

Knowledge-Intensive Systems in the Social Service Agency: Anticipated Impacts on the Organisation

William J. Ferns, Jr¹ and Abbe Mowshowitz²

¹ *Department of Statistics/Computer Information Systems, Baruch College of the City University of New York, New York, USA*

² *Department of Social Science Informatics, University of Amsterdam, The Netherlands*

Abstract: Shrinking resources and the increasing complexity of clinical decisions are stimulating research in knowledge-intensive computer applications for the delivery of social services. The expected benefits of knowledge-intensive applications such as expert systems include improvement in both the quality and the consistency of service delivery, augmentation of institutional memory, and reduced labour costs through greater reliance on paraprofessionals. This paper analyses the likely impacts of knowledge-intensive systems on social service organisations, drawing on trends in related service-delivery fields, and on known impacts of computer applications in organisations. A structural change may be anticipated: decision making and planning functions will shift increasingly from social service professionals to administrators.

Keywords: Bureaucratic rationalism; Expert systems; Knowledge-intensive systems; Organisational impact; Social services

1. Introduction

Shrinking resources and the increasing complexity of clinical decisions have led to growing interest and research in knowledge-intensive computer applications for the delivery of social services in the United States. A noteworthy example of such applications is the expert system. The attractiveness of expert systems in the delivery of social services stems from both economic and operational considerations. Social service agencies are operating in an environment characterised by growing demand and tight budgets. In an effort to shrink the gap between demand and resources, agencies are using more paraprofessional staff to provide direct services. Additionally, increasing formalisation and standardisation of functions within social service agencies have created a fundamental knowledge-base for the development of knowledge-intensive systems.

The use of knowledge-intensive systems in social services holds out the promise of improvements in both the quality and consistency of service delivery. Moreover, these systems have the capacity to augment institutional memory, and to "coach" paraprofessionals. This coaching function is important because it enables paraprofessionals to perform tasks that were once reserved exclusively for professional social workers. The need to meet societal demands for service, along with the potential benefits of knowledge-intensive systems, has sparked the development of a number of specialised clinical and service delivery applications. Some of these systems are positioned as knowledge amplifiers, increasing the knowledge and decision making abilities of paraprofessional users (Ferns, in press), while others are replacement systems which remove humans from the case-by-case decision making process (Petrie, 1988).

Despite the interest in the technology, operational expert systems are relatively rare in most settings (Byrd, 1992), and the social service arena is no exception. The reasons for this are complex. First, the low level of information technology in use by small agencies makes knowledge-intensive systems seem exotic (Taber and DiBello, 1990; Pick, 1991, 1992); secondly, many mental health professionals resist the introduction of such systems (Spiesel, 1978; Murphy and Pardeck, 1988); and finally, the most natural areas of application tasks requiring high level of reasoning or training – appear to be the least receptive to the use of knowledge-intensive systems (Cullen and Bryman, 1988). Also there is a misconception that the social service domain's knowledge base is ill formed, vague and not susceptible to computerisation. In actuality, although much of the knowledge base is qualitative, it has gone through considerable formalisation over the past several decades.

Increased deployment of knowledge-intensive systems is likely because of decreasing hardware costs of computing, increasing interest on the part of social service professionals in expert systems (Schoech *et al.*, 1989), and improved methods of design and implementation of knowledge-intensive systems. As more production level expert systems come into operation, they will have an impact not only on the actual delivery of services, but on the organisational structure of the social services agencies in which they are used. To date, this last issue has received little attention.

Because of the slow diffusion on knowledge-intensive systems in the social services, it is difficult to obtain direct, empirical evidence of their impact on the organisation of social service agencies. The research reported here compensates for this scarcity by extrapolating from two types of experience:

1. The use of expert systems wherever they may be found
2. The organisational changes induced by computer use in public administration

Although social service agencies do have unique features, they have enough in common with other types of organisations to make extrapolation useful. Moreover, computer applications may be distinguished not so much by the specific application area, but according to the type of human activity they replace or support – in other words, by their respective positions in a continuum of tasks ranging from routine and repetitive to unique and creative (Simon, 1965).

To anticipate the organisational effects of expert systems on social service agencies, this analysis refers to two bodies of experience, namely

- organisational changes occurring within the social work arena
- the organisational impact of information systems in the public administration sector

In extrapolating from and interpreting these bodies of experience, we make use of a model, developed by Alford (1972, 1975) of “structural interests” in the health care industry.

Our analysis shows that knowledge-intensive systems are likely to produce several short- and long-term structural changes in the social service organisation. These changes include an increase in the paraprofessional’s service responsibilities, the ascendancy of the professional manager in the agency and the transformation of the professional clinician into a consultant. System designers and users should anticipate these changes to forestall any unintended or undesirable consequences stemming from the design and deployment of knowledge-intensive systems. It may not be possible (or desirable) to avoid these transformations altogether, but there remains considerable choice within these directions. System designers, professionals and managers have options in influencing the quality of service-provision and staff relations in the social service agency.

2. Expert Systems

The expert system is a specific type of knowledge-intensive system. Expert systems are computer programs which attempt to emulate the judgement and decision-making of human experts, often in the absence or unavailability of those experts. The problem area, or *domain*, of an expert systems tends to be narrow, focusing on one problem area. Waterman (1986) outlines several aspects of expert systems which set them apart from other types of computer systems:

- the knowledge should be explicit and accessible;
- an expert system contains high-level expertise;
- an expert system provides an institutional memory;
- an expert system provides a training component through an explanation facility.

Additionally expert systems differ from other knowledge-intensive systems in their ability to handle uncertainty and their use of qualitative factors and heuristic processes (Liberatore and Stylianou, 1993). Not only does the expert system provide support and expertise in the same ways a human expert would, but the process of building the expert system accumulates and codifies knowledge that can be accessed repeatedly when the expert is not available.

Expert systems have been used in several different industries, including banking (Newquist, 1987), mining (Smith, 1984) and manufacturing (Archetti *et al.*, 1992). The main attraction for using expert systems in these areas is their ability to enable human non-experts to perform tasks at a higher level. Some applications, such as finance or production management, require the use of relatively precise quantitative data for decision-making. For applications such as these, other types of knowledge-intensive systems, such as decision-support or modelling systems, may work just as well.

In the social service domain, however, expert systems are more suitable than other types of knowledge-intensive systems. In many tasks of social service delivery, human experts apply well defined rules, rules which can be incorporated in a formal knowledge-based system (Ferns and Riedel, in press). Nonetheless, aspects of a social service knowledge base are qualitative and are not amenable to precise quantification; they are not easily formalisable in the categories of knowledge-intensive systems that rely heavily on quantitative methods. Expert systems can better encompass the qualitative and heuristic aspects of social service tasks.

The domain of assessment of depression serves as an example. There are several validated and reliable tools that assess depression, and these tools make up part of the knowledge base on depression. These tools can provide a qualitative decision about whether a client is depressed or not, and distinguish between broad categories of depression. One such tool is the Depression Scale (CES-D) of the Centre for Epidemiological Studies (Radloff, 1977). The CES-D applies a formalised interviewing and scoring structure to symptoms such as sudden weight change, lethargy, or fearfulness, and uses the presence of these symptoms as indications of depression. These symptoms are self-reported on a four-point scale by the client, providing relatively imprecise input data. Although the data are neither precise nor objective measures, the CES-D can help a clinician ascertain the presence and severity of depression in a client (Bellack and Hersen, 1988). Such formal procedures are amenable to computerisation in expert systems.

2.1. Factors Stimulating Deployment of Expert Systems

Social service organisations are facing two major challenges beyond their control. These are:

- **Increasing need for services:** The increase of social problems such as homelessness (Opinion Research Corporation, 1976; US Health and Human Services, 1987) coupled with newer problems such as AIDS (Centre for Disease Control, 1990; NYC Department of Health, 1992) has created an ever-growing demand for more social services, straining the “social safety net” to the breaking point.
- **Decreasing funding for services:** Many social service agencies face increasing demand with shrinking budgets. Some contributing reasons are the federal government’s withdrawal of financial support during the 1980s (Burghardt and Fabricant, 1991; Patterson, 1986), increasing federal government regulation which puts more financial burdens on state and local social service agencies (Hinds, 1992), and recessionary pressures decreasing state and local revenues.

The pressures of providing increased services at lower costs have forced agencies to investigate alternatives for service delivery. One of the more commonly used alternatives has been the de-skilling of direct service provision (Karger, 1986) and the increased use of lower paid paraprofessionals to perform tasks formerly within the purview of social service professionals. This increasing reliance on paraprofessionals exacerbates other challenges that face the social service agency:

- **Lack of domain skills of direct service staff:** Social service agencies have turned increasingly to the use of paraprofessionals to provide direct services,

sometimes even clinical assistance to clients (Lipsky, 1990; Shyne, 1980; Lieberman, *et al.*, 1988). Front-line staffing typically suffers from a lack of professional training specific to the field and high turnover partially caused by staff “burnout” (Shyne, 1980). Consequently, the workers who provide direct services may not be well trained or experienced (Schuerman and Vogel, 1986).

- **Complexity of decision load:** In the context of social service delivery, the concept of decision load describes the degree of decision-making required to provide adequate services (Caputo, 1988). Typically, social service organisations are multi-service agencies, offering services such as drug treatment, housing, and health care. The decision load of social service workers in these agencies is increasing both in the breadth of the domain knowledge required and in the complexity of the factors involved.
- **Labour-intensive nature of service delivery:** Although different models of service delivery require different staffing levels, staffing is typically the single largest variable in calculating per-diem costs (Ashbaugh and Nerney, 1990) and agencies across the social service sector suffer from understaffing (Stewart and Smith, 1987; Moxley and Buzas, 1989; Ashbaugh and Nerney, 1990; Barton, 1991). In the context of exploding demand for services and severe budgetary constraints, labour intensive staffing requirements are simply affordable.
- **Affective nature of service delivery:** The quality of the relationship between the service provider and the client can be just as important as the accrual services provided. Paraprofessionals are rarely trained in the affective nature of service delivery.
- **Increasing clerical workload:** Regulators and funders have increased their reporting requirements for accountability purposes. This has increased the clerical workload of direct service providers (Hinds, 1992).

Accompanying these pressures has been an increasing rationalisation of service delivery. Rationalisation can be defined as the combination of formalisation, standardisation, and specialisation of function. Formalisation is the codification of knowledge, processes and activities into formal procedures that are used in decision making. Standardisation is the adoption of conventions allowing for the diffusion of those procedures. Implicit in this diffusion is the expectation that these procedures be used. Specialisation permits higher levels of individual expertise and performance within narrower functional responsibilities.

In the social services, rationalisation has been pursued for reasons of quality assurance, the fair distribution of services, cost-effectiveness and greater administrative control (Karger, 1986; Savage, 1987). As in the other industries, the social services have undergone a great deal of specialisation, standards have been adopted, and formal procedures have been established. Formalisation in particular has made service delivery much more of a deductive process. With the development of systematic, rational and identifiable procedures for providing services, expert systems become appropriate application tools (Schuerman and Vogel, 1986).

The Diagnostic and Statistical Manual of Mental Disorders – now in its fourth edition, the DSM-IV – illustrates both formalisation and standardisation in the social service sector (APA, 1994). Developed by the American Psychiatric Association, the DSM series formalises definitions for categorising various mental health disorders

and decision tress for determining diagnoses. Because many public programs and third party insurance payers started to require DSM-III-R (APA, 1980) diagnoses before providing services or payments, the Diagnostic and Statistical Manual has become a de facto standard for diagnostic categorisation throughout the mental health profession (Kutchins and Kirk, 1987).

Specialisation in social service delivery is evident in both the horizontal and vertical organisation of activities. Horizontal specialisation can be seen from the differentiation of social services according to the client groups (e.g. geriatrics, adolescents or substance abusers) served. Vertical specialisation is apparent in the correlation between expertise and discretion, on the one hand, and position in the service agency on the other hand – the more specialised the skill and discretion, the higher the position. This correlation is clear from the task-hierarchy in social services: paraprofessionals perform clerical duties as intake workers; professional social workers function as clinical managers; and psychiatrists or psychologists work as clinical therapists.

Rationalisation aims to tighten the connection between goals and their implementation. It does not distinguish between goals, however. For example, in social service delivery, rationalisation may reduce the discretion of an individual caseworker, increasing the likelihood of efficient and effective compliance with agency policy. But if the rules and guidelines resulting from rationalisation are designed to realise inappropriate goals, the gain in efficiency and effectiveness is of questionable value. Clearly, the rationalisers themselves have stakes and interests which must be examined, for these interests may influence the goals of rationalisation.

2.2. The Promise of Expert Systems in the Social Services

The use of expert systems in service delivery has several anticipated benefits. Expert systems can augment the user's domain knowledge and ability to handle complex decision loads (Waterman, 1986). Agencies may realise some benefit by enhancing the decision-making of paraprofessionals (Ferns, 1992), thus improving the quality and consistency of services. Expert systems have a potential for augmenting the institutional memory of an organisation (Waterman, 1986; Cummings *et al.*, 1988). This feature is helpful, particularly in social service agencies that have fairly inexperienced staff providing direct services and must conform to agency protocols and government regulations.

Additionally, a knowledge-intensive system with a well-developed explanation facility can provide continual reinforcement of training (Clancy, 1983; Mullen and Schuerman, 1990). Paraprofessionals can use a knowledge-intensive system independently to develop and hone their skills further. An assortment of knowledge-intensive systems could provide an agency with the means to train new personnel and upgrade the skills of veteran paraprofessionals in various service tasks.

The use of computerised tools for clinical tasks may also have a positive effect on the client/provider interaction in service delivery. There is telling empirical evidence that patients are more honest in a computerised interview (Slack and Van Cura, 1968; Lucas *et al.*, 1977; Angle *et al.*, 1978); find computerised interviews more interesting and relaxing (Coddington and King, 1972; Greist *et al.*, 1973; Skinner and Allen, 1983); and at times *prefer* computerised interviews to human interviewers

(Slack and Van Cura, 1968; Angle *et al.*, 1978; Porter, 1978; Carr and Ghosh, 1983). These studies span a range of client populations: phobics (Carr and Ghosh, 1983); alcoholics (Lucas *et al.*, 1977); psychiatric hospital patients (Anglet *et al.*, 1978); mothers of children in psychiatric treatment (Coddington and King, 1972); general medical patients (Slack and Van Cura, 1968); and overweight subjects (Porter, 1982). There is little evidence that computer-based intervention will have a negative impact on the effective nature of client/provider interaction.

2.3. Examples of Expert Systems in Service Delivery

Knowledge-intensive systems have been developed to support a variety of services. These systems include child placement (Schuerman and Vogel, 1986; Mullen and Schuerman, 1990), risk assessment of adolescent suicide (Ferns, 1992; in press), and family counselling (Gripton *et al.*, 1986). Typically, few “operational” expert systems are actually used on a working basis (Cullen and Bryman, 1988); this is also true in the social service arena, where few production systems exist (Mullen, 1989; Schuerman, in press). Besides the usual challenges of acquiring complex knowledge and finding ways to best represent that knowledge, developers of expert systems in social service domains have additional obstacles. The “product” of the social service organisation is basically a change in human behaviour or in the circumstances of individuals and families. Such change is difficult to measure. When an expert system’s purpose is to help delivery of this particular “product”, verification of the system’s accuracy is difficult and time-consuming. Relatively few clinical expert systems, including medical systems, have been evaluated in live clinical settings (Lundsgaarde, 1987). Additionally, when human beings are the direct recipients of the expert system’s decisions, there are ethical issues involved as well (Murphy and Pardeck, 1988). But as better evaluation measures are developed, more systems could reach the production level (Ferns, 1992).

2.4. Are Knowledge-Intensive Systems Appropriate for Service Delivery?

There are several arguments against the use of expert systems for clinical applications. Some observers believe that the therapeutic use of computers is demeaning and de-humanising (Weizenbaum, 1976; Spiesel, 1978; Murphy and Pardeck, 1986), although empirical evidence contradicts this position (Slack and Van Cura, 1968; Coddington and King, 1972; Greist *et al.*, 1973; Angle *et al.*, 1978; Porter, 1978; Skinner and Allen, 1983).

This claim that computerised interviewing demeans the client is posed as a moral argument, but it does address the morality of denying help to those who do not have access to or cannot afford the services of mental health professionals.

Some critics of expert systems argue that, by converting the client’s state of mind into the “rational” data format required by a computer, the expert system objectifies the client and creates a computerised model that is not a complete or accurate representation of the client (Murphy and Pardeck, 1986). But extensive collection, coding and classification of symptoms and disorders already existed prior to the introduction of computerised assessment tools. Many structured psychological tests

and the Diagnostic and Statistical Manual of Mental Disorders attempt to classify the client's mental state. If one is to object to classification by computers, one must also object to classification by humans when it is based on essentially the same rules and procedures used by the computer. At the root of this objection is the belief that classification is not value-neutral. According to this view, it is a process through which a particular – and necessarily biased – representation of an individual is constructed (Hacking, 1986). For example, until authorities started the collection, classification and analysis of data on human behaviour in the early nineteenth century, many forms of deviant behaviour were not known, and arguably, did not exist (Hacking, 1986). So, if one rejects computer applications on the grounds of inappropriate objectification, one must also reject structured psychological interviewing and assessment. Such wholesale rejection is tantamount to a call for dismantling the entire mental health profession and industry as practised in the United States.

A less far-reaching objection is that expert systems may make organisations resistant to changing their therapeutic or programmatic procedures (Gripton *et al.*, 1986). Agencies may be unable, or simply unwilling, to invest in revising computerised clinical systems, especially in the light of budgetary constraints and limited resources. This resistance to change may result in clinical systems which are out of step with newer clinical developments, and may also force new clinical developments to fit into older computerised models, instead of the reverse (Gripton *et al.*, 1986). But even in the absence of information technology, an organisation may be resistant to change, and there is no evidence that manual procedures can or will be updated any more consistently.

On the other hand, modifying an expert system, rather than using other means of re-training clinical workers, may provide quicker, more thorough and more consistent diffusion of new clinical methods. This raises the opposite concern that, without proper safeguards, whoever controls the expert system can arbitrarily alter an organisation's procedures. But this is true of information systems in general and applies across sectors, and is not exclusive to knowledge-intensive systems or social service agencies. Barring organisational dysfunction, sound audit and control practices can be used to minimise such abuses.

3. Examination of Structural Change

Many community-based non-profit organisations have under-developed information technology infrastructures (Taber and DiBello, 1990; Pick, 1991, 1992), and limited experience with information systems. These organisations are at a stage of direct substitution, i.e. using information technology to replicate manual processes, rather than to redesign those processes.

Efforts at introducing intelligent systems in social service delivery will likely resemble the earlier efforts of business and government agencies to computerise without changing processes, rather than the more recent efforts to re-engineer in the course of computerisation. In many cases, the impact of the earlier efforts were unanticipated, but still had long-term profound effects on organisational structure. These included centralisation of control and increased coordination of the organisation (Bjorn-Andersen *et al.*, 1986)¹, the shift of power to those segments of the organisation

that “own” the information technology (Kraemer and Dutton, 1982)²; increasing formalisation of tasks for the sake of computerisation (Bjorn-Andersen and Eason, 1980), increasing dependence upon professional administrators and technicians to manage the information technology (Mowshowitz, 1977), and the growth of subgoals that may not be consistent with the mission of the organisation (Bjorn-Andersen and Eason, 1980).

Once knowledge-intensive systems become more integrated in social service organisations, these systems will have their own impact. Because there are very few expert systems currently operational in social service agencies, there are few existing situations in which the organisational impact of such systems can be measured. But similarities in information needs make it possible to compare the impacts of information systems on different types of organisations (Mowshowitz, 1976). Lessons learned in business, health care and public administration can be transferred directly to the problem of computerising social service delivery. Our analysis of organisational impacts covers three broad issues:

1. The movement towards centralisation in social service organisations;
2. Robert Alford’s theory of “structural interests” in the health care industry; and
3. The organisational impact of information systems in the public sector. The examination of these three issues is directed toward building a framework for anticipating the “unanticipated” when implementing social service-oriented expert systems.

3.1. Rationalisation and Control in the Social Service Organisation

Organisational changes in the social service sector exhibit a tension between centralisation and decentralisation. This tension reflects conflict over where decisions in the service delivery organisation should be made, and who should make them. One perspective is that social service delivery, particularly clinically-oriented delivery, generally comprises non-routine tasks with indeterminate outcomes (Austin, 1983; Fabricant, 1985). This argues for the systems theory approach to organisational behaviour and promotes the idea that social service organisations should have decentralised structures and decentralised decision making (Aldrich, 1978; Patti, 1983).

Running counter to this idea is the tendency to rationalise some of the procedures and technologies used in service delivery. The desire to “professionalise” the mental health field has led to the development and use of the Diagnostic and Statistical Manual series, increasing the formalisation of diagnostic procedures and standardising the field’s taxonomy (Karger, 1986; Kutchins and Kirk, 1988; 1989). Funding agencies’ demands for accountability have created a need to standardise some of the procedures of service delivery to provide more measurable outputs (Austin, 1983; Fabricant, 1985; Karger, 1986), and a need to improve the data collection on the services provided (Attkinson *et al.*, 1974; Patti, 1983). To ensure a fair distribution of resources to clients, social service organisations have formulated basic procedures for caseworkers to follow (Gordon, 1975; Aldrich, 1978). Increasing formalisation and routinisation makes the application of a centralised organisation and decision making structure more feasible for the social service organisation (Woodward, 1958; Patti, 1983; Karger, 1986).

The push towards centralisation of control and rationalisation of delivery occurs whether or not the social service organisation uses computer technology. Increasing demands for services and decreasing resources have sent social service organisations scurrying for ways to increase their productivity, and many have accepted economies of scale and rationalisation as at least short-term solutions. Greater productivity, efficiency and consistency are the goals of bureaucratic rationalism (Mowshowitz, 1978), and the search for these goals represent the increasing influence of bureaucratic rationalism in the social services organisation. Solutions based in bureaucratic rationalism contribute to an organisational environment of highly structured decision processes consistent with centralisation, and this environment is highly amenable to computerisation. But "to blame technology *per se* is to confuse substance with appearance" (Karger, 1986, p. 119). The introduction of information technology in social service organisations has not occurred in a social vacuum. On the contrary, the professionals charged with managing social service organisations are often products of business schools or public administration programs (Patti, 1983; Sarri, 1986). These professionals bring with them a belief in rationalisation and control as used in business and government; the desirability of information technology is its ability to support such rationalisation and control. The technology carries the hopes, aspirations and failures of applications developed in other sectors of contemporary society.

Consequently, one may argue that the "industrialisation" of social service organisations would occur whether or not computer technology existed, and that the use of computer technology is an outgrowth of this trend of rationalisation (Karger, 1986). Similar changes in the organisation of production have taken place in many other industries. This underscores that the similarities in organisations' behaviour transcend the differences in the services those organisations render.

Shifts in power within organisations typically occur either by the shift of decision making from one group to another, or by the formalisation of rules and procedures – bureaucratic rationalism – which replaces the decision making authority of an individual or group (Simon, 1965; Mowshowitz, 1977, 1986). The increasing presence of professional administrators in social service organisations illustrated the first kind of power shift. Professional direct service providers have decreasing authority in organisations in which the administrators are likely to know more about budget lines and service utilisation rates than about intervention theories and client assessments.

The second type of power shift, the rise of bureaucratic rationalism in social service delivery, is evidenced by the existence of such diagnostic tools as the Diagnostic and Statistical Manuals, and the Minnesota Multiphasic Personality Inventory (MMPI) (Fowler, 1980; Johnson, 1984). Such tools have been created to professionalise the mental health field by making it more scientific, to codify expertise and thereby limit the possibility of errant assessments, and to standardise terminology throughout the field. These tools support the rationalisation of service-delivery tasks. Actual casework becomes deprofessionalised, because the codification of the field makes it possible to rely on paraprofessionals with less training than professionals to serve clients (Karger, 1983, 1986; Millar, 1986). Moreover, rationalisation of service-delivery tasks also affects the locus of decision making. The limiting of discretion is one way in which rationalisation decreases the power of individual

decision-making and authority shifts to those who oversee the rationalisation process: licensing boards, professional groups, and managers.

The effects of rationalisation are consistent with certain consequences of the exercise of power. Clegg (1989) observed that power is manifest in three facets of organisation: agency, social integration, and system integration. "Agency" denotes the conventional arena in which power is exercised by determinable actors and has an influence on outcomes. "Social integration" refers to an organisation's rules and practices, and the procedures for modifying those rules. "System integration" is defined in terms of an organisation's instruments of production and its functional discipline, which may be controlled through innovation and diffusion of new techniques or methods. Rationalisation clearly affects social and system integration and is thus linked to power.

Rationalisation changes not only organisational processes but also the way in which such processes are viewed. This change of perspective alters the roles of both the members of the organisation and the processes that actualise the organisation (Bloomfield and Coombs, 1992). Rationalisation provides organisational discipline that is more subtle than what can be achieved with the use of threats and coercion (Foucault, 1977).

3.2. The Structural Interest Perspective

Some of these trends in social services are similar to changes in medical practice and health care delivery. In both cases, the services provided are commonly considered to be important to the well-being of the general public. Care providers in both social services and health care include profit, private not-for-profit, and public organisations. Both fields typically started out with smaller organisations built around an individual or small group of care givers (Germain, 1970; Alford, 1975). With escalating costs, growing demand, and new technologies, there has been an increase in both the size and complexity of these care-giving organisations, and in the government's involvement with them (Alford, 1972, 1975; Weissman *et al.*, 1983).

Alford's "structural interest" model of the health care industry provides a framework for understanding similar forces in the field of social service delivery. Structural interests do not represent a single special interest group, but rather reflect the common interests of various actors within an organisation. Structural interests are internally heterogeneous, and the members of each interest may differ among themselves as to their relationship to each other and to the institution. Similarities in the members' location in the institutional structure will outweigh these differences, however, and emphasise their common interests for the sake of maintaining or improving the collective position of the interest group.

Alford distinguishes three types of interests, namely dominant, challenging, and repressed interests. *Dominant interests* are those embedded in the structures of the institutions which make up a given sector. These interests generally do not have to be organised to have their needs met, since institutional structures implicitly meet their needs. In the health care profession, the dominant interest is still the "professional monopoly" of the medical profession – mostly physicians and biomedical researchers. This professional monopoly has achieved its dominant position by several means: limiting the number of new doctors entering the field, retaining control of professional

accreditation within the profession's own associations, and controlling the categorisation of specialists within the field.

Challenging interests are those created by the changing structure of institutions, and they represent the major challenge to the power of the dominant interests. Alford labels these interests "corporate rationalisers". The main feature of these challenging interests are those of bureaucratic rationalism discussed above. In the health care industry, corporate rationalisation is the objective of hospital administrators, public health officials, insurance companies and medical school administrators. The growth of this interest is due to several factors: changes in technology, the need to control costs, and the growth of the medical centre (as opposed to hospital) as a social institution. Growing demands for coordination of services has led to the increasing size and complexity of health care organisations. This growth partially serves the interests of the corporate rationalisers, for a primary source of professional gratification for the challenging interests is the growth in size and influence of their organisations.

The last structural interest, *repressed interests*, comprises those on the receiving end of institutional services. In the health care industry, the repressed interests are contained within the community which the health care organisation serves, and are extremely heterogeneous. Generally, the repressed interests have as much at stake in the effectiveness of the health care organisation as the other two interests, but have little control over the institution. Repressed interests cannot be organised without great difficulty, or the structures of the institutions work *against* serving these interests. This structural interest is heterogeneous along the lines of people's ability to pay for care, their specific health needs, and their ability to organise. Typically, the repressed interests include those marginally represented in social, economic, and political institutions: the poor, people of colour, struggling working and lower middle class families to name a few.

Alford developed the structural interest model through meta-analysis of 23 investigative reports on the New York City health care system. These reports were developed and released over a 22 year span. While Alford's model focused on the dynamics of power in the New York City health care industry, the shift towards the rationalist view is evident in other health care systems (Bloomfield and Coombs, 1992), and is a trend supported elsewhere for institutions in general (Simon, 1965). Alford's framework can be applied to the social service industry to better understand how power may be shifting in that sector. The dominant interests are those of the professional mental health clinicians – psychiatrists, clinical psychologists, and social workers with advanced degrees who operate professionally as mental health clinicians. The composition of the challenging interest group is similar to that in the health care industry – government officials, insurance companies, agency administrators with MBAs or MPAs, and psychologists and social workers who have advanced degrees and who work in administrative capacities. These challenging interests are similar to Alford's corporate rationalisers in that they seek to incorporate new technologies to streamline service delivery and to minimise costs, as well as reorganise social service organisations. Last, the repressed interests in this industry are those who receive services. Because the need for social services implies the inability to provide for those needs oneself, the people receiving services are likely to be disenfranchised from structural power.

The structural interest perspective provides a model of how power has shifted in the social service organisation. While the structural interests are roughly parallel across the two industries, the power seems to have shifted towards the bureaucratic rationalisers more quickly in the social service industry. There are several possible reasons for this:

- Unlike the health care industry, which has been and still is focused on the practice of medicine, only a fraction of social service delivery entails mental health provision. Other problems such as homelessness, unemployment, and substance abuse all have mental health aspects, but the professional clinician is not the sole provider of services in these areas. As opposed to medical doctors, mental health practitioners do not have a professional monopoly on the provision and distribution of services. Structurally, the dominant interests are not as well protected.
- Professional clinicians have not maintained a monopoly even over mental health provision. Those at the higher tier of the profession are psychiatrists, who are medical doctors. Psychiatrists tend to be less well regarded within the medical profession itself. They have not mustered the prestige to keep other professionals, such as psychologists and clinical social workers, out of the profession. In many parts of the United States, a social worker with a Masters of Social Work (MSW) degree – generally the low person in the mental health profession pecking order – can accept third party payments by billing insurance companies and Medicaid directly. More and more, the only difference between the highest and the lowest tier of the mental health profession is the ability of the psychiatrist to prescribe drugs.
- Both the dominant and challenging interests in the social service industry contain social workers with advanced degrees – as clinical professionals in the dominant interests, and as social welfare administrators in the challenging interests. Like the medical profession social workers have been able to gain control over their own accreditation in many states. This has served social workers in both interest groups by giving clinical social workers more power, vis-à-vis psychiatrists and psychologists in providing mental health services, and by shifting more power to the rationalisers by weakening the professional monopoly.
- The dominant interest in the health care industry has retained its power partially through the support it gains from the general public, and by consistently framing discussion of health care provision around the issue of quality of care (Alford, 1975). The dominant interests in social service delivery have not been nearly as successful, for they do not enjoy the same level of public support, possibly because the repressed interests – those people who receive social services – have less social, economic and political influence.
- Professional clinicians are not always a strong presence in the social service organisation. When professional clinicians work in the social service organisation, frequently their roles are as consultants (Bunker and Singer, 1978), and they are not viewed as integral to the organisation (Weissman *et al.*, 1983).

Still, even with these differences, there is one similarity – the respective repressed interests will have little control over the institution.

The imperfect analogy between the health care and social service industries does not weaken the structural interest perspective. Although these industries do differ in their institutional structures, the structural interest perspective provides the framework for understanding the struggles for power in both. In turn, this framework may clarify how the use of information technology, especially knowledge-intensive systems, affects the structural interests of social service delivery.

3.3. Some Effects of Information Technology on the Social Service Organisation

Although social service organisations experienced conflict and power shifts towards the bureaucratic rationalisers before the introduction of computer technology, the use of computers in these institutions appears to have accelerated the process of centralisation. The word “appears” is pivotal here. While there have been investigations which point to the movement of decision-making to higher levels of management (Mumford and Banks, 1967; Whisler, 1970), others suggest that the evidence is not so conclusive (Stewart, 1971; Mowshowitz, 1986; Kraemer *et al.*, 1989). This ambiguity also exists in social service organisations’ use of information systems. Some suggest that computerisation has led to greater consolidation of power in the hands of agency managers while at the same time alienating line personnel (Weirich, 1980). But there is contradictory evidence that information technology can help increase effective decentralised decision-making, especially if the basic information is not integrated for central management (Alter, 1985). Most likely, these ambiguities arise because the best that can be said is that technologies used for different organisational goals will have different impacts (Stewart, 1971; Bjorn-Andersen *et al.*, 1986)³.

3.3.1 *Information Technology and the Rationalisation of Services*

A decision-making model of the activities of clinical practitioners will serve as a framework for analysing the impact of information technology on service provision (Einhorn and Hogarth, 1981). This model presents these activities as part of a sequence that repeats cyclically. Service provision activities include information search and gathering, information processing and integration, judgement, decision-making, and action. Using this model, Oyersman and Benbenishty (1993) outline the effect information systems have on direct service activities.

Information gathering – information systems emphasise structured data recording. Structural recording selects and filters data in predetermined ways, which in turn affect and possibly dictate treatment technologies. On the other hand, structural recording can improve clinical communication by standardising terminology and by enforcing treatment documentation.

- Information processing – information systems can process complex data on a client and provide near-immediate information that the practitioner can include in clinical decisions. Using longitudinal client data for research and secondary analysis can affect policy and training.
- Evaluation of judgement/performance – at the level of the individual practitioner, information systems can evaluate success in achieving treatment goals and in

obtaining the practitioner's compliance with policy guidelines. Such monitoring facilitates increased management control and decreased practitioner discretion. At an organisational level information systems can evaluate overall compliance with policy, utilisation of treatment methodologies, and policy options.

- Decision-making – information systems can assist decision-making at all levels of the social service organisation. This can include diagnoses of individual clients to decisions concerning broader organisational policy. While providing more consistency of decision-making between practitioners, this feature may limit the clinical options of individual practitioners.

Additionally, as clinical personnel train to use the information system, the information system will influence the way they understand and address the task area described above. This “instrumental reasoning” neglects the essence and inherent goals of these tasks in favour of problems the information system can handle (Weizenbaum, 1976).

Each task area above illustrates how information systems increase formalisation and standardisation of practices. Moreover, information systems reinforce the specialisation of function that is characteristic of the performance of repetitive tasks such as preliminary assessment of new clients. By increasing formalisation, standardisation and specialisation, information systems reinforce the rationalisation of service delivery.

3.3.2. *Impact of IT on the Locus of Control in the Social Service Agency*

Many social service organisations are turning to bureaucratic rationalism to increase productivity. As noted earlier, bureaucratic rationalisation tends to shift control to the rationalisers (Mowshowitz, 1977, 1978) and technology aimed at increasing the efficiency of bureaucratic rationalisation tends to reinforce that shift (Karger, 1986). Furthermore, empirical evidence suggests that control of an organisation's computing resources is more important for a manager's power than is access to the information produced (Danziger *et al.*, 1982). The segments that control an organisation's computing resources benefit considerably more than those that only have access to the information (Kraemer, 1980), and bureaucrats enjoy greater benefit from computerisation than do staff professionals (Danziger and Kraemer, 1986). Additionally, specialisation of function requires more interdependence between segments of the organisation, creating an environment in which power shifts are more likely when one segment gains greater control over computerisation (Pederson, 1986).

Alford's structural interest perspective can now be used to extrapolate from this observation. The “owners” of computing resources enjoy reinforced power, and in the social service organisation these owners are likely the bureaucratic rationalists. These combine to alter the institutional structures so that more power shifts towards these challenging interests. The increasing reliance on bureaucratic rationalism has created a fertile environment for this trend in many social service organisations, and these agencies are just as susceptible to the centralising impact of information systems as are organisations in the for-profit sector. The phenomena cited above – centralisation of the social service organisation, shifts of power from professional practitioners to professional administrators, and the rationalisation of the mental health field – did not occur because of computerisation.

But once introduced into the equation, computerisation does push these trends even further. Bureaucratic rationalism first creates a suitable terrain for computerisation. Afterwards, because a computer system needs to have its operations put into rational form, even more activities are analysed and designed with computerisation in mind (Simon, 1965; Bjorn-Andersen and Eason, 1980). With increasing use of computers, there is an increasing dependence upon professional administrators and technicians to manage this equipment (Mowshowitz, 1977). This reliance further exacerbates the shift of power by filling the ranks of managerial challenging interests with people who may have little knowledge or concern about the actual service, product or mission of the organisation. These factors increase the likelihood of an organisational structure which is slow to adapt because of vested interests, and create sub-goals which are not consistent with that of the organisation (Bjorn-Andersen and Eason, 1980; Mowshowitz, 1977).

These questions become more subtle with the increasing use of distributed computer systems. In these systems the responsibility for task performance is decentralised, but control over the formulation of these tasks and the decision-making logic behind them, is still centralised. Distributed topologies in information technology can camouflage this distinction. Knowledge-intensive systems, particularly intelligence amplifiers such as expert systems, may serve to obscure these distinctions in a similar fashion. One goal of these knowledge-intensive systems is to help line workers apply added intelligence to specific instances of problem areas and solve these instances more effectively and efficiently. The intelligent amplifier gives workers more autonomy in task performance, and creates the impression of increasing the decision-making authority of the worker. But the system builders, with the help of a limited number of domain experts, are actually the ones who formulate the problem-identification and problem-solving processes in the intelligent amplifier, and the bulk of the decision-making authority has shifted to them.

4. Expert Systems and the Delivery of Social Services

Agencies that provide social services directly to clients, as opposed to those which simply administer benefits, have been slow to introduce information technology in their front line operations. One reason is the resistance to using highly structured methods of transaction processing for intake and assessment functions. But expert systems can address more qualitative and heuristic problems, and are typically targeted as mission-critical applications. In social service delivery, expert systems can provide a means by which intake and assessment "transactions" can be computerised, providing a facility that was not available through conventional transaction processing systems.

Knowledge-intensive systems may provide cost savings and service improvements to the social service agency in several ways. The intervention process can be shortened with the use of an expert system while improving paraprofessional decision-making (Ferns, 1992). Because of the shorter length of the interview process, agencies should receive some economic benefit from the increased number of interviews that case-workers can conduct.

Much of the knowledge acquisition and codification for clinical expert systems has already been done for the sake of developing manual structured interviews.

Computer hardware costs a fraction of the salary of even the lower paid paraprofessional. Agencies may not enjoy much additional direct savings by having technology replace costly human experts, however, because many agencies have already minimised the number of professional staff and replaced them with paraprofessionals. The benefits that accrue will be in improving the decision-making of paraprofessionals at very little additional cost.

A comprehensive interviewing tool can help the caseworker gather a more detailed and robust client profile, improve record-keeping of clinical histories and match clients to services more accurately. Because the data collection is clinically driven, as opposed to administratively driven, there may be better caseworker compliance (Altern, 1985), or at least no more resistance than to manual procedures (Ferns, 1992).

On the administrative side, use of clinical records may supply data to improve the agency's accountability reports to funding sources and strategic decision-making concerning the targeting of service populations. More precise targeting of agency services to the client's needs can minimise unnecessary service provision and maximise the effectiveness of the services provided.

The Lifenet expert system can illustrate some of these points. Lifenet was developed by one of the authors, and is designed to assess the risk that an adolescent will commit suicide (Ferns, *in press*). A controlled experiment compared the clinical performance of a study group of social service paraprofessionals using Lifenet with that of a control group of paraprofessionals using a corresponding manual instrument. The Lifenet users completed interviews in significantly less time, with more complete and accurate data collection, than did the group using manual procedures. This increase in productivity can provide cost savings to an agency. The Lifenet users were significantly more accurate in identifying clients who were at risk for attempting suicide, thus providing service enhancement. And last, Lifenet users showed no more resistance to using a computerised assessment tool than the control group showed to using manual assessment methods (Ferns, 1992).

4.1. Organisational Implication of Knowledge-Intensive Systems

Knowledge-intensive systems constitute a natural vehicle for promoting bureaucratic rationalisation. Deployment of knowledge-intensive systems, like other computer applications, depends on organisational "sponsors" or top management (Leonard-Barton, 1987; Dologite and Mockler, 1989). The knowledge acquisition process requires the active participation of the domain expert, together with a development team of domain experts, knowledge engineers, and programmers (Keller, 1985; Leonard-Barton, 1987). This process centralises the development of knowledge-intensive systems. These systems typically focus on a specific domain, and a specialised task. And "the accumulation and codification of knowledge is one of the most important aspects of an expert system" (Waterman, 1986, p. 7).

Because they embody rationalisation of higher-level knowledge and expertise, knowledge-intensive systems will affect the role of the professional information worker. In the social service agency, this information worker is the mental health or social service professional. Information workers as decision-makers have three basic tasks: intelligent gathering, solution design, and choice-making (Simon, 1965). The

knowledge-intensive system facilitates the intelligence gathering and choice-making, allowing paraprofessionals to take over some of these tasks. The development team for knowledge-intensive system specifies the option for solution design. This removes the basic tasks of decision-making from the professional information worker in the social services, and also limits much of the professional's discretion.

The analysis of structural interests in the health care industry (Alford, 1975), outlines the struggle between the dominant interests of the medical profession and the challenging interests of the bureaucratic rationalisers. A similar situation exists in the social service agency. The increased reliance on paraprofessionals for routine clinical tasks will likely decrease the presence of mental health professionals in the agency even further, for they will be reserved for specialised and infrequent treatments.

Research indicates that expert systems can help paraprofessionals make more accurate clinical decisions in less time (Ferns, 1992). But the paraprofessional case worker does not fall into either the dominant or challenging interest structures. Even if paraprofessionals can make better decisions on their own using experts systems, this does not mean that they will necessarily have more autonomy.

The use of knowledge-intensive systems may reduce the need for social service professionals in direct service provision. Some jobs for social service professionals may disappear, others may simply be redefined. But even if job losses are minimal, the de-emphasis will lead to the ascendancy of the challenging interests, the professional agency managers. Because administrators are the likely "owners" of an agency's information technology, this shift will be even stronger, as illustrated by the impact of information technology in the public sector.

5. Conclusion

Social service agencies are increasingly faced with declining budgets and rising demand for services, and knowledge-intensive systems provide a means to address these problems. These systems allow relatively unskilled paraprofessionals to perform the work of highly trained social service professionals, thereby providing therapeutic and related services to a wide public at modest cost. But there is a price to be paid for this substitution. As social service professionals' direct involvement with clients diminishes, so does their power to shape the values and goals of the social service agency. Administrators prevail, and administrative values dominate. Cost control and efficiency tend to replace quality and attention to the individual as dominant considerations in the running of the social service agency. This type of organisational shift is consistent with trends towards bureaucratic rationalism in health care and public administration.

The transformation of social services, described in this paper, is traceable in part to the objectification of clients through the use of formalised diagnostic procedures. Knowledge-intensive systems are a natural extension of this development, not a cause. Nonetheless, such systems do provide a strong stimulus for further changes along the same lines. The desirability of this development depends on whether the services provided by knowledge based systems, along with their side effects, are worth their low cost. It is not clear whether the concomitant shift from the dominant interests comprising social service professionals to the challenging interests of

bureaucratic rationalisers will service the clients any better or worse, and warrants further investigation.

Notes

1. Several papers cited in this article (Bjorn-Andersen and Eason, 1980; Bjorn-Andersen *et al.*, 1986; Pederson, 1986) use data collection during the Computer Systems and Management Project. This project examined the ways in which "advanced" management information systems affected the roles of individual managers, and how MIS changed communication and influence patterns within the organisation. International teams in five countries – Austria, Denmark, UK, West Germany, and USA – produced eight case studies of organisations using MIS. Each case study included: in-depth interviews with 10–40 managers in each case; additional data from subordinates using a structured questionnaire; and additional data from top managers, systems staff, and informant using a semi-structured questionnaire.
2. The URban Information Systems (URBIS) Project examined computing in public sector organisations throughout the USA. URBIS had two major phases. The first was a census survey of all cities with populations over 50,000 ($n = 403$), and countries with populations over 100,000 ($n = 310$). Over 75% of the sample responded. The census included surveys sent to the chief executive and to the computer installation of each government. The second phase was an in-depth field study of 40 cities from the original sample. These cities were matched by population and various information processing tasks. URBIS and follow-up case studies provided the findings in Kraemer (1980), Kraemer and Dutton (1982), Danziger *et al.*, (1982), Danziger and Kraemer (1986) and Kraemer *et al.*, (1989).
3. Most of the studies cited in Section 3.3. utilise in-depth case studies to study the effect of computerisation on organisational structure. These case studies typically focus on a small number of organisations in a limited range of industries. Mumford and Banks (1967) interviewed over 130 clerks in two business (a bank and the accounts department of a manufacturing firm) and used surveys before and after installation of computer systems. The study ran from late 1960 to early 1965. Whisler (1970) studied 19 insurance companies in the UK (three more were added later) using an exhaustive qualitative and quantitative survey instrument. Stewart (1971) examined ten organisations along three application areas: clerical procedures, planning and control, and long-term policy decisions. Frequent open-ended interviews with systems staff and managers were the main source of data. Alter (1985) studied the impact of 10 computer applications on the structure and operations of a social services organisation over a year's time. The organisation was country-wide and had 415 workers in six divisions.

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Correspondence and offprint requests to: Prof. Dr. A Mowshowitz, Department of Social Science Informatics, Faculty of Psychology, University of Amsterdam, Roetersstraat 15, 1018 WB Amsterdam, The Netherlands.
e-mail: abbe@swi.psy.uva.nl.