

Caught in a Web of Fuzzy Problems Confronting the Ethical Issues in Systems Design

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Abstract:

The design of technological support for organizations confronts systems designers with complex ethical questions. While, traditionally, the engineering professions define the standards of their field through technical norms, they have little experience with participatory approaches to normative questions. Using the example of time-management in a surgery clinic, this paper discusses systems designers' role in an intercultural dialogue with users. It examines the constraints of such a dialogue inherent in systems designers' professional socialization and practice and discusses methodological principles such as empathy (combined with the ability to take distance) and the ability to acknowledge and analyze contradiction, ambiguity and conflict (without necessarily solving them). It also explicates some of the central tasks that a process-oriented approach to ethical issues needs to focus on: constructing interpretations of "reality"; identifying legitimate participants; critical examination of the implicit cultural norms inherent in the practice of systems design; discussing a "vision" of the system within the organization.

Keywords

Communicative research methodology, collaborative decision-making, conflict, control, ethical issues, organizational learning, time-management, user involvement

Introduction

Systems development, as Tamar Bermann and Kari Thoresen (1988) understand it, is intricately interwoven with organizational change, both reflecting and shaping organizations. One of their main points is that systems development is a learning process, full of contradictions and conflicts which can only partly be resolved, resulting in new ways of getting things done, new patterns of work, changed work relations which in turn give rise to contradiction and conflict. They stress the ubiquity of "fuzzy problems" to be dealt with in this process.

I wish to take this diagnosis - ubiquity of "fuzzy problems" - as a starting point for asking how systems designers can be prepared or prepare themselves for acting competently within such a complex social field. More specifically, the question poses itself, how ethical problems can be dealt with in the kind of open-ended organizational learning processes Bermann and Thoresen describe.

This paper deals with these questions in two steps:

- * Firstly, a case - the scheduling of operations in a surgery clinic - is introduced and the main ethical problems inherent in the staff's time-management practices are examined.
- * Secondly, a process-oriented approach to ethical issues (including the constraints systems designers face and the resources they can build upon) is discussed.

The Hidden Agenda in Temporal Orders

The clinic, part of a large university hospital, consists of six departments, representing different specialties. A main organizational problem this clinic faces is the scheduling of operations. A research project was set up in which the clinic's social practices of managing time were studied in-depth, with the objective to help identify high-leverage factors for the design of supportive technology. At the present stage, a simple prototype has been developed for use in cooperative prototyping sessions in two different clinics. Special attention is given to the problem of representing time in an information system and to supporting collaborative time planning.

Current Planning Practices

The clinic disposes of six operation theatres and one small room for minor surgery. The planning of surgery is done in a several phase scheduling process. Each department has been allotted a certain number of days for surgery. Pre-planning is done by entering a surgery (including name of patient and responsible surgeon) into a book which is located in the clinic's main secretariat. The pre-program for the following day is discussed in an afternoon session in which one representative from each department (normally a doctor), the head surgery nurse and one representative from anaesthesiology are present. In this session the schedule for the next day is set up. It contains names of

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team members and the estimated beginning time of each surgery. The result of these consultations is a time table which shows the distribution of operations over the available theatres. Nurses decide among themselves who is going to join which surgical team. No pre-planning for the following days is done, although surgeons may enter operations ahead. Normally a days's program cannot be realized as it was planned. Due to unrealistic time estimates, unforeseen complications, emergencies and organizational delays, ad-hoc-adjustments have to be made which might result in the cancelling of a surgery (even though the patient may already be waiting outside the operation theatre).

Planning for computer-support directly touches upon some of the major ethical problems inherent in the scheduling of operations; in particular:

- * the issue of transparency versus privacy of one's use of time,
- * the right to voice temporal priorities and to dispose of the time of others,
- * competing explicit and hidden priorities,
- * the differential value of the time (and knowledge) of different occupational groups as expressed in the "surgical team".

Transparency Versus Privacy

One main problem inherent in time-management practices is the high level of temporal ambiguity (McGrath 1990). Mainly three factors contribute to this ambiguity: the cultural and social nature of time, loose coupling and problematic trajectories.

Time is a social category of thought, derived from social life (Gurvitch 1964). Hospitals host such diverse groups as physicians, nurses, technicians, administrators and patients, each representing a specific social world. These cultural differences manifest themselves in differences in evaluating one's own time and the time of others, in coping with time constraints, and in making temporal commitments. Temporal ambiguity is also inherent in patients' trajectories. Although many of them reveal distinct patterns, work with patients is always of an evolving character, requiring continual readjustment and coordination (Strauss et al 1985). The temporal uncertainties created by unexpected complications are aggravated by the organization's loose coupling. The scheduling of surgery is only partially bounded by explicit rules, agreement on these rules is minimal, and feedback mechanisms poorly developed (Weick 1985). Given this weak frame, informal relationships and with them status and power gain influence and an immediacy unmodified by rules and procedures develops. This means that information sharing is highly selective and temporal commitments are not made transparent.

Closely associated with temporal ambiguity is the problem of how transparent personal time calendars can and should be made. Software development highlights this problem in a specific way. Information technology acts as a mirror in which actors can see how resources are distributed and how successfully competing priorities are implemented (Wagner 1991). In combination with suitable statistical methods this (necessarily selective and aggregated) collection of information gains normative-regula-

tive significance: Actors are confronted with an "objectified" image of their own practice in the light of the organization. Experience shows that actors' perceptions of their own use of time is often self-deceptive. Computer-based scheduling of surgery makes this kind of self-deception more difficult. Among the facts that can be made more visible are: gaps of "unused" time; systematic deviations in the time needed by different surgical teams; the performance profile of each department, including the frequency of complications; individual time calendars.

The most salient ethical questions associated with information technology's mirror function is the "privacy versus transparency" dilemma. It poses itself differently for different (occupational) groups within the hospital. Transparency may be in the interest of patients whose waiting time is often totally unstructured since information on how long to wait for what kind of interventions and in which sequence is rarely given. Contrary to nurses who have to be available within their working hours independent of individual time preferences and instantaneous commitments, surgeons have a interest to keep parts of their individual time calendars private.

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of competing notions of efficiency, including the right to dispose of the time of others or to take one's time, and the acceptability of time losses.

Shared Versus "Autocratic" Decision-Making

A second set of ethical questions pertains to actors' access to information and decision-making. Power in organizations heavily depends on the arrangement of interaction contexts in time and space (Giddens 1984). Information technology offers the opportunity to handle "last minute" adaptations collaboratively by loosening the connection between actors' co-presence and their opportunity to participate in a decision. Access to planning processes is re-defined with these technological possibilities - in the words of Meyrowitz: "Electronic media may begin to blur previously distinct group identities by allowing people to 'escape' informationally from place-defined groups and be permitting outsiders to 'invade' many groups' territories without ever entering them" (1985, 57).

Currently, a senior surgeon is responsible for most readjustments of a day's schedule, including the decision to postpone a surgery on behalf of another one he judges to be more urgent. As a consequence of his role, this surgeon has monopolized valuable information and only selectively involves implicated colleagues in his decisions. He bases his decisions on an internalized "map" of an individuals' or teams' specific competences and deficiencies and their capability to mobilize resources under time constraints. This knowledge is only partially shared. Still, all surgeons expect to get their fair share of time.

A computer-based information system might help to broaden participation in ad-hoc adjustments of the operation plan (when a scheduled surgery cannot take place, a speciality does not exhaust its time for surgery etc) by making "unused" time slots as well as local patient queues visible.

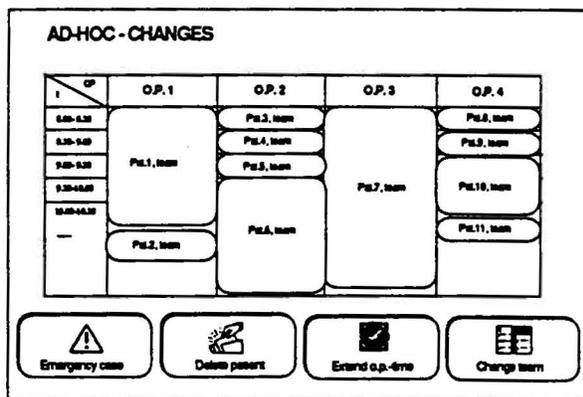


Table 2: Ad-Hoc Planning

An illustration of how to invite participation in ad-hoc changes is given in Table 2 (Egger/Wagner 1992). In order to be able to update the operation plan whenever changes are required, a special function has been designed. Options are: to insert emergency cases, to delete a patient (e.g. whose condition has deteriorated), to extend the estimated

operation time, and to change the surgery team. This gives surgeons the opportunity to enter the process of bargaining for time for surgery. Records of the organization's "past" (e.g. containing information on average times needed for different types of surgery or on past decisions) can support this ad-hoc planning. So may for instance knowledge on which department or individual surgeon was most affected by past ad-hoc changes influence future decisions.

A Plurality of Priority-Setting Systems

Inherent in the clinic's operation calendar is a specific scheme of priorities, some of which are made explicit while others remain hidden. Part of these priorities is the internal hierarchy of specialties within the clinic, with heart surgery ranking before all others. A second set of priorities derives from surgeons' ambition to perform as many complicated operations as possible. As each surgery offers unique chances for learning (and for producing research papers), this ambition varies with the surgeon's professional biography. As a result, admission of patients is highly selective. In addition to professional preferences, there are other priorities such as those which apply to emergency patients. Also care values matter as in the case of old or particularly nervous patients or of patients who have to undergo a lengthy and sometimes painful preparation for surgery.

Computer-support requires that priorities be made more explicit and that they be stated in an unambiguous and decision-relevant form. This explicitness makes individual and group practices and decisions more accessible to discussion and reflection within an organization. It turns hitherto private regions into public ones (Giddens 1984). The organization faces the problem of negotiating the legitimacy of priorities and practices (Hirschhorn/ Farquhar 1985).

Team Versus Pool

The task of synchronizing different surgical teams and different "bets" for time for surgery is made difficult by the fact that, although surgery is a product of group work, the performing team does not constitute itself as a group nor does it act as one. Rather people who are based within different substantive and social domains meet at certain physical spaces at particular times to engage in particular tasks. This peculiarity is partly due to the fact that the tasks which have to be performed during an operation are sequentially organized with team members being present at different times and - with the exception of the surgical nurse - only partially overlapping and directly collaborating. After the patient has been brought into the operation theatre, first enters the anaesthesiologist, second the assistant surgeon, third the main surgeon (who finds the patient as an "open field" on whom to perform his specialized task) and these persons leave the theatre in reverse order. This sequential work order also reflects a hierarchy of knowledge, with surgeon's expertise and time being considered as more valuable as the knowledge and time of e.g. surgical nurses.

As surgical nurses and anaesthesiologists in this clinic form small "pools", there are no permanent and stable per-

sonal relationships between them and particular surgeons. Part of nurses' disenchantment with their work is related to the fact that, although it is technically demanding, there is no time for patient contact. Anaesthesiologists in this clinic are looked upon as "service people". Their quest for time for seeing the patient before the operation is considered as not so relevant. The design of supportive technology is not neutral to these organizational decisions, e.g. if the clinic favours a team or a pool arrangement.

Unavoidable "Bias"

Cultural differences in perceiving, evaluating and scheduling time limit systems designers' possibilities of creating a "true" image of the hospital's time organization. The complexity of time planning is not reducible to a set of well defined variables and related values. Contingency is built into the daily working of a hospital (emergency cases arriving, a patient's condition deteriorating so that the operation has to be postponed) and into actors' interactions which are only partly routinized. This means, however, that computer support of social practices has to be necessarily selective and biased; reinforcing specific notions of time (and, correspondingly, of adequate, "efficient" scheduling, of cooperative decision-making etc) while constraining others. The empirically observable plurality of time-reckoning systems can only be selectively represented in an information system.

Advocates of a participative approach would argue that in order to be able to act competently in this complex field full of contingency and conflict, systems designers need to confront themselves with the empirically observable plurality of organizational realities and to enter a process of (self)reflection and communication. This quest, however, needs careful examination: What are system designers' resources and what are their constraints vis à vis such a task?

Coping With "Fuzzy Problems": Resources and Constraints

Systems developers are inevitably confronted with at least some of the ethical issues discussed when designing technological support for the scheduling of surgery. Carving an appropriate role for themselves in this process and developing a suitable methodology, however, is difficult; not only due to the ubiquity of "fuzzy problems" within the organization itself but also due to constraints in systems developers' own professional socialization.

Normative-Prescriptive Regulations

To act like an ethnographer is a particularly difficult task for engineers who have been trained "to look for abstract orientations in the form of generalizable, empirical data as a basis for decision-making" (Wolf 1988, 165). It is disconnected from traditional practices within the engineering professions to deal with ethical questions. For many engineering professions the standards of the field are being defined through the development of technical norms. Such norms are based on "an immanent logic of quantity, standardization and focus on detail" (Wolf 1988, 173) and promise some kind of guidance in the maze of "fuzzy problems" to be tackled. Grudin (1991) discusses some of these norms, such as design simplicity, consistency with

a real-world analog, or anticipation of low-frequency events, arguing that they often are in conflict with users' interests. Other types of norms (technical as well as legal ones) can be found in the field of data security and data protection.

Given these long standing practices within the engineering sciences themselves to establish "codes of conduct" through the definition of technical norms, the question arises whether the development of a network of normative-descriptive regulations for system design might not provide guidelines in a complex field, such as e.g. the scheduling of operations. There is an argument in favour of this view. Explicit normative regulations can act as some kind of guarantee for minimal social standards to be taken into account. In their analysis of technical norms Ekart and Löffler favour those types of codes of conduct which "strongly accentuate the regulation of procedures in addition to material criteria of rightful vocational practice and ... which require the practitioner to consciously connect a cognitively elaborate analysis of a problem with a differentiated moral-practical judgement" (1990, 14). If the consequences of normative regulations are to be understood and evaluated, norms have to be applied to and interpreted within a specific context. They may be in conflict with competing norms. This is why Ekart and Löffler formulate two requirements such norms would have to fulfil: "Their formulation should make clear the consequences of an adequate, responsible attitude to the task for the relationships between all participants (in the design). ... Such ethical codes should clearly express the difference and tension between the obligation to watch legal and quasi legal norms on one hand and to take distance from these norms if other principles or the situation make this necessary" (1990, 20f).

Limited Control

A second problem to be kept in mind is associated with the present status of computer science and its position within fields of competing interests (e.g. user goals, corporate goals). Computer scientists are far from forming a homogeneous profession with well-defined boundaries and a clear set of standards. They rather constitute a heterogeneous field of practitioner-experts, characterized by limited work autonomy (in particular within large product development organizations) and a lack of "monopolistic" knowledge and clearly defined territories. Due to the influence of external producers of software, the growth of end-user computing and, as a consequence, the shift of expertise to users, "IS workers' diagnosis and understanding of user problems and needs is contextual, constrained by their involvement in a shared organizational culture, by organizationally defined goals, priorities and values, by the history of prior IS-user relations, existing technology, and IS department procedures" (Orlikowski/Baroudi 1989, 22). Within these limits system designers seem to find some space for carving out specific subcultures and personal identities through the development of subjective styles and techniques (Strübing 1988).

A second fundamental limitation of systems developers' control over the process and product of their work arises from the fact that actors' integration of a system into their everyday work is by no means completed with its imple-

mentation. Systems developers have little if any part in the restructuring of work relations, the re-negotiation of professional boundaries, the re-definition of competences which "microscopic" analysis of ongoing negotiation and emerging new patterns reveals.

Ethical Issues as Part of a Communicative Research Methodology

Systems developers searching for methodological principles that provide guidance through the maze of "fuzzy problems" might learn from the intense debate on methodology within feminism. In German speaking countries this debate has focused on "concernedness" (Betroffenheit) as a methodological principle of good (that means engaged, partisan, subject-centered) research. It is the capacity for empathy - emotional identification with the life situation of "the other" - which enables researchers to gain a full understanding of the problems they are researching into.

Empathy Versus Distance

Emotional identification may also be thought of as helping systems developers to find the "right path" through the difficult ethical issues to be dealt with in the course of a project. It might be argued that system designers be not able to identify and understand "fuzzy problems" unless they feel concern for the concerns of "the other" (in our case: patients, nurses, doctors). However, as a methodological principle, "concernedness" contains some pitfalls.

One problem which poses itself is ethnocentricity - to infer from one's own values, anxieties, interpretations, commitments, and ideological positions to the orientations that prevail in other social worlds. Erdheim (1984) has pointed to the blind spots associated with one's own biography, the unconscious distortions of "otherness" caused by an unreflected, naive, good-willed ethnocentricity. Systems developers are subject to their own psychic and social conflicts when encountering others. Within a hospital setting, identification with the frightened, suffering patient is easily evoked (and certainly not morally wrong). Being a woman makes empathy with nurses who perform what is defined as "women's work" in our society and "have contended with what appears as a dichotomy between the duty to care for others and the right to control their own activities in the name of caring" (Reverby 1987,1) much easier than with those in power. The psychological stress of being confronted with the suffering on the other hand might seduce designers to identify with role models that exhibit a professionally distanced attitude toward the patient (Menzius 1960).

These examples point to the necessity to combine empathy with the ability to take distance (Wagner 1992). Habermas has argued that the rightfulness of norms "ultimately" needs to be based on reasons that have to be tested in what he calls a "practical discourse". When taking the "moral point of view" we rely on intuitive knowledge. This, however, is not sufficient in itself, although Habermas warns against making moral-practical questions too readily an object of a theoretical discourse. It seems important that "the practical discourse characterized through internal links to interpreted needs of concerned

persons ("Betroffene") be not assimilated too quickly within a theoretical discourse based on the interpreted experiences of an observer" (1987, 40).

Admitting and Handling Conflict

The second problem inherent in "concernedness" as a methodological principle is that identification with "the other" may blur contradictions, ambiguities and conflict between users when it may be more fruitful to acknowledge and analyze them. Feminists in particular have been confronted with this problem when realizing that only looking at what women share might prevent them from admitting and analyzing differences in women's life styles, commitments and problems (Keller 1987).

In an organization characterized by strong authority relations and interpersonal networks many problems are handled locally (Cicourel 1990) without resolving the underlying conflicts. Negotiated order theory seems to conceptualize particularly well the organizational procedures for getting things done in such types of organizations. In a series of case-studies Strauss has developed a "paradigm" which helps to analyze negotiation processes and their embeddedness in social settings. Its "key terms include subprocesses of negotiation, of which examples were making trade-offs, obtaining kickbacks, compromising toward the middle, paying off debts, and reaching negotiated agreements" (1979, 237). The concept of negotiation implies that, although overt or endemic conflict may exist, actors within an organization are able to develop modes of interacting which help them to reach an agreement. Power forms an important part of negotiation. However, it is not seen as absolute and unchallengeable but in relation to other factors which help actors create coalitions and partnership.

There are many arguments in favour of surgical teams meeting before the operation and discussing the patient, with the responsible surgical nurses contacting their patients in the ward and accompanying them throughout the whole event. Teamwork of this kind implies values that few persons would question on principle, its relevance for the well-being of the patient being obvious. Still, teamwork as a goal is hardly consensual. It is conflicting with many other goals that different groups of actors in a hospital think worthwhile adhering to; e.g. the interest of nurses to preserve distance from surgeons, surgeons' interest in dividing up their time most efficiently between surgery, research, administration, and teaching. Teamwork might prove to be a solution for some problems while creating new ones.

Users and Designers in an Intercultural Dialogue

Senghaas-Knobloch et al (1990) have elaborated the concept of an interdisciplinary dialogue which is based upon the development of a shared "language game". Their idea comes close to the definition of cooperative prototyping developed by Bodker and Gronback who perceive the cooperation between users and designers as one "between two groups of subjects that from the outset possess different kinds of instruments and work on different kinds of objects aiming at different purposes. However, we claim that

the purpose of designing computer support is that new objects tailored to the users' needs, have to be temporarily shared between the two groups, or two skills" (1991, 476).

The central idea is that within such an intercultural dialogue systems designers do not act as promoters of issues or as experts. They are viewed as participants in a process for which they do not have any specific training. Participants in such a dialogue face the two-fold task of on the one hand creating the conditions for "normal" communication through problematizing mutual misperceptions and prejudices. They at the same time need to take a step further and "revolutionize communication through pulling down the limits of communication within communication or making them permeable" (Leithäuser in Senghaas-Knobloch/Volmerg 1990, 203). The authors have developed methods for monitoring such a communication process (e.g. through agreeing on goals for learning and communication, through the systematic changing of perspectives) and for analyzing the process as well as the issues that have been dealt with (e.g. analysis of "core sentences").

A process-oriented approach to an intercultural dialogue on ethical issues needs to focus on some central tasks:

- * identifying legitimate participants;
- * constructing interpretations of "reality";
- * self-reflection - thinking about one's individual and professional one-sidedness, including the implicit cultural norms inherent in the practice of systems design (notions of efficiency, internalized hierarchies of knowledge, practices of coding reality, images of work, communication, social relations);
- * discussing a "vision" of the system within the organization.

These tasks form part of a communicative research methodology. Its first step consists in building up an understanding of the social reality of time-planning. Systems developers increasingly use ethnographic methods for exploring a field of application and communicating with users. Users in such a process are actors within and interpreters of their social world; they offer interpretations of perceived problems and "solutions". Through observation and inquiry systems designers gain access to users' knowledge and social practices. Following a classical hermeneutical approach, this can be interpreted as a process in which systems designers' implicit models of the surgery clinic's reality interact with users' acts and interpretations.

One main task is the identification of the legitimate participants in such a dialogue. Analysis of the composition of ethical committees in the medical area, for example, has brought forward the difficulties involved in deciding whether some people are more "affected" or more worthy of participation than others because of their education, social background, specific merits for society or their minority position (Rothman, 1992). In our project, the question poses itself whether the organization's clients - patients - should be involved in such a process and how their participation could be made practicable. A second problem concerns what Murnighan and Conlon (1991) have called a

"leadership versus democracy paradox" - the problems groups encounter when trying to combine leadership with democracy. As interactions between surgeons and nurses are based on rigid and largely unchallenged distinctions of power and status, nurses in our case are reluctant to participate in decision-making (which they fear might only add to the complexity of their tasks and will consume more time than can be spent). This immediately brings up the question of systems designers' role in such a process: Are they morally obligated to secure equal participation?

Corporatist concepts of equality are based on the assumption "that the voices of all relevant groups within the polity must be heard in order to reach the solution that is best for the whole group" (Leidner 1991, 277). With physicians claiming absolute authority, for example, this ideal (and with it the idea of cooperative planning) does not necessarily find sufficient and powerful supporters among "users". Is it systems designers obligation to "lobby" for such a commitment for cooperativity and on what grounds? In spite of shared egalitarian values, situations may develop in which not all voices carry equal weight. Conversely, an ethic of social responsibility faces the dilemma that decisions, even when they are rightful in some legalistic sense cannot be considered "good" as long as they are not consensual. This makes voicing dissent extremely difficult. At the same time, there are limits to what can be made explicit and be discussed: power structures, personal and cultural barriers (Bermann/Thoresen 1988).

Closely linked to this problem is the question of how to cope with heterogeneity and dissent in a communicative research environment. Among the highly controversial aspects of information systems is their use for control purposes. The computer's "mirror function" can be used, e.g., for identifying systematic bottlenecks, for providing an overview over the utilization of resources (in comparison with stated priorities) or over the average duration of different types of operations (eventually comparing different teams). Hospital management has a high interest in such type of information which can be used for optimizing the use of facilities and for imposing a stricter discipline. Given the existence of long patient queues for elective surgery in many clinics and the apparent underutilization of operation theatres (in our case), the idea of using statistical analyses of past needs for the re-negotiation of priorities, cannot easily be dismissed.

Systems designers in this project also have to engage in a critical examination of the normative foundations of their own discipline as well as of their own concepts of time and its efficient use. Computer scientists aim at developing standard applications for many different contexts of use. The construction of such standardized tools presupposes that designers abstract from the specific needs of a specific group of users and the very texture of their temporal concepts. Systems designers are committed to automation. Thus one approach to the design of computer support is to define time management as a pure scheduling problem. The task then consists in distributing limited temporal resources, given certain boundary conditions. A goal function, to optimize the utilization of surgery time,

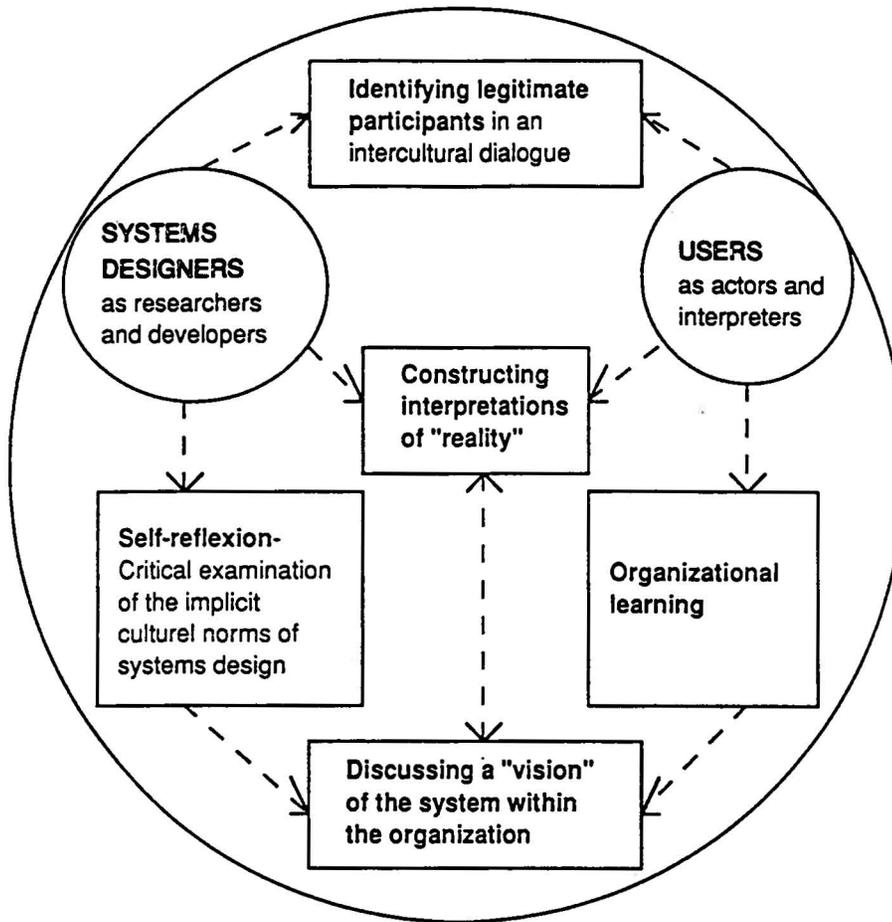


Table 3: A Communicative Research Methodology

can be defined. An automatic scheduler would be a module which "knows" a series of restrictions and tests the compatibility of data. Although there are some clearly defined rules which can be administered by the system, temporal ambiguity and the existence of competing priorities limit the possibilities of automating time-management.

Such a process of self-reflection requires systems designers to critically examine some of the guiding principles of their discipline - as Lyotard puts it: "... the communication problems which the scientific community encounters when modifying and re-constructing their languages are comparable to those of social communities who, when having lost their 'narrative culture', have to examine their ways of communicating with themselves thereby questioning the legitimacy of decisions" (1986,180f).

Conclusion

Understanding and supporting users does not save systems designers from making moral-practical judgements. In our project, designer's commitment to the idea of cooperative planning has proven to be a main focus of conflict in an organizational environment in which surgeons claim absolute authority and often argue for "chaos" as the most productive way of coping with contingency. A cooperativity-enhancing system only makes sense if actors are willing to share information and resources. The local autonomy of

medical departments (and within those of individual senior surgeons) works against developing a culture of transparency and sharing. Systems designers on the other hand find it difficult to accept the idea that the "lay-person's" view might influence the "paradigm" in which they are working.

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