The interaction between electronic storage systems and their users

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Access to information via on-line computer systems is rapidly becoming available to everyone. Most banks, for example, allow their customers to use public computer terminals to see the balance on their accounts, withdraw cash and, in some cases, obtain printed statements. We might infer from developments of this sort that the general public, or at least those with bank accounts, are now able to interact freely with any well designed computer system and that the introduction of publicly accessible computerised information systems, for example in libraries, should present no problems. From this inference it would seem even more likely that trained staff should have no problems at all in coping with the new technology.

However, since the beginnings of the spread of computerisation, research in commerce and industry has shown that the optimism of the designers and implementers of computer systems has frequently foundered on the hostile response of the systems intended users.

Elizur (1970) conducted a detailed survey in European government organisations and banks of staff attitudes prior to computerisation. In descending order of severity, their fears were of less interesting work, difficulty of work and transfer or dismissal, as the effects of computerisation. Elizur reported active resistance to computerisation, for example by staff exaggerating or inventing technical or operational difficulties, as a consequence of such fears.

De Greene (1970) also identified apprehension, fear and hostility towards computers among the possible reactions. A complicating factor, aversion to change of any sort, may also exist.

Both Elizur (1970) and Weir (1976) describe cases of organisations which have had to abandon computerised methods and revert to manual working as a result of staff resistance.

Jagodzinski (1983) and Philips and Whimster (1982) found that highly trained staff with special expertise in an area that was being computerised were especially resistant to the change.

So, there is a paradox between the apparently reasonable expectation that people will, in general, take to computer systems and the facts which show clearly that, in many cases, they do not. There are many elements in the explanation of this paradox, and these can be found by examining individually some of the reasons for peoples' antipathy to computer systems.

First of all, we can distinguish between the different styles of use of a computer system. The bank customers' use is helpful and time saving for the individual. Such use is entirely optional and probably does not impinge in any important way on the central issues of the user's world-view. However, if the same individual is told, for example, that his company's product details which he refers to in his job as a sales office supervisor will now
be computer produced via a VDU terminal, the effect on his life is quite different. For one thing he will be obliged to use the system. If he is slow to learn how to use it he will lose face with his subordinates. It will also mean that his personal, informal information system, based on personal contact and developed over many years, will now give him no edge over his colleagues.

In other words, this type of use impinges directly on many issues which are central to the individual. His professional status, job security and self esteem are all potentially at risk from a proposal to introduce computerisation. Even if he is a loyal company man with high regard for his employer's interests, he is hardly likely to place these above such personally crucial considerations. Unless he can see some substantial overriding benefit in the proposed change he will probably oppose computerisation.

A third type of use is shown in the dilemma of the academic researcher. He is likely to be highly motivated to use a computerised catalogue or bibliographic search facility because he knows that it could save him hours of tedious manual work. On the other hand, if the system is not well-designed and clearly presented then he could miss vital references, or even whole areas of potentially fruitful material. Again, computer based information systems are likely to be regarded with mixed feelings in this type of application. Expert systems and natural language interfaces will probably displace intermediary operators eventually in systems of this sort, making the dilemma even more complex.

As well as illustrating the ambivalence with which people regard computerised information systems the foregoing examples also show that there is more to human-computer interaction than the terminal dialogue. The users' attitudes, beliefs and personal objectives are in complex interaction with the host organisation's objectives and norms, its task structures and with the general information and misinformation about computers that exists in the world in general.

These two aspects of human-computer interaction create two distinct classes of problem in the implementation of computer systems. First, there is the problem of representing the operations which the system performs to the users. The elements of the human and computer components are concentrated through the physical interface (for example, a VDU terminal and keyboard). They are set in the context of the task which the system is performing as shown in figure 1.

Secondly, there is the problem of user-acceptance. Figure 2 adds the additional contexts of organisation and world, each with its elements of norms, objectives, structures and so on, which have just been discussed.

Clearly, the elements shown in figure 1 are entirely central to the interaction between humans and computer systems, and it is right that they should be given priority in the systems design process. Nevertheless, the additional elements of figure 2 are extremely important and can, for the reasons discussed above, make the difference between the success or failure of a computer system. The problem is that the effects of these elements can seem diffuse, fuzzy or unpredictable, especially to computer systems analysts who are more used to dealing with the relatively deterministic, quantifiable issues of say, file design.

A comprehensive and detailed understanding of organisation and world elements in the human-computer interaction would require extensive excursions into psychology and sociology. However, for practical purposes, comprehensive and detailed knowledge is probably not necessary. Those involved in the computer system implementation, including the organisation's management,
Figure 1: The central elements of human computer interaction.

Figure 2: A broader perspective of human-computer interaction.
should nevertheless have sufficient understanding of the issues to be able to anticipate the sort of problems which might arise. Further, a systematic investigation of users' attitudes and beliefs with regard to the impending system, should be conducted as part of the systems analyst's fact-finding process. The latter exercise serves to identify particular worries among the population of potential users, which can then be tackled before they cause problems.

Guidance in understanding, users attitudes and beliefs, specifically directed towards computer systems implementation, is given by Jagodzinski and Clarke (1985). For example, Balance Theory and the principle of cognitive consistency (Eiser, 1980) explain why individuals may deny the advantages of a computer system if it also has disadvantages for them personally. To summarise, an individual prefers to hold beliefs which are consistent with each other. Thus, if he perceives disadvantages in computerisation he will find it difficult to acknowledge the advantages, even to the point of irrationality. Similarly, Personal Construct Theory, (Kelly 1955; Bannister, Mair 1968) postulates that an individual's view of the world is divided up into constructs: "Man is trying to predict the real world and the events with which he deals are real events, even though they cannot be absolutely apprehended, but only construed" (Bannister and Mair, p 13).

In his system of constructs the individual has those which are central to his well-being (e.g. job security) and those which are peripheral (e.g. the convenience of his banking facilities).

The prospect of imminent change to his peripheral constructs will not seem important, but "threat" is defined by Bannister and Mair as "the awareness of imminent comprehensive change in one's core constructs", such as the effect of computerisation on job status.

It is difficult to convey the value of the insights provided by the psychology of attitudes and so on, in such brief summaries. However, the main point is to show that systems analysts and management do need such insights if they are to avoid some of the pitfalls of computer system implementation. The interaction between humans and computer systems extends far beyond the physical interface at the terminal. Systems analysis increasingly recognises the full scope of the interaction and a corpus of relevant theory and techniques is now available to comprehend the interaction in its fullest sense.
References


