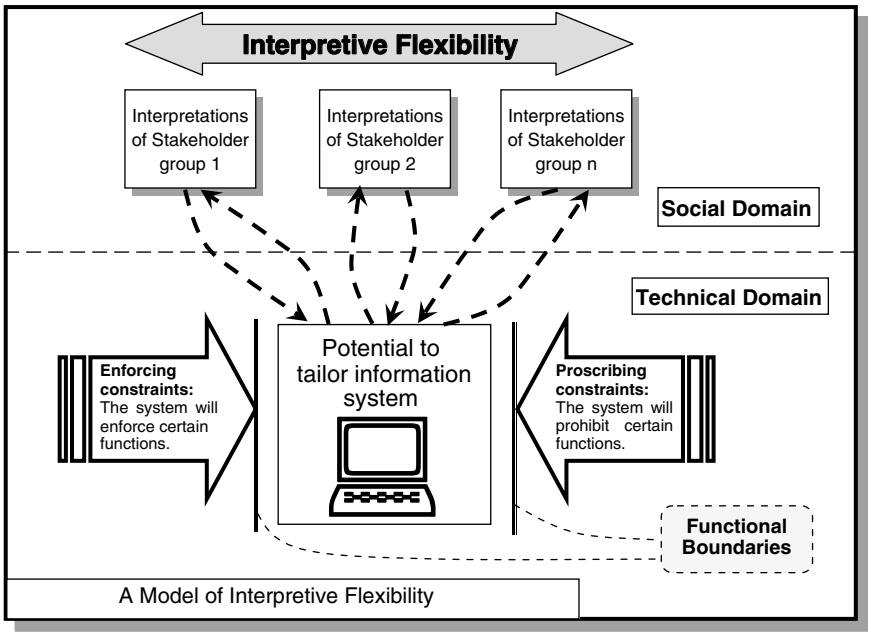

Figure 1 A model of interpretive flexibility.

information system's potential to tailored, before appropriating this flexibility to effect their desired outcomes.

The above discussion adds weight to the dualist perspective, as it demonstrates how the interpretive flexibility of technology can be appropriated to moderate the extent to which the artefact is both shaping of, and shaped by, its social context. The implementation of CISYS significantly shaped the behaviour of both Trusts, particularly with respect to the processes for recording and collating data for the minimum data sets, but the technology was also shaped by the Trusts to reinforce their preferences for control or empowerment. However, this is not the end of the story, because evidence from the study suggested that where an interpretation has been taken as far as it can, within the technologies current constraints, it may be possible to take action to have its boundaries redrawn to better suit the interpretation. For example, in Trust Y, there was a strong belief that the software supplier should be encouraged to reposition the package's functional boundaries so that that it could be more effectively tailored in support of their interpretation of a system to facilitate an empowered workforce. But does this finding imply that information systems, such as CISYS, are open to ongoing re-interpretation and refinement, without any limits, and what does this tell us about the long-term balance between the social and the technical?

The evidence from the literature certainly suggests that information technologies are typically subjected to fairly regular modifications and adaptations throughout their working lives (Orlikowski, 2000). Consequently, it is possible to suggest that this gradual unpicking and redefining of the systems' functional boundaries might be an almost continuous process, with the technology frequently being reinterpreted and then refined. However, in practice, it is generally very difficult to significantly push back the boundaries of packaged software, and in so-doing modify its functionality, without limit. As Kallinikos (2004b, p. 11) notes in the context of ERP technology, '*Contextual adaptation and re-shaping of such packages cannot undo the logic and very presuppositions on which the package is predicated*'. Given the inherent difficulties of significantly redefining a technology's functional boundaries, any changes are likely to be highly costly, time consuming and disruptive, and will also probably require a unity of purpose and a high degree of political will, as was evidenced in the case of Trust Y. A tension is therefore likely to arise between the social and the technical: the natural desires of human agents to continually re-interpret and modify their technologies, to perfectly match their dynamic requirements, are likely to be kept in check by the technology's functional constraints. Consequently, it is likely that following the initial period of interpretation, experimentation and, where possible, customization, a period of stability will be reached, where the system's boundaries and functions remain relatively settled. It will then take a fairly significant event, such as a change of strategy, to justify any serious re-interpretation and redefinition of the system's functionality. Based upon the preceding analysis, it can be argued that the social is locked in a recursive relationship with the technical. As depicted by the broken arrows, in Figure 1, the system's technical characteristics strongly shape both the initial and emergent interpretations, which in turn influence how an organization will seek to exploit and ultimately

redefine the technology's functionality. However, it seems likely that at any given point in this recursive cycle, it will still be possible to identify elements of the technology that have been shaped through human agency and elements of the technology that are shaping of its social context.

Having used the evidence from the case studies to present a provisional explanation of how the characteristics of a technology might limit its interpretive flexibility, it also became apparent that a key element our favoured definition of 'interpretive flexibility' warranted further comment. We accepted Sahay & Robey's (1996) argument that an information system's interpretive flexibility should allow it to '*sustain divergent interpretations*'. However, it is interesting to note that the evidence from our study suggests that this sustaining of divergent interpretations is working at two distinct levels: between-case divergence and within-case divergence. The most obvious divergence occurs at the between case level: at Trust X the interpretation of the dominant stakeholder group that CISYS should be used as a control mechanism was embedded in the system's functionality, whereas at Trust Y, a consensus position, favouring empowerment, was agreed between stakeholders, and ultimately established within the system. Moreover, it is likely that the two Trust's very different interpretations, of the same packaged software, are likely to continue into the future. In terms of within-case divergence, it can be argued that because Trust Y have given their staff a high degree of autonomy as to how they use the CISYS, it is possible that divergent interpretations will develop, and be sustained (see Figure 1), within the single Trust. For example, by tailoring their reports to suit their needs, it is likely that individual professional groups will be able to develop their own distinct interpretation. However, it must be reiterated that at both the within-case and the between-case levels, the extent to which interpretation can diverge is being kept in check by the system's functional boundaries.

Contribution

This study makes an important contribution to the field by presenting a new theoretical conceptualization of interpretive flexibility, which explicitly explores how the technical characteristics of an artefact might limit, or indeed facilitate, the degree to which it can be interpreted flexibly, and shaped through human agency. In so doing, it helps to redress the balance between the social and the technical, by exploring how the technical characteristics of a system can be shaping of, as well as shaped by, its social context. Moreover, it underlines the significant role of proactive user engagement in understanding and exploiting an artefact's interpretive flexibility. However, it is not just in the theoretical domain that this study makes an important contribution, as there are also many important lessons to be learnt for practitioners, and in particular, those working in the NHS. Perhaps the most important message, to emerge from this study, is that centrally based IT strategists and project managers cannot expect their IT projects to deliver a uniform effect, when implemented in an organization that is as large-scale and diverse, as the NHS. Moreover, while they might be able to tightly specify certain elements of a system's functionality, so that it supports key strategies, there is also a need to offer some capacity to tailor the system, so that that managers and users have some room to interpret and appropriate the system in a way that meets their local needs. In this later respect, the role of user engagement is absolutely critical, in allowing the system's capabilities and constraints to be fully explored and ultimately appropriated, to suit the needs of local staff. Finally, it is important for practitioners to remember that information systems should be viewed as a '*work in progress*', as they need to be frequently monitored, and where necessary modified, to ensure that they continue to support organizational goals.

Concluding remarks

Myers (1994) notes that the key questions to be asked with respect to the implementation of a new technology concern what it will '*mean*' to people in the organization and how it is to be '*used*'. The significance of this exploratory study is that it provides some important new insights into the role of interpretive flexibility in establishing what a specific technical artefact will '*mean*' to its users, and how this will strongly influence how it will be appropriated and ultimately '*used*'. More specifically, the study demonstrates how the material characteristics of an information system strongly influence the way in which it will be interpreted by stakeholders, which will then, in turn, help to determine how any flexibility associated with these characteristics will be appropriated and exploited to help reinforce, or indeed modify, these initial interpretations. Moreover, given that individual information systems, and their host organizations, operate within a highly dynamic environment, it is likely that a recursive relationship will develop between the system's material characteristics and how these are interpreted by stakeholders.

Research into the role of information systems, within the organizational context, is an ambitious undertaking, and therefore contains a number of inherent limitations. For example, the adoption of the case study format reduced the number of organizations that could realistically participate and there is also the potential for some bias with respect to the way in which these cases, and the interviewees, were ultimately chosen. Consequently, while the study provides many interesting and novel insights, these limitations do highlight the need for follow-up studies to be conducted that adopt different methods, and target different populations and respondents, to investigate the wider currency of the results. Of particular importance, in terms of follow-up research, will be longitudinal studies. As was noted earlier, the interpretations of stakeholders are highly unlikely to remain

constant over the operational life of an information system. It is highly probable that an information system will be reinterpreted, in light of changing organizational circumstances, which may necessitate appropriating the system's functional flexibility in different ways, or even seeking to have its functional boundaries redefined. The on-going, recursive nature of the relationship, between a system's material characteristics and the subjective interpretations of its stakeholders, underscores the need for more longitudinal studies to explore how well our theoretical model reflects organizational realities, in the longer term. Moreover, it is envisaged that such studies might help to shed light on the transmutation points between deterministic and non-deterministic interaction of man and machine.

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