

INFORMATION TECHNOLOGY, CONTROL AND POWER: THE  
CENTRALIZATION AND DECENTRALIZATION DEBATE  
REVISITED\*

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ABSTRACT

This article addresses the conceptualization of power in relation to the use of computers in organizations. Commonly held views that the application of computer based information systems leads to either a centralization or a decentralization of power and control, or that computers merely reinforce the power of dominant actors, are criticized, and an alternative view is put forward which focuses on the *symbolic* and *disciplinary* dimensions of the development of information systems. This perspective is then illustrated in connection with the development of management information systems in the National Health Service.

INTRODUCTION

When computers first came into common use within organizations there was an expectation shared among many observers that they would tend to centralize organizational power. Information was equated with power and the potent information processing capacity of computers was seen as an extension of managerial control. To some extent the reason for the expectation can also be attributed to extrapolations from the particular technological form in which computing emerged following the first military uses during and immediately after the Second World War – namely, large centralized data-processing departments.<sup>[1]</sup> In addition, it is worth pointing out the fact that the dissemination of computers into organizations was accompanied by ideas from systems theory which engendered a reconceptualization of managerial and organizational processes, explicitly emphasizing the importance of control over sub-systems (Boguslaw, 1965; Lilienfeld, 1978). Systems thinking has often been associated with technocratic ideas and so further strengthened the feeling that computers would pave the way for enhanced centralization in organizations.

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However, as computers became progressively smaller and hardware costs fell there was a rising expectation that they could further aspirations toward decentralization; in other words, the fundamental issue in terms of power and computing came to be seen as one of ownership and access. If having a computer was equated with power then the proliferation of computers throughout organizations could indicate a decentralization of power. In more recent years the arrival of distributed computing and other developments in information and communications technologies have tended to re-open the debate, and to encourage a perspective in which smaller-scale semi-autonomous units can achieve both good internal control and good interface with external markets and institutions. In addition we have seen a tendency to less vertical organizational hierarchies; more devolution of responsibility to smaller management units; even contracting out operations on the basis of information linkages which ensure performance monitoring. All these phenomena can be seen as partly related to the enabling function of information technology.

The possibility of such changes creates a conundrum in respect of power and control in organizations. The real displacement of some forms of decision to a new and more peripheral location creates an apparent element of decentralization of decision-making; but the continued use of information technology (IT) to monitor output and standards, and even to establish more firmly codified rules and procedures (thereby setting bounds on the decisions which are to be taken as well as the solutions which are deemed feasible), creates a new sense of centralization of power and control (Robey, 1981). According to this view, centralization and decentralization may no longer be seen as 'opposites or alternatives' but as 'mutually dependent' (Heydebrand, 1985, cited in Orlikowski, 1988). It is this dual character of current developments in information systems which creates a difficulty of interpretation for perspectives which emphasize either centralization or decentralization alone; it also renders problematic the notion that access and ownership are the key features in respect of computers and power.

In this article we examine three current approaches to the question of computers and organizational power before proceeding to elaborate a fourth alternative which offers a new perspective on 'centralization versus decentralization'. On a note of caution, at this stage in the argument it behoves us to point out one important *caveat* – namely, we do not endeavour to discuss the whole of the complex literature on power *per se* but restrict ourselves to those conceptions of power which underpin common views on the relationship between computers and power in organizations.<sup>[2]</sup>

The first approach to computers and organizational power is seen to be derived from a sovereign view of power (see Clegg, 1989). Specifically, it centres on the conceptualization that power is akin to a mechanical force possessed by *someone* and which operates *causally* over others. With a lineage which derives from the political theory of Thomas Hobbes, its modern expression surfaces in the notion that information is equivalent to power. A corollary of this view is that shifts in power within organizations can be measured. The second approach is that which, broadly speaking, can be seen to embrace systems, structural<sup>[3]</sup> and contingency approaches to computers

and power. Adopting a more sophisticated view of organizations, according to this second approach computers do not centralize or decentralize power *per se* but tend to strengthen the hand of already dominant players – that is, they reinforce existing organizational games. The third approach eschews a consideration of sources of power and looks instead to its exercise, which is construed in terms of *behavioural* outcomes. We refer to the limitations of this perspective before moving on to advocate a fourth approach which looks at the potential role of computer based information systems in the renegotiation of professional knowledge, discourses, and practices within organizations. The contention is that these renegotiations are examples of exercises of power which so far as power and computing are concerned have hitherto remained obscure. Indeed, nobody *owns* the form of power discussed in this fourth perspective, it is not a possession but a *relationship*. We then move on to relate this alternative conception of computers and power to examples of current developments within the National Health Service (NHS) where there is a drive to introduce management information systems on a significant scale.

#### COMPUTERS AND POWER IN ORGANIZATIONS: CENTRALIZATION OR DECENTRALIZATION?

From the very early days of computing people have raised a variety of questions pertaining to the societal implications of the increasing pervasiveness of computers, with all manner of utopias and dystopias being perceived on the not too distant horizon (see Fleck, 1984). Indeed, Norbert Wiener, the founder of cybernetics (the science of control and communication in animals and machines) was one of the first to address some of the social and ethical issues surrounding the development and use of computers (Wiener, 1950).<sup>[4]</sup> Amongst organization theorists, one recurrent question which perhaps seemed fairly obvious to ask was whether or not computers tended to centralize organizational power; the basis of this question stemmed from the belief that information was a source of power from which it was often predicted that information providers (usually in subordinate organizational positions) would lose power to information gatherers who tended to be in positions closer to the top of organizational hierarchies (Gotlieb and Borodin, 1973, p. 210). This position finds a more recent formulation in arguments about the enhanced surveillance potential of IT in the workplace (see Mosco, 1989). Indeed, if one looks at labour process theory one finds a number of discussions of the role of computers in job fragmentation and deskilling – these being equated with the strengthening of hierarchical control and centralization (for a review of this literature see Orlikowski, 1988). Thus in crude versions of labour process theory, computers (and technology more generally) have been seen as instruments in the hands of managers, the agents of capital who use them to further centralize power and control in the workplace. However, more sophisticated approaches in this literature argue against any inherent centralizing properties in computer technology; they point out the potential costs to management and efficiency of such tendencies

and some also discuss the use of computers to deliver a decentralization of organizational power and control.

Another aspect of information and managerial control arises from the view that the generation of information provides a means by which organizations might reduce uncertainty about their environment. In this regard accounting departments in particular have been identified as loci of enhanced control and power because of the potential 'uncertainty-reducing' information which they are able to define, possess or generate. This implies a shift in relative power toward such departments (marketing would be another example) and could therefore be read as an instance of decentralization away from what have usually been taken to be the centres of organizational power – that is, senior management – and marks the emergence of a technostructure (Galbraith, 1968; see also Bariff and Galbraith, 1978). However, one could also argue that such a technostructure represents not decentralization *per se* but rather a shift in the *location* of centralized control.

In a more general vein, the notion that the decentralization of information represents a decentralization of power has led some to regard IT as a potential means of furthering organizational democracy and political decentralization: 'The new power is not money in the hands of the few, but information in the hands of the many' (Naisbitt, 1982, cited in Roszak, 1988; see also de Solla Pool, 1983; Toffler, 1980).

These examples of how computers and organizational power have been related in the literature – both the centralizing and the decentralizing views – can be read as instances of information politics; that is the decisions concerning the development and content of computer based information systems are the site of conflict between rival organizational factions. Interestingly, each takes a *different* view of where information systems will lead in terms of organizational development or design but each shares a *similar* conception of power. Thus, against this general background to theorizing the connections between computers and organizational power, as well as the associated discussions of centralization versus decentralization, let us now consider some of the different models of power in more detail. By discussing their various assumptions and flaws we will pave the way for a different conceptualization of computers and power.

#### *A Sovereign View of Power*

Despite different views and valuations of authority and hierarchy, the various exponents of the centralization/decentralization theses have often tended to share a similar conception of power – put simply, you either have it or you don't, you either exercise power over others, or it is exercised over you. Thus power is assumed to be derived from sources who are intentional agents, *e.g.* the sovereign, 'an originating subject whose will is power' (Clegg, 1989, p. 155).

Throughout most of recorded history land has been the critical resource, and power accrued to those who possessed land; in the last 200 years capital has been the critical resource and those who possessed it have had

extraordinary power; now it is argued, power is conferred upon those who possess and can use knowledge (Gotlieb and Borodin, 1973, p. 211).

Thus the important assumptions underlying this conception of power are: first, that power is a thing, almost akin to a material or physical substance; second that it has simple mechanical or causal effects; third that it is owned, something which is possessed; and fourth, that power is apportioned within a zero-sum game. Because of the equation of information with power a host of empirical studies were spawned in which social and political scientists sought to determine, usually by interviews/questionnaires, who had lost and who had gained power in a given organization as a result of computerization (for a review of this literature see Kling, 1980). In these approaches information was seen largely in quantitative terms – conceptions of information tending to borrow heavily from the work on information theory developed by Shannon and Weaver (1962). This quantitative view of information was reinforced by the fact that whatever is input into a computer-based information system has to be coded in some way, which in turn underpinned the conviction that power was a phenomenon whose dynamism could be assessed according to a metric. Such quantitative approaches of course conformed well to the positivist norms of empirical testing within North American social science in general, and management science in particular. However, the outcome to which we wish to draw attention here is the possibility that the quantitative conception of information at least reinforced the zero-sum notion of power. In other words, if information could be measured and – by notions of information flows and networks – changes in the organizational distribution of information could be mapped, then corresponding shifts in power would also appear open to measurement.

Among the people who addressed the problem of centralization versus decentralization, some saw power in pejorative terms while others did not. For 'systems rationalists' (Kling, 1980), including management scientists and some systems theorists, organizational power may be legitimately centralized in the interests of achieving goals (around which there is a presumed consensus), increasing efficiency and strengthening an organization's adaptability to environmental change. Again we can see the distant influence of Hobbes here; just as political subjects were to subordinate themselves to the sovereign in exchange for the benefits of pacification offered by the latter, so too modern day organizational members are exhorted to divest any sectional interests in favour of higher organizational goals. Variants of systems rationalism have in fact been posited both for large and small organizations and even nation-states – as in the case of Stafford Beer's cybernetic experiments in Allende's Chile (Beer, 1971). Further, it has even been suggested that centralization and decentralization are expressions of a systemic mechanism for maintaining systems equilibrium.

What may be needed is a pulsating structure which oscillates between the two modes. At the very least any equilibrium should be dynamic in the sense that the system is constantly adjusting itself in response to changes in

its environment, by allowing more autonomy to the satellites or applying more control at the centre, as the need arises (Gotlieb and Borodin, 1973, p. 217).

Systems rationalism reaches its apogee in the notion that social or organizational changes may be deliberately effected through an information system.

The politics of organizational decision-making has three important implications for providers of information services. First, the objective of an information system project may be successful implementation with minimal effect upon the current social structure. Thus, knowledge of existing political relationships is required. Second, an information system modification may be used to effect a *planned change in the social structure*. Finally, information system modifications may be used to enhance the relative power of the information systems group (Bariff and Galbraith, 1978, pp. 15–16; our emphasis).

The idea that designing an information system is equivalent to designing a power system, that such a system will realize power for the designers or, more commonly, their clients, may justifiably be viewed as a fantasy (see Boland, 1986). But the important point as far as our argument is concerned is that this view of power, how to get it and keep it, depends crucially on the particular view of information on which it is based. Not only is power construed in terms of mechanical cause and effect but the very fabric of the social and cultural life of organizations is construed instrumentally.

#### *Systems and Structural Views*

The sovereign view of power has not remained unchallenged and indeed it has been seen as naive in other social science circles. For instance, early reactions by political theorists and symbolic interactionists tended to draw attention to the particularity of organizations where, it was argued, power resided not in people but in systems and structures: '[a]utomated information systems should be viewed as social resources that are absorbed into ongoing organizational games but do not materially influence the structure of the games being played' (Kling, 1980, p. 92; see also Brewer, 1973; Dutton and Kraemer, 1980; Greenberger *et al.*, 1976; Kling, 1991; Wynne and Otway, 1982). In other words, in this view, computers do not centralize or decentralize power *per se* but tend to reinforce the power of already potent players. Thus computers and information technology represent yet further examples of organizational resources over which different actors may lay claim. The ensuing struggles are instances of resource politics in which competing organizational factions seek to maintain and extend their relative positions. Thus, Pettigrew (1973) talks of technological gatekeepers who can extract rewards from other organizational groups in return for allowing access to the skills and technology over which they have control. To this must be added the observation that computers can play a symbolic role in organizations – their very use can convince other parties that important decisions are being carefully made; they 'increase the influence of those who have access to the

technology, can organize data to their advantage, and can understand computing use' (Kling, 1980, p. 90; *cf.* Feldman and March, 1981; Weizenbaum, 1976).

Another interesting view of the symbolic aspects of computers and power is offered by Markus and Pfeffer (1983) who discuss the importance of the dominant culture, paradigm and hence beliefs and values (the symbolic domain) of an organization *vis-à-vis* those pertaining to the introduction of a new information system. But despite their greater degree of sophistication concerning power and the nature of organizations, Markus and Pfeffer still view inter-organizational power (relative power) within a zero-sum context (*cf.* Swanson, 1983). This is highlighted by their commitment to the possibility of an empirical verification of their hypotheses:

research in this domain requires specification of ways to measure the impacts of accounting and control systems on intraorganizational power. . . . Until a better technology is in place for assessing the implications of a given accounting and control system for intraorganizational power, various surrogate indicators may have to be employed (Markus and Pfeffer, 1983, p. 216).

In other words, they have still not shed all the vestiges of the sovereign view of power which has orchestrated so much of the debate concerning centralization and decentralization.

We turn now to another approach, one which eschews intentionality and the possibility of measuring power but is, as we shall argue, still tied to a rather mechanical conception of power.

*Power: from Sources to Behaviour*

A third approach to computers and power is offered in Markus's later work with Bjørn-Andersen where we find a discussion of the power which information systems professionals exercise over users. In a departure from previous work in the area Markus and Bjørn-Andersen chose not to concentrate on either the intentional sources of power (*i.e.* in the terms employed earlier, the sovereign) or an awareness that power is being exercised on the part of those individuals or groups who are its target. This more radical formulation of power derives explicitly from the work of Lukes (1974).

Thus, from our perspective, to say that IS professionals have exercised power over users means that the users behaved differently from the way they would have if not for the professionals (Markus and Bjørn-Andersen, 1987, p. 499).

There are major objections which can be raised against this model. The first is that it carries with it all the problems attendant on the assumption of 'real' interests. It presupposes the notion of real interests because it is *only* against this assumption that user behaviour can be judged: if users don't act in their real interests then power is or has been exercised (for a critique of Lukes' model of power see Clegg, 1989; Knights and Willmott, 1985). The second,

and for our purposes, more pertinent difficulty is the differentiation which Markus and Bjørn-Andersen make between four types of power exercise – namely, technical, structural, conceptual, and symbolic – and the suggestion that if information systems professionals and users each come to recognize these ‘different types of power exercise’ then this might lead to heightened *awareness* among users and mutual negotiation.<sup>[5]</sup> The problem here is that such a recognition of power on the part of users may itself be constituted by that power. Even the apparently simple distinction between professionals and users is an exercise of power. Thus user realization of the exercise of power can not take place in a power vacuum for even the categories through which resistance is effected can be viewed as arising from the operation of a particular discourse within organizational practices – in this case the practices of information systems professionals during systems implementation.

Following Clegg (1989), we might argue that despite the radicalism inherent in Lukes, his model still holds to the rather mechanical conceptualization derived from Hobbes and inevitably this limitation carries over into the work of Markus and Bjørn-Andersen – in the latter case the power exercised by information systems professionals is seen to *prevent* users from perceiving their real interests in respect of information systems development.

What is required is a different conception of power, we need to avoid the trap of falling into the ascription of real interests, to avoid simple cause and effect, and the idea that power is owned, while seeking to understand the operation of power through the constitution of the categories of organizational life. The provision of such a model is the task of the next section where it will be framed within the context of management control.

#### *Power and Management Control*

The area of management control is one which has been extensively examined by organization theorists over the years, indeed it has been a central question in the framing of the problem field for social science generally. In particular it is the connection between management control and the broader question of the nature of power which makes the issue central to the study of organizations. Many of the traditional approaches to the nature of management control share a view of control (and therefore power) which is rather like the zero-sum game approach mentioned earlier. Control is seen as a disputed commodity; increments of it pass back and forth across a ‘frontier of control’ as a result of struggles between parties with particular locations or ‘interests’. As the various schools of thought have developed their emphasis on, for example, formal structures and roles (Fayol and Weber); informal practices as modifying formal roles (Taylor); workers as multidimensional individuals rather than instrumental ciphers (human relations and socio-technical theorists); and workers and managers as ‘representatives’ of labour and capital (labour process theories), this view of control as a property of people or roles has remained fairly constant.

But writing which focuses on power itself, rather than on management control, has taken a different tack much influenced by the work of Foucault (1977, 1980; see also Hoy, 1986). This is not the place to attempt to summarize, much less synthesize this increasingly large and rather disparate

body of research (for a review of the literature on management control in the light of Foucault see Cooper and Robson, 1989). Rather, we choose to concentrate on one particular aspect of this 'new' thinking about power which is of special interest to the task of understanding the role of computer based information systems in organizations. The facet we want to explore is concerned with power as a technique embodied in discursive practices – *i.e.* discourses, ways of thinking and speaking, instituted within organizational practices – which define *the way subjects see the world and themselves* and thereby discipline those subjects. In short, this view of power is not concerned with more or less naked threats, coercion and control, with sovereignty and mechanical cause and effect. It is concerned with discourses and associated bodies of knowledge (disciplines) which constitute the dominant view and meaning of things, and we are interested in the role of computer based information systems in mediating and reinforcing these particular views and meanings.

The power in the hierarchized surveillance of the disciplines is not possessed as a thing, or transferred as a property; it functions like a piece of machinery. . . . Discipline makes possible the operation of a relational power that sustains itself by its own mechanism and which, for the spectacle of public events, substitutes the uninterrupted play of calculated gazes (Foucault, 1977, p. 177).

Thus, power is not local but dispersed; it is not some *thing* which allows one agent to cause an effect on the part of another, mechanically as it were, but is itself a kind of mechanism constituted by the multiplicity of power/knowledge relationships between agents. Moreover, in this conceptualization power is not seen in solely negative terms: the discursively constituted categories of social or professional life discipline human beings (subjects) through the operation of norms – setting out standards to which persons should adhere in view of the social gaze – but they also empower by creating a space for action.

From such a vantage point one interesting facet of computers in organizations stems from the idea that an information system embodies a particular *view* or *model* of the world (organization); it is a social construction developed against a backdrop of professional and other knowledges, and associated ways of thinking and speaking. Thus in contrast to the earlier views of computers and power, we must shift our focus from information networks and information flows to consider the *meaning* of information systems, the visibilities (Hopwood, 1985) whose creation and mobilization they make possible within organizations (*e.g.* costs or efficiency levels), and thus their role in classifying, ordering, and constructing reality. In short we must move our attention away from the *form* of computing to its *content*; from the location of ownership of information to its significance.

Another feature of the non-sovereign approach to power is the view that the development of modern societies is characterized by the growth of self-discipline or self-regulation by individuals alongside regulative practices associated with the state and other institutions (*cf.* Elias, 1978). In particular the increasing involvement of individuals with complex bodies of professional

knowledge and expertise which give meaning and coherence to a whole variety of individual acts of self-discipline is seen as a source of this self-regulation (for an exposition of this idea in connection with the accounting profession see Miller and O'Leary, 1987). This notion of self-regulation can also be applied in an organizational context and used to explore the nature of power in that setting. In the context of a discussion of management control we can recast the idea of self-regulation or self-discipline as self-control.

One area of particular interest in this regard centres on the ways in which individuals or groups construe their profession and the degree to which they see themselves as adhering to or diverging from a professional role within an organization. Thus, to the extent that individuals' practices become reshaped through the mediation of new bodies of knowledge or discourses from a different sphere or profession, and the degree to which those individuals internalize norms and values which are associated with those knowledges and discourses, then we can say that a change in discipline and control has been effected, and manifests itself at least in part as regular acts of self-control according to those knowledge-related norms and values.<sup>[6]</sup> What must be stressed here is that though particular organizational groups might seek to direct an intervention in terms of organizational culture and practices (in the manner of systems rationalism), and though the force of that intervention will carry the weight of their current relative position, such moves do not directly determine the effective renegotiation of knowledges which may ensue. In this regard we must reiterate the point that no-one *owns* the sort of power we are discussing here.

The emphasis on the symbolic domain of organizations is the clue to the potential role of management information systems in altering the circumstances of power and control. Whereas Kling, for example, chooses to emphasize the role of computers in the symbolic legitimation of information because of their association with science, calculation and accuracy, what seems to us rather more important in the control setting is the more direct sense in which the concrete form of a computer based information system represents an implicit or explicit model of reality. Models include some items of information and exclude others; define those items of information and specify the relationships between them.<sup>[7]</sup> As such, information systems become interwoven within organizational practices, within the culture of an organization, and, potentially at least, mediate and reinforce the sense of meaning of those practices.

However, it would be wrong to see information systems as omnipotent or uncontested; this would be to fall prey to the fantasy that designing an information system is akin to designing a power system. Indeed, sometimes information systems may be completely ignored and hence of little effect. But it is important to register the general point that information systems in control applications do have the potential to invoke a renegotiation of the everyday working definitions of important phenomena which are the stuff of an organizations' daily life. Following Marcuse (1978), we might say that technology (*e.g.* the particular configuration of hardware and software, together with the associated practices inherent in, and arising out of the running of a management information system) is not an instrument by which

one group or organizational faction seeks to control another; rather, technology is the *outcome* of the struggle between those parties. Changes arising from the renegotiated understanding of social practices can be seen as gradual mutations of the culture(s) of the organization in question. These mutations have the power to reproduce as culture(s) shape the practices handed on to new members of the organization. In the remainder of this article we offer a tentative elaboration of how the perspective developed above might inform a strategy for researching the current development of information systems in the National Health Service. The discussion is based on exploratory research drawing on public documentation and on some limited fieldwork in a small number of sites. The research programme is ongoing and a fuller and more definitive testing of the framework is therefore not appropriate here.

#### INFORMATION SYSTEMS IN THE NHS

##### *Background*

The NHS is presently experiencing a burgeoning – albeit from a low base – in the development of computerized information systems. The overall colour of the various IT applications reflects a concern with management of the health service – with resource allocation, efficiency, and budgeting – rather than with clinical applications. Although some systems are being developed which focus on the information needs of doctors and nurses engaged in clinical practice, they are not receiving the same funding and policy support as management-related systems. On balance then, the motivation behind the current surge of interest in information systems is primarily financial and organizational rather than medical.

This trend in the introduction of information systems to strengthen managerial planning and control has been in evidence from the early 1980s onwards, but has been given a further radical impetus since the White Paper on the NHS (DoH, 1989). The subsequent moves towards the use of ‘internal markets’ to regulate the pattern of health provision and seek greater efficiency, have suddenly put costs and prices at the centre of the concerns of health service managers arranging contracts for services. Not surprisingly, this has pushed information systems designed to generate cost information much higher up the management agenda. In fact many of the procedural details of the model of NHS organization being developed following that White Paper are based on full-scale implementation of some earlier pilot schemes to develop management information systems, most notably the Resource Management Initiative. This and other information system developments have been in existence for some time and are linked to broader shifts in the management style of the NHS which have followed the Griffiths Report of 1983. As Scrivens notes:

The greed of the NHS for information has grown rapidly in the last decade because of increased pressures from central government to increase the accountability of the service in its use of public money, to rationalize its resource allocation procedures and to maximize value for money. Recent

changes in the management style of the NHS towards general management have increased further the desire for more information about the running of the health care services. The information needs of the NHS are closely related to its concerns about limited resources, increased demands for services and a lack of management in the past (Scrivens, 1987, p. 147).

The major information systems now available to try to meet these information needs in NHS hospitals are the following:

*Patient administration systems* are used to register the admission, movements, and discharge of patients, and frequently other information such as diagnosis and doctor-in-charge.

*Departmental systems* are used in departments such as X-Ray or pathology to schedule work and record results.

*Order communication systems* (which are still rare in the UK but common in the USA) use terminals in wards to order diagnostic tests for patients and to receive results. They therefore have to interface with departmental systems.

*Medical audit systems* are used to capture and analyse clinical data on treatment patterns in order to allow doctors to review the quality and efficacy of their clinical practice. The data used are in part provided by the other systems described above.

*Resource management systems* are designed to generate information on the patterns of resource usage associated with particular groups of patients, and particular doctors. They will be described in more detail later in this section.

These systems are all available in different forms from a large variety of software and hardware suppliers, and differ greatly in their features and ability to connect to each other. Furthermore NHS units often develop 'home-grown' software for some parts of these systems. The diversity is further amplified by the organizational and purchasing structure of the NHS. The NHS has 14 regions further subdivided into many local district health authorities, each typically encompassing numerous hospital/clinical sites. It is perhaps not surprising that there is a plethora of computer hardware and software, a scarcity of IT skills, problems of constraints on IT budgets, and technical problems of incompatibility between many of the existing systems. In a word, it would not be overstating the case too much to say that a pluralism bordering on anarchy has reigned in the development of IT in the NHS. While there may well have been some benefits from all this experimentation in terms of learning from experience, it is clear that the NHS Management Board felt that some centralizing initiatives were required. It is against this background that centrally directed work – principally by the NHS Information Management Group – has been undertaken to derive a coherent information strategy for the NHS.

In this section we focus on two aspects of the attempts by the NHS Management Board to impose some central strategic thrust on the development of IT and information systems in the NHS. One of these is the NHS

Data Model, which has been developed under the stewardship of IT professionals in the NHS, and the other is the Resource Management Initiative, which is the 'property' of the Financial Director of the NHS. In both of these cases, though in different ways, there are complex interactions between the 'technical' ways in which knowledge is defined and presented, the professional 'ownership' of knowledge, and the exercise of managerial control. We explore a number of possible ramifications which stem from these ongoing developments and see them as important areas for further empirical investigation.

#### *The Data Model*

The NHS Data Model has been developed as part of the NHS Information Strategy. It is meant to define the meaning of and relationships between all items of data necessary to describe the operation and 'business' of a health authority and to meet the information requirements critical to the effective and efficient management of health care. Information strategists in the NHS accepted that only data could be standardized; any idea of creating one big model for all information systems as a whole was not possible but the procedures for the gathering and coding of data could be tackled. The model is meant to be used both by health authorities and hardware/software suppliers with the aim of avoiding mismatches of definitions and systems.

We will examine three aspects of the power which attends the deployment and use of the NHS Data Model: first, the claims made on behalf of data modelling as a means of capturing organizational processes, and the management ramifications which flow from this; second, standardization; and third, the actual process or practice of data modelling, with specific reference to information requirements analysis and the introduction of management by objectives.

Perhaps the first thing that should be said about the information strategy of the NHS, and in particular its development of a data model, is that it bears close affinities with the perspective dubbed as systems rationalism by Kling (1980) – namely, the belief that organizations share common objectives, that these can be clearly defined, and the emphasis on efficiency which, it is held, computers can facilitate.

Indeed, once the aims and objectives of an organisation have been clarified, its functions delineated and the level of quality required of its outputs and outcomes established, the information necessary to support those aims, objectives and functions becomes readily apparent. Thus the proper identification of information requirements is dependent on the existence of clear service objectives and plans (NHS Information Management Group, 1987a, p. 5).

Not all managers are good users of information and some prefer to manage instinctively. Such management styles are not immediately obvious for the firmness of their objectives or for the rigour in monitoring progress towards them . . . A massive cultural change in attitude to information is required . . . all levels need to seek sound data for planning and need to develop objective measures for what they are doing . . . (*Ibid.*, p. 31).

Thus here we have a playing down of expertise based on non-quantitative information and an emphasis on management which is driven by objectives. Managers are to be given a sense of ownership of information and to be in partnership in its further development; in short, they are to become information managers. So, while it seems fairly clear that the NHS Data Model represents part of a strong centrally directed initiative we also find an important emphasis laid on the 'grass roots' cultural changes perceived necessary in the NHS – both among management and other groups.

The NHS Data Model embodies an attempt to define what a health authority is and thereby stakes a claim to being a legitimate reflection of what constitutes its workings. In other words, the national information strategy does not just provide the occasion for the *technical* development of IT systems but is also connected to the *meaning* of the information held on computers within particular sites, on what is included and what is excluded: the internal content of IT systems is shaped by the view from the centre.

Much of the data will be processed and stored in computers of different types at different locations. If these data bases are to be linked and associated to meet information needs, the data must be encapsulated within a model which defines their relationships and meaning. Such a data model defines the *facts of importance* to people who work in an organisation. It can therefore be used to determine the data they need to do their work, and provides a powerful means for ensuring that people working in different disciplines *share a common view of the authority and of the data which it owns* (*Ibid.*, p. 17; emphasis added).

And again:

A data model provides a picture of what we know about our world – in our case about the NHS. It ties down the meanings of the words and numbers we use for planning, managing and monitoring the NHS. . . . Data modelling provides a language which enables people to avoid misunderstandings and mistakes. . . . This will not only help two people who are looking at one subject, such as manpower, but also people who are looking at work in a health authority from different angles, such as medical and financial. A data model can help them to get at the underlying essence of things, however different these things may appear (NHS Information Management Group, 1987b).

Though it is acknowledged that each health authority may have its own uniqueness or specificity – particular wards or procedures may vary between different health authorities – it is argued that they share an extensive common core and a model of this is provided by the NHS Data Model. Thus, the NHS Data Model is claimed to be independent of particular health authorities and is believed that it will be immune to any future reorganizations within the NHS – such as the current development of an internal market. Instead, it is focused on the functions and the 'business' of hospitals; data is related to physical things or activities and the model has a reusable core: '[d]esigns

based on the essence of things will survive well through a period of change' (NHS Information Management Group, 1987b).

Implicit in such claims is the idea that data modelling provides a neutral medium for representing the world, in this case an NHS organization such as a hospital. In the philosophy of science the search for such a neutral observation language fell into disrepute some time ago (Lakatos and Musgrave, 1970) but leaving aside its dubious philosophical basis, what is interesting about such claims for our purposes is that they represent an exercise of power.

It is important to stress that what we observe here is not a mere case of computer technologists seeking to exercise power over NHS managers in some mechanical fashion (*qua* Markus and Bjørn-Andersen, 1987); the belief in the efficacy of data modelling derives from the discipline of computer science and the creators and exponents of the NHS Data Model are subjects of this disciplinary power as much as those who they seek to convert.

The generation of such a model should not be seen only as part of the information strategy process, nor carried out as a backroom activity by specially commissioned modelling 'experts'. . . . It is only by involving senior managers in . . . [the] process of analysis that a firm sense of ownership and commitment will be established (NHS Information Management Group, 1989).

This disciplinary power not only encompasses data modelling but also a systems rationalist view of organizations: the other side of the coin depicting the power of data modelling is the unitary view of organizations and the injunction for parties to subordinate any particular goals and objectives to those of the organization 'as a whole'. And sitting alongside this view of organizations is a distinctive picture of management. The exercise of this power should not be read in purely negative terms for though it represents a specific view of organizational reality and how it should be managed, it also bears the hallmark of empowerment. That is, it enables or opens up a space for action.

A second aspect of power pertaining to the NHS Data Model is that of standardization. It seems reasonable to regard the model as a significant attempt to increase the degree of standardization of data representations of hospitals and Health Authorities.<sup>[8]</sup> Moreover, all the hospital units which embark on the implementation of the Resource Management Initiative (see below) are required to use the model as part of the 'common basic specification' for that process (NHS Management Board, 1989). Such standardizations of data representations are of some importance to Health Authorities, both in terms of internal functioning and external relationships: they pave the way for hospitals to make comparisons between themselves (decentralization); or, for Regions or the Department of Health to compare one hospital with another (centralization). Further, in terms of the theoretical discussion of the first part of this article we can see the NHS Data Model as promoting a particular *image* of the organization which serves to underpin and provide a framework of meaning within which organization members might regulate their own behaviour. The NHS Data Model emphasizes what a hospital unit

is, it emphasizes the similarities between hospitals for purposes of comparison; and at the same time this de-emphasizes differences or particularities. It also raises consciousness about a particular way of managing – namely, management by objectives. This brings us to the third aspect of power which we want to discuss in relation to the data model.

To illuminate the third aspect of power attendant upon the use of the NHS Data Model it is necessary to say a little more about how it has been used by management and other staff in hospital units. The model defines a number of discrete entities or functions, such as an outpatient 'service point', each of which has to have a set of local management objectives for improving the effectiveness and efficiency of that function (NHS Information Management Group, 1989). To meet these objectives requires a local information requirements analysis and once this is carried out the subsequent information needs provide for the extension of the data model; or, in other words, its customization and application to the context of a particular hospital unit. The activities involved here have two interesting features as far as our argument is concerned. First, power is exercised on any occasion when arguments ensue over the setting of aims and objectives for each of the functions specified in the data model: different individuals or groups will attempt to persuade others as to what these should be and to do so will mobilize various resources (*e.g.* information). Secondly, and more subtly, the fact that aims and objectives (and therefore information requirements) are eventually set is itself an exercise of power; it constitutes the reconceptualization of hospital management and defines how new entrants to management (*e.g.* nurse managers, or doctor managers *etc.*) should see both management and health care. Thus the NHS Data Model is not just an abstract entity, or a set of definitions, but very much represents a particular form of management process. As far as the centralization/decentralization issue is concerned, we can see that the imposition of management by objectives represents a centralized move; but the filling out or customization of the NHS Data Model in specific locations represents a decentralized activity.

It is therefore clear that any notion that the widespread introduction of computerized information systems in the NHS represents a simple centralization of power does not hold water. In fact there is a tension between two dimensions of the project of introducing such systems. The pressure to standardize around particular hardware, software, and data definitions does offer potential for increased power at the centre (*i.e.* the NHS Management Board) as a result of increased transparency in the organization. But there is also a recognition of and indeed insistence on cultural change at the grass roots, and an associated notion of the users of the systems as having some ownership and, implicitly, autonomy in the way they use information systems. The effects of the information systems on the management practices of particular units are therefore under-determined by the intentions of the powerful groups shaping the systems at the centre of the organization. The centre might seek to control the development of IT through its information strategies but it cannot directly control the organizational cultures within the regions or within particular hospitals.

We can also cite a further feature of the situation which contributes toward

uncertainty. Namely, we should not lose sight of the fact that there has been a growing influx of IT specialists from outside the NHS, experts whose relatively scarce skills are increasingly in demand. Indeed, though the IT strategy of the NHS is being forged at the behest of those at the top, the people involved in the day-to-day work have their own backgrounds, bodies of expert knowledge and professional allegiances. For example, we find that a number of management consultancy firms are intimately connected with the development of IT in the NHS: it is these organizations who sell themselves as IT specialists, tend to reinforce the assumptions of systems rationalism, and who bring with them various methodologies for implementation and project evaluation. In short, the development of IT brings significant *new players* into the life of an organization.

Of course it is worth pointing out that the NHS central management have attempted to intervene in the culture and style of management at a local level through routes other than information systems, for example, through the provision of incentives, short-term contracts, individual performance review, and bonus payments. Indeed such moves can be seen as consistent with broader cultural shifts which emphasize individualism and the enterprise culture, and promote market institutions as superior to bureaucracies. These cultural shifts are interacting with the changes in the prominence and complexity of information systems to produce new forms of financial self-regulation at the local level of hospitals. This brings us to our second example.

#### *Resource Management*

The second example we develop here involves the Resource Management Initiative, formerly known as Management Budgeting, which originated from the Griffiths report on the NHS (DHSS, 1983). In essence its intention is to develop procedures which relate information about volumes of work performed to information about the costs of that work at the level of the individual hospital consultant. Substantial development projects in the Resource Management field were funded from the late 1980s at six national pilot sites but there were also a number of local initiatives which grew up in anticipation of the fact that Resource Management would eventually be widely diffused throughout the NHS. The implementation of the more radical reform proposals contained in the 1989 White Paper has accelerated the 'roll-out' of Resource Management, which is now proceeding with some haste. All District Health Authorities are now either embarked, or due to embark on Resource Management in the near future.

The essence of the Resource Management experiments is summed up in a phrase from the Griffiths report which states that 'the doctors are the natural managers'. The argument is that it is doctors' decisions which result in resources being committed, but they do not have formal responsibility, nor are they accountable for those resources. This is what the NHS Management Board wishes to change. Doctors then, are seen as being responsible for much of hospital expenditure but at the same time are subject to little formal management control. Traditions of clinical freedom dictate that it is doctors who decide on treatment regimes, and thus the resources (drugs, surgery, diagnostic tests, nursing staff, bed occupancy *etc.*) consumed in treating

patients. Given this degree of freedom in the relationship between medical practice and financial budgets, the idea behind Resource Management is rooted in the belief that the provision of appropriate information to medical staff will influence their behaviour: if doctors are informed that, for a given medical condition, treatment protocol A costs £X and protocol B costs £Y then (it is alleged) they can decide more rationally which mix of treatments to carry out within an overall budget set at £Z. In other words, it is assumed that the provision of information (which is presumed to be objective) on resource usage will lead to more efficient and therefore more 'responsible' medical practice.

There is some uncertainty and variety of practice on the question of how to establish the connection between this management information and the actual practices of doctors. In the original Griffiths report the expectation was that doctors would indeed be given budgets in which a planned volume of work and a related cash budget would be allocated to a doctor at the beginning of the year. A doctor, or a group of doctors, would be provided with regular information about actual work done and cash spent and would be responsible for adjustments in practice to ensure compliance with the budget. This is clearly a radical change in the organizational position of doctors *vis-à-vis* the other parts of the formal management structure and represents a renegotiation of the received boundaries between medicine and management. It encourages doctors to internalize more thoroughly certain norms and values concerning efficiency and to regulate their own behaviour in accordance with those norms. It is interesting to speculate how far this approach might succeed, given the prior existence of a strong set of norms and values concerning clinical freedom within the medical profession. If a successful 'colonization' of the professional value structure and knowledge base were to be accomplished by the ideas associated with resource management, then it would certainly be possible to say that medical practice had been significantly changed. But it is also important to make clear that such a change would not simply be the result of the 'addition' or 'grafting-on' of knowledge and values concerning efficiency *etc.* to the pre-existing knowledge and values associated with clinical freedom. Rather it would be more accurate to see the notion of clinical freedom itself as being subject to renegotiation, with complex results.

An example of this scope for renegotiation can be seen in the dialogues which have ensued over how to code and analyse information about patient illness episodes in the information systems. There has been a strong impetus, especially present in the early stages of the Resource Management programme, to use an American coding and analysis system called Diagnostic Related Groups. These 'DRGs' are statistically generated categories which group together patients whose illness episodes have consumed approximately similar amounts of money, and whose actual disease states are the same, or at least medically related. However, UK doctors found much to disagree with in these DRG categories, and, partly as a result of this, they alighted on an alternative coding system called 'Read Codes' developed by a UK doctor of that name.<sup>[9]</sup> What is important here is not principally the details of the differences between the codes, although they are interesting, but that the doctors, whilst challenging the particular coding system first suggested, did

not challenge the need for some sort of coding. On the contrary they endorsed their own preferred scheme. In so doing they moved further within the broad framework of associated management ideas which are part of the Resource Management programme. Thus they were active participants in a renegotiation of the knowledge base which supports and informs clinical freedom.

We can offer a second example of the changes in doctors' understandings and behaviour which may occur as a result of the design and use of the information systems. This example involves the creation of 'care profiles'. These are predetermined standardized packages of tests and drug therapies, different for any specified diagnosis and set of circumstances, which are laid down by consultants as being the appropriate course of action to follow when a patient presents with that diagnosis. These care profiles are recorded in the software in Resource Management systems and used as a basis for collection of data on numbers of patients, to observe patterns and variances in resource usage. In one system they are even available via menus on a computer screen for a junior hospital doctor to order, thus ensuring that she/he has acted in accordance with the predetermined requirements of the consultant doctor who is their immediate superior.

The control implications of this arrangement are interesting. The consultant is exercising self-control within a view of clinical freedom which has an integral norm of efficiency. Furthermore she/he is directly controlling a subordinate according to that norm, in a situation of training and assessment. The subordinate is invited to understand and internalize these practices in their entirety as examples of clinical freedom. But it would be wrong to interpret this development as merely an increase in the constraints on junior doctors. It was pointed out in the first section of the article that when individuals submit to standards to regulate their behaviour they are also empowered in the sense that a legitimate space for action is opened up for them. In this case it can be argued that the junior doctors might learn existing medical practice more quickly, and take more patient responsibility as a result of the use of care profiles. Furthermore they may even be able to behave more creatively and develop new medical insights as a result of the more explicit informational structuring of their medical practice. Thus, since 'self-control' on matters of efficiency is still control within an 'open' framework of medical practice, the dynamic set in motion by its introduction is not easily predictable. It certainly cannot be assumed to be purely constraining in the sense associated with traditional notions of direct managerial control.

Nevertheless, as the Resource Management Initiative has progressed, signs have developed that some hospitals are restructuring their lines of managerial control to achieve 'tighter' surveillance of medical practice on the back of the Resource Management information systems. In particular, the organizational model of 'Clinical Directorates' appears to be slowly gaining ground (Fitzgerald, 1991). In this model, which originated in Guy's Hospital London, major medical groupings such as surgery, orthopaedics, geriatric medicine *etc.*, are in effect constituted as 'departments' of the hospital, with budgets, workloads, and clear boundaries. Each directorate has a management structure which typically consists of a senior consultant doctor as Director, supported by a 'business manager' and a senior nurse. This divisionalization

process is seen as both an effective way to involve senior doctors more directly in management, and as creating natural decision-making units which can act on the basis of the information on numbers and costs of treatment episodes which is generated by the Resource Management information systems.

Whilst some sites implementing Resource Management are adopting this general 'medical self-control' thrust, a less radical approach is discernible in several of the remaining sites. This less radical approach involves maintaining budgetary responsibilities within the management hierarchy rather than in the medical hierarchy, but using the management information systems to generate information which is designed to 'influence' the behaviour of the doctors through discussion and debate in various formal and informal arenas. But whatever the particular form of the strategy being pursued the common thread is that information systems and the understandings of reality they promote are seen as a linchpin of Resource Management activities.

In parallel to the analysis of the NHS Data Model offered above, the Resource Management Initiative can be seen to involve a centrally directed intervention in the culture (which is construed in instrumental terms) and therefore the practices of doctors. While the upshot of this planned intervention cannot be predicted it has the potential to lead to a renegotiation of the understanding of managerial and medical practices. What we can observe is a convergence or, more correctly, a clash of discourses; a conflict between different ways of thinking and speaking about medical and management practice. Thus the conventional conceptions of patients and treatments are being challenged by the introduction of concepts from business – for example, terms such as efficiency, effectiveness, resources *etc.*

Clearly experimentation rather than standardization characterizes the stage of development of these systems at present. The resolution of these ambiguities and choices is not merely a technical matter however. The key factor which appears to be influencing the outcome is the uncertainty within the medical profession itself as to how far it should move in adjusting its values and practices (and ultimately, therefore the culture of medicine) in a direction which accommodates 'managerial' aspects. Since the publication of the 1989 White Paper which places a strong emphasis on internal markets and trading of clinical services between districts, this issue has been brought sharply into focus in the medical profession. It would be wrong, of course, to paint a black-and-white picture of doctors being completely unconcerned about efficiency and managers struggling to introduce these ideas *ab initio*. In fact doctors generally believe themselves to be already practising medicine very efficiently, not least because of their perception of a continued shortage of resources which prevents them from being profligate. Nevertheless they are forced to concede that they cannot *prove* their efficiency in the terms demanded by the proponents of Resource Management. A significant proportion of doctors are therefore prepared to accept that the systems may reveal new evidence and arguments concerning efficiency in particular areas of medical practice.

One of us has argued elsewhere (Coombs, 1987), in the context of the Swedish Health System, that there is some reason to expect the medical profession to at least *consider* the possibility of annexing such management

procedures and incorporating them into a revised definition of medical practice, thus overturning some of the shibboleths of clinical freedom. The recent actions of some doctors in the NHS could be seen as indicating contradictory views. For example, doctors in the six pilot sites for Resource Management declared themselves to be opposed to their hospitals' 'opting out' under the terms of the White Paper, but have at the same time endorsed their commitment to the Resource Management experiments.

In summary then, the nexus of this specific example of the use of information in NHS management is an uncertain balance point between a degree of attempted direct control over the financial aspects of doctors clinical practice, and a degree of *self-control* which they can be 'helped' to exercise through the new management information systems. It seems to us that there are two sources of uncertainty in the minds of the designers of the new systems which contribute to this plurality of approach. Firstly, managers pursuing Resource Management are very sensitive to the fact that the system will be, and is seen as, a new form of control over doctors; and therefore they are tempted by an indirect strategy which involves less confrontation and appeals to the professional standards of the doctors. This is seen as the less radical approach. Secondly, managers may not be sure of the consequences for themselves if they displace significant legitimated budgetary authority to another group outside the realm of professional management. Indeed, it is possible that doctors with budgets could be catapulted into quite a high level of formal management status in some versions of the more radical approach. As we have seen, this ambiguity is mirrored on the medical side of the fence, with some doctors appearing quite eager to embrace the new responsibilities but with a majority being suspicious.

### *Discussion*

The view that information systems, even in control applications within organizations, are either centralizing or decentralizing in character has been shown to be inadequate. By interpreting control as an instance of power relations, rather than as a property or a thing, we have been led to examine the relationship between the creation of information systems and changes in the practices and professional knowledges of groups of actors. This has been illustrated with observations on two current examples of the development of information systems in the NHS.

The construction of the NHS Data Model, which is part and parcel of a national information strategy, and the requirement for its use by health authorities, is a centrally directed exercise of power. However, the exercise of power which the deployment of the model represents is more subtle and intricate than a simple 'sovereign' view of power will allow. First, the model carries with it a distinctive view of how the information problem of the NHS is to be defined and tackled – a view which lays emphasis on data modelling.<sup>[10]</sup> The model upholds a unitary view of organizations and is the vehicle of powerful claims as to how different perspectives among organizational members can be represented and unified. In particular, it is claimed that data modelling offers a neutral medium for representing reality. Second, the NHS Data Model is part of a significant move toward data standardization

throughout the NHS and this has important implications for management and medicine. Third, the model is also part of a management process, one which is centred on management by objectives and sees information as a central key to the proper management of the 'business' of NHS hospitals.

To the extent that it brings coherence, and indeed makes possible the development of IT systems in the NHS, the national information strategy paves the way for Resource Management and thereby facilitates the central exercise of power and control in relation to the resources used by health authorities. For with the IT systems in place health authorities can be more easily, if not more justly or objectively, brought to account and compared one with the other. However, in contrast to the systems rationalism of the perspective implied in the NHS information strategy, it is clear that it does not amount to a simple centralization of power. For example, though the information strategy might seem to strengthen the hand of managers unilaterally *vis-à-vis* doctors we find that the sword is double-edged. For just as a manager might seek to influence doctors' behaviour through information supplied from Resource Management systems, so too doctors might demand *more* resources on the basis of their efficiency as constructed and made visible by those very same systems. Indeed doctors may increase their propensity to occupy managerial roles as a result of some experiments with such systems. Thus, in contrast to the systems/structural approach to computers and power, in the context of the relationship between management and medicine where doctors have conventionally been cast as the dominant voice, the new information systems do not simply strengthen the hand of already dominant players.

An important deduction follows from this discussion: we have argued that projects like the NHS Data Model and Resource Management have some features which resemble the 'systems rationalist' approach, but that these are in tension with others which are more akin to attempting to change the values of doctors, nurses, and managers, such that they will shape the information systems for themselves but act in ways which are consistent with the desires of the central management group. The openness and under-determination of this situation, coupled with the emergence of new concepts with which actors view the organization (such as costs of particular treatment profiles, management by objectives *etc.*) may, to use the terminology of Kling, give rise to *new* 'organizational games'. For example, Notman *et al.* (1987) discuss several instances in which physicians adopted different strategies to 'manipulate and work around' rules specified in connection with treatment and cost containment: 'A senior resident reported, for instance, that it is common practice to keep children with diffuse symptoms on oxygen to permit continued hospitalization for the real purpose of observation' (Notman *et al.*, 1987, p. 1265).

In this article we have tried to show that two instances of the use of information technology in the NHS – the NHS Data Model and Resource Management – can be most fruitfully understood in terms of a perspective which focuses on the capacity of information systems to alter – in a particular direction – NHS personnel's *understanding* of the NHS units in which they work, and to promote self-disciplining behaviour consistent with that under-

standing. This shift in understanding, if it proceeds, will eventually be reflected in a change in the bodies of knowledge of the various professional groups in the NHS, as well as in a change in the more diffuse 'culture' of the organization as a whole. It is certainly true that the origins of this attempted shift in understanding lie at the centre of the NHS as an organization, and spring from a desire to alter the hierarchy of goals of the NHS and the relative positions of different groups of 'stakeholders'. However, we have seen that a 'sovereign' view of power is simply not applicable to an organization as large and complex as the NHS; we cannot reduce the changes in the boundaries between management and medicine which are currently taking shape to the intentions of those at the centre. Neither does a structural view of power assist our understanding since we have shown that IT systems may well alter existing influence structures rather than reinforce them. Furthermore, the behavioural approach towards computers and organizational power derived from Lukes also founders in this context because of its dependence on a problematic mechanical conception of the 'effects' which are considered to attend any exercise of power. For example, the point to be made about data modelling is not that it prevents NHS staff from seeing their 'real' interests or reality as it 'really' is, but that it makes available only one particular view. The exponents *and* those exhorted to adopt data modelling are the subjects of the disciplinary power of which it is a part. The latter empowers both – not generally but in a specific direction.

We have argued that deliberate interventions in the culture and therefore the understandings and practices of an organization unleash a dynamic which is inherently uncertain in its outcomes. In the future the situation may indeed arise in which, for example, doctors regulate their clinical decisions with a more acute sense of resource efficiency, which would be in general conformity with the hopes of central management. But it will still be the doctors themselves conducting that regulation, not managers pulling strings from a distance. This scenario cannot be sensibly viewed as a change in the 'location' of power as between the centre and the periphery, according to some implied metric; but only as a qualitative change in the character of the power relationships between the relevant parties. In this case a centralization/decentralization perspective on the effects of information system development on power relationships simply does not help. Moreover, as the IT strategy of the NHS evolves we will find that the range of information systems described earlier will become increasingly interconnected – a prospect which is already underway at a selected number of sites. This is likely to promote even more interesting changes in the boundaries between the responsibilities and knowledge of different professional groups in the NHS; not just between management and doctors, but also between nursing staff and management, and nursing staff and doctors *etc.* This represents an interesting area for future research and will require an approach to computers and power which departs from mechanical and possessive views of power and adopts the sort of relational approach suggested here.

## NOTES

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- [1] As a US newsreel report on the ENIAC machine stated in the late 1940s, while this first computer was being used to tackle military problems such as shell trajectories, it might soon be used to analyse citizens' tax returns ('The Dream Machine', BBC, 17 November 1991).
- [2] Indeed, if one considers the more extensive literature on power – rather than that which is more narrowly focused on computers and power – one finds much more sophisticated and critical work. For instance, Latour (1986) even goes so far as to suggest that the notion of power be abandoned as part of a reorientation of the project of the social sciences.
- [3] In the sense of organizational structures.
- [4] Wiener warned that machines were akin to slave labour and that any worker who competed with a machine must inevitably accept the economic conditions of slave labour. Instead of a drive first and foremost for profits, Wiener argued that the (then) new computer technology should be used for human benefit and should not be worshipped as a brazen calf.
- [5] For example, the technical exercise of power is seen to influence the content of particular information systems; structural power relates to the position of information systems professionals within organizational hierarchies; the conceptual exercise of power holds influence over the goals of an information system; and the symbolic aspects of power exercise might refer to the ways in which users see their own work in relation to information systems.
- [6] For example, accountancy in discussions of the concept of an economic coal mine, systems theory in family studies, or indeed, the way in which management and medicine are coming to be seen to overlap.
- [7] Elsewhere it has been argued that the use of computer simulation models in the late 1960s for the management and control of urban systems similarly provided a sense of meaning and coherence in the face of seemingly intractable urban problems (Bloomfield, 1986).
- [8] This is not something unique to the Data Model however. In the second half of the 1980s all Health Authorities were subject to the standardization of data reporting developed by the Körner Committee (DHSS, 1982).
- [9] For a discussion of the debate over READ and DRG codes see Bloomfield, 1991.
- [10] A decade ago we would have expected the emphasis to be placed on simulation modelling; this was a time when various assorted groups of academics, computer people and other self-proclaimed organizational consultants sought to solve organizational problems through the construction of large computer simulation models.

## REFERENCES

- BARIEFF, M. L. and GALBRAITH, J. R. (1978). 'Interorganizational power considerations for designing information systems'. *Accounting, Organizations and Society*, **3**, 1, 15–27.
- BEER, S. (1971). 'The liberty machine'. *Futures*, December, 338–48.
- BLOOMFIELD, B. P. (1986). *Modelling the World: the Social Constructions of Systems Analysts*. Oxford: Blackwell.

- BLOOMFIELD, B. P. (1991). 'The role of information systems in the NHS: action at a distance and the fetish of calculation'. *Social Studies of Science*, **21**, 4, 701-34.
- BOGUSLAW, R. (1965). *The New Utopians*. Englewood Cliffs, N.J.: Prentice-Hall.
- BOLAND, R. (1986). 'Fantasies of information'. *Advances in Public Interest Accounting*, **1**, 49-65.
- BREWER, G. (1973). *Politicians, Bureaucrats and the Consultant*. New York: Basic Books.
- CLEGG, S. R. (1989). *Frameworks of Power*. London: Sage.
- COOMBS, R. W. (1987). 'Accounting for the control of doctors: management information systems in hospitals'. *Accounting, Organizations and Society*, **12**, 4, 389-404.
- COOPER, D. J. and ROBSON, K. (1989). 'Power and management control'. In Chua, W. F., Lowe, E. A. and Puxty, A. (Eds.), *Critical Perspectives in Management Control*. New York, London: Macmillan.
- DHSS (1982). *DHSS Steering Group on Health Services Information Reports to the Secretary of State*. London: HMSO.
- DHSS (1983). *Report of the NHS Management Inquiry*. London: HMSO.
- DoH (1989). *Working for Patients*. London: HMSO.
- DUTTON, W. and KRAEMER, K. (1980). 'Automation bias: computers and local government budgeting'. *Society*, **17**, 2, 36-41.
- ELIAS, N. (1978). *The Civilizing Process, Volume I*. Oxford: Blackwell.
- FELDMAN, M. and MARCH, J. G. (1981). 'Information in organizations as signal and symbol'. *Administrative Science Quarterly*, **26**, 171-86.
- FITZGERALD, L. (1991). 'Made to measure'. *The Health Service Journal*, 31 October, 24-5.
- FLECK, J. (1984). 'Artificial intelligence and industrial robots: an automatic end for utopian thought?'. In Mendelsohn, E. and Nowotny, H. (Eds.), *Nineteen Eighty-Four: Science Between Utopia and Dystopia*, Sociology of Sciences Yearbook Vol. VIII. Dordrecht: Reidel, 189-231.
- FOUCAULT, M. (1977). *Discipline and Punish: the Birth of the Prison*. London: Allen Lane.
- FOUCAULT, M. (1980). In C. Gordon (Ed.), *Power/Knowledge*. Brighton: Harvester.
- GALBRAITH, J. K. (1968). *The New Industrial State*. New York: New American Library.
- GOTLIEB, C. C. and BORODIN, A. (1973). *Social Issues in Computing*. London: Academic Press.
- GREENBERGER, M., CRENSON, M. and CRISSEY, B. (1976). *Models in the Policy Process*. New York: Sage.
- HEYDEBRAND, W. (1985). 'Technarchy and neo-corporatism: toward a theory of organizational change under advanced capitalism and early state socialism'. *Current Perspectives in Social Theory*, **6**, 71-128.
- HOPWOOD, A. (1985). 'Accounting and the domain of the public: some observations on current developments'. The Price Waterhouse Public Lecture on Accounting, University of Leeds.
- HOY, D. (Ed.) (1986). *Foucault: A Critical Reader*. Oxford: Blackwell.
- KLING, R. (1980). 'Social analyses of computing: theoretical perspectives in recent empirical research'. *ACM Computing Surveys*, **12**, 1, 61-110.
- KLING, R. (1991). 'Computerization and social transformation'. *Science, Technology, and Human Values*, **16**, 3, 342-67.
- KNIGHTS, D. and WILLMOTT, H. (1985). 'Power and identity in theory and practice'. *Sociological Review*, **33**, 22-46.
- LAKATOS, I. and MUSGRAVE, A. (Eds.) (1970). *Criticism and the Growth of Knowledge*. Cambridge: Cambridge University Press.
- LATOUR, B. (1986). 'The powers of association'. In Law, J. (Ed.), *Power, Action and Belief: A New Sociology of Knowledge?* London: Routledge & Kegan Paul.
- LILIENTHAL, R. (1978). *The Rise of Systems Theory: An Ideological Analysis*. New York: Wiley.
- LUKES, S. (1974). *Power: A Radical View*. London: Macmillan.

- MARCUSE, H. (1978, orig. 1941). 'Some social implications of modern technology'. In Arato, A. and Gebhardt, E. (Eds.), *The Essential Frankfurt School Reader*. Oxford: Blackwell, 138–62, 180–2.
- MARKUS, M. L. and BJØRN-ANDERSEN, N. (1987). 'Power over users: its exercise by system professionals'. *Communications of the ACM*, **30**, 6, 498–504.
- MARKUS, M. L. and PFEFFER, J. (1983). 'Power and the design and implementation of accounting and control systems'. *Accounting, Organizations and Society*, **8**, 2/3, 205–18.
- MILLER, P. and O'LEARY, T. (1987). 'Accounting and the construction of the governable person'. *Accounting, Organizations and Society*, **12**, 3, 235–65.
- MOSCO, V. (1989). *The Pay-Per Society*. Toronto: Garamond Press.
- NAISBITT, I. (1982). *MegaTrends*. New York: Warner.
- NHS INFORMATION MANAGEMENT GROUP (1987a). *Guidance for Information Strategies*.
- NHS INFORMATION MANAGEMENT GROUP (1987b). *Newsletter*, No. 1, October.
- NHS INFORMATION MANAGEMENT GROUP (1989). *Defining Information Requirements*.
- NHS MANAGEMENT BOARD (1989). *Case Mix Management System Core Specification*.
- NOTMAN, M., HOWE, K. R., RITTENBERG, W., BRIDGHAM, R., HOLMES, M. M. and ROVNER, D. R. (1987). 'Social policy and professional self-interest: physician responses to DRGs'. *Social Science and Medicine*, **25**, 12, 1259–67.
- ORLIKOWSKI, W. (1988). 'Computer technology in organizations: some critical notes'. In Knights, D. and Willmott, H. (Eds.), *New Technology and the Labour Process*. London: Macmillan, 20–49.
- PETTIGREW, A. M. (1973). *The Politics of Organizational Decision-Making*. London: Tavistock.
- ROBEY, D. (1981). 'Computer information systems and organization structure'. *Communications of the ACM*, **26**, 10, 679–87.
- ROSZAK, T. (1988). *The Cult of Information*. London: Paladin.
- SCRIVENS, E. (1987). 'The information needs of district general managers in the English National Health Service'. *International Journal of Information Management*, **7**, 147–57.
- SHANNON, C. E. and WEAVER, W. (1962, orig. 1959). *The Mathematical Theory of Communication*. Urbana, Ill.: University of Illinois.
- DE SOLLA POOL, I. (1983). *Technologies of Freedom*. Harvard: University Press.
- SWANSON, E. B. (1983). 'Rationality and politics in information system design and implementation: a juxtaposition of two views'. *Accounting, Organizations and Society*, **8**, 2/3, 219–21.
- TOFFLER, A. (1980). *The Third Wave*. New York: Morrow.
- WEIZENBAUM, J. (1976). *Computer Power and Human Reason*. San Francisco: Freeman.
- WIENER, N. (1950). *The Human Use of Human Beings*. New York: Houghton Mifflin.
- WYNNE, B. and OTWAY, H. J. (1982). 'Information technology, power and managers'. In Bjørn-Andersen, N. et al. (Eds.), *Information Society: For Richer, For Poorer*. Amsterdam: North-Holland.