The Potential Contribution of Social Science to Information Technology Implementation in Healthcare

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Information technology (IT) implementation in healthcare (and other sectors) has not always proved to be straightforward nor have the intended benefits of systems always been delivered.1,2 Although there are many factors that have caused these problems, a general consensus is emerging that what might be termed “human factors” are important. This has already been acknowledged in the research of Southon et al3 and Lorenzi et al.4 Their detailed fieldwork shows how important the professional culture and working practices of the intended users of systems can be and how conventional approaches to systems analysis and design may not always grasp the complexities of these issues. This article draws the attention of the nursing informatics community to some recent research (delineated below), perhaps less well known that it might be, which suggests that a sociologic approach might be quite fruitful in analyzing these issues. Sociology can provide informatics with valid and reliable tools to understand better the kinds of issues subsumed under the heading human factors. These techniques have, as this article shows, proved their worth in the design and implementation of real systems,5 often by uncovering informal culture and working practices that may not be apparent immediately. This research has been undertaken on systems used by both doctors and nurses and on systems that are used by multidisciplinary teams. For the purposes of this article, some lessons are drawn together that may be relevant to health informatics as a whole field and some points are made that are more specific to nursing. Wagner,6 Schneider and Wagner,7 Berg,8 Berg et al,9 and Timmons,10 all using broadly sociologic techniques and studying different systems in different countries,
have some common conclusions. These conclusions are that systems embody certain ideas about nursing (and medicine) and the way it is done, which do not always correspond to the reality of practice. For instance, nurses engage in a great deal of what sociologists call "articulation work," that is, oiling the wheels of a large and complex organization so that it works in a coordinated way for the patient. This kind of work is sometimes not clearly acknowledged in computer systems. Much nursing work involves doing several things simultaneously, and this is often the kind of work analyzed by Wagner and Schneider and Wagner as being "unacknowledged" or "hidden."

There is, on occasion, some distance between what nurses say they do and what it is they appear to do when observed in practice. This occurs in the use of computer-ized care planning systems11 and paper-based systems.12 An analogous situation can be found in the study reported by Berg et al.9 Berg et al show the difficulty of designing computer systems that accurately reflect the complex relationship between the medical record and day-to-day working practice of, in this case, doctors. "As one physician put it: 'often, what is most important is what is not explicitly there but what I can read between the lines.' This is not mysticism or computer-resistance."9(p245) It is not mysticism because of the constitutive role of the record in the rich patterns of social interaction that make up medical work, and it is not resistance because of the inherent difficulty in "computerizing" these activities. Indeed, it has been compared with landing a man on the moon. What is so difficult about computerizing these activities and categories of knowledge is that they are informal, are often tacit, reside with groups rather than individuals, and depend heavily on a context that changes rapidly both in time and in space. A later study by Goorman and Berg13 confirms the importance of these factors in a nursing rather than a medical context.

This has implications for the design of future nursing systems. Simply getting the "views" of the users may not be adequate because of the phenomena described. An alternative might be a more sociologically informed approach. What might it look like? Goorman and Berg suggest detailed observation of practice to uncover the kinds of issues discussed, with a focus on how nursing work is practically (and cooperatively) organized. The most directly relevant of these, in the sense of being the closest, is the work of Berg on healthcare systems, though largely in his case, medical computer systems. Berg, drawing on his work on the use of decision-support systems and computerized patient records in medicine, has sought to show how sociologic (and other "human science") perspectives can affect the problems of systems design and implementation. In a survey of the fragmented and varied literature that can be subsumed under these headings, he draws together 3 key critiques of conventional methods of systems design, "... all [the perspectives under review] predict that by ignoring the users (practically and/or theoretically), such technologies will function poorly in concrete workplaces. Second, all warn that traditional systems design tends to produce technologies which embody a managerial perspective. Finally, they all stress the importance of going out into the workplace and studying the work as it actually takes place."17(p462) Berg argues that sociologists should not establish themselves as a new breed of systems analysts, because this will merely reproduce the errors of conventional systems design. Only if the perspectives derived from the work of the sociologist are included, will systems remain flawed, but in a different way. What might be more appropriate is to discuss a sociologically informed systems analysis. Berg also suggests that all parties involved in the process should acknowledge that they are political actors in a political context, and "... take our intertwinement with technologies as a starting point and move from there: to operate in a piecemeal way, making moves in a game that constantly and inevitably overtake the mover,"17(p480) that is, they will always be overtaken by unexpected events and circumstances.

Berg recommends that systems "should not be overly structured with rationalistic and pre-fixed notions of the organization and content of medical work."9(p249) Concerning nursing systems, I would echo his words, only substituting "nursing" for "medical." Again, I would support his recommendation that "notions (of the patterns of work) should come from hands-on insight of the actual work, and not from secondary accounts or generalized and rationalized text-book abstractions about the structure of 'nursing' or 'medical' work."9(p249)

Rip has sought to use these kinds of insights in approaches to "real-world" design and introduction of technology. He gives the following recommendations about how new technology can be successfully introduced, based on his work on telecommunication in the Netherlands.18 Three factors must be considered in the introduction of any new technology:

- The nonlinearity and situated character of technological developments.
- The importance of the articulation of demand and acceptance (that is, does the demand for them exist, or can it be created?).
- Viable combinations of introduction strategies and building actor-networks.

The third of these requires some elucidation. Rip argues that the organization needs to be in place, as does technology, and often paying attention to these kinds of organizational and social issues is not anyone's responsibility.
However, Rip warns against expecting too much from the use of his recommended approaches. The insights of sociology and economics may teach us a lot about the introduction of new technology, but they do not guarantee that we will be any better at it. Actors cannot expect to be able to control all of the factors: it is the interaction between technology and society that will determine their fate, and Rip points to the obduracy of culture in shaping this interaction, “Actors cannot outsmart culture.” 17(p427)

Rip has been involved with the Constructive Technology Assessment, 19 which is a large program in the Netherlands that aims to achieve societal embedding of new technologies through structured feedback from interested parties within society as a whole in the early stages of development. This should go some way toward preventing some of the uninformed controversies about new technology in Europe and the United States.

One of the areas in which these kinds of approaches to systems design and development have been applied within the mainstream commercial world is as a result of the work of the Xerox Palo Alto Research Centre (PARC). Although Xerox PARC is better known for its study of photocopier repair men and their informal working practices, especially use of new technologies. Typically, the work done at Xerox PARC is the study of work and professional practice in those areas under consideration for the use of the projected new computer systems. This will entail the use of at least two techniques. The first of these is ethnographic, with an observer or observers spending time in the areas under review, looking at how both individuals and groups accomplished their work. This will focus on a variety of issues, including, but not limited to:

- Practical tasks, especially those that involved patients and how they were accomplished.
- Articulation work, that is, the activities that are undertaken to coordinate the work of a large organization and focus its efforts on the patient.
- How work is organized in time and space.
- Who does what in reality and not as it “should” be.
- The negotiated nature of work.

It is desirable to conduct a sufficiently full study to give a fairly detailed “rich” sense of the context into which the system was intended to be implemented, but time and costs may militate against this. What might also be problematic is doing a study of this type across a whole hospital (or, indeed, community health services organization), as there may be subtle variations in practice and culture between wards and departments, and it is not practical to study all of them in depth. However, as Timmons 10 has shown, there is enough common practice and culture to make such an exercise worthwhile.

Ideally, this first phase of ethnographic research, focused on issues such as articulation work and unspoken “tacit” knowledge (as listed above) would be followed by a round of interviews with staff in the relevant areas, informed by the findings of the first stage. Even if the sys-
tem were intended to be used by qualified nurses only, it would probably be valuable to interview staff who worked with the nurses, as well as (obviously) the nurses themselves. In the case of care planning systems, it may be useful to ascertain the views of some unqualified nursing staff, nursing students, and possibly doctors, because all of these groups work closely with the qualified nursing staff and may have useful and interesting perspectives on their work. This phase of the study will focus on checking and expanding the data collected in the first phase.

The issue of who should do this research is an interesting one. The researchers will need skills in observing, interviewing, and analyzing the kinds of data that these methods produce, but there is also the issue of whether they must be qualified professionals in the groups that they are studying. Although this may have advantages in terms of a better understanding of what is happening, there is also the danger that either consciously or subconsciously they will bring their own views about how, for instance, nursing “should” be done. Equally, outsiders may lack some insight into these kinds of subtleties or may take longer to appreciate them. However, the studies that have been done by “outsiders,” both sociologists and anthropologists, of healthcare settings do not lack validity and richness, and many of these studies are used by the professions to inform practice and education (eg, Fox, Goffman, and Atkinson).

This process can produce both a set of information requirements and a good understanding of the practical constraints on a system, which would enable the process of systems design to proceed in a much more informed way, focused on the realities of practice in any given area. At a later stage, the testing of systems can take place in as realistic a setting as possible. This should be in the area where they are intended to be used and by “ordinary” users, although this may be difficult to achieve.

Taking this type of development may appear to be lengthy and thus expensive, and no doubt questions will be raised by managers as to its value. In the absence of any robust data on whether these methods are genuinely cost-effective, this is a hard argument to counter. However, in the light of the substantial sums of money wasted on systems in healthcare that do not work at all, but would never had been implemented if some of the suggested approaches had been followed, it may very well be that they are worth it. In addition, conventionally designed systems may also have hidden costs because of the way they are used. A rough example should suffice. The data structure of the systems studied by Timmons means that nurses take longer than they need to complete care plans. If a system can be designed to save each nurse only 5 minutes a day creating care plans, this would equate, over the course of a year for the whole hospital, to a saving of (approximately) £500,000, equivalent to another 20-25 nursing staff.

Although there are other ways in which systems design can be made more cost-effective (for instance by the use of voice data entry), where these sociologically informed approaches would offer additional benefits is that they should produce systems that are more acceptable to users, that “fit” better with the way they work, and thus be less likely to be resisted.

Sociologic and anthropologic techniques and approaches have proven useful in understanding how and why the design and implementation of information systems in healthcare have often been less than optimal. The application of methods based on these understandings is an approach that can potentially benefit a wide range of systems in the health informatics field, not least in nursing informatics, for instance, by accounting for the hidden articulation work that nurses do. Although many of the recommendations derived from this work may seem no different from the conventional prescriptions of systems analysis, the kinds of research reviewed in this article show that they have not been carried out in practice or only “lip-service” has been paid to them. This article has summarized some of the key findings of this literature, not hitherto widely known in the mainstream of nursing informatics, and made some practical suggestions about how these techniques can be implemented in the design and implementation of real-world systems.

REFERENCES


