C H A P T E R 13

Concluding Remarks

1. Discussion of the Methodology of the Approach

Though the design of man-computer interfacesis becoming more and more important there are relatively few research results in this area. With the project presented here we hope to advance the discussion within computer science.

Our technological know-how and the methods of computer science have proved to be helpful. However, we had problems to actually include the human side in dp-system design. They were of substantial and methodical nature: We had to find out, what the main characteristics of a computer user are, and we were in doubt with what methods we could work in this field.

We finally chose to study man and computer by different means. We described the human side by factors which influence the user's behaviour. On the other hand we developed general design concepts basing on the deterministic properties of the computer.

Both components meet at the interface, which we formally described by nets. We represented the agency 'computer' by refined nets and automata, whereas the agency 'user' was not further formalized.

For the development of design recommendations for a man-computer interface we chose a deductive approach: From the rather general user factors we deduced design guidelines for a user-oriented interface. This approach seems appropriate out of two different reasons:

1. Because of the rapid progress of the computer technology computer science needs general methods in order to adapt design quickly enough to the continously changing reality.

Empirical studies alone cannot be sufficient to develop design criteria: they need too much time to achieve their results and they can only deal with those technologies already implemented. Therefore a deductive approach which leads to immediate results can be more appropriate than an empirical one.

2. On the other side, the main user characteristics do not change that rapidly, if at all. In the long run we consider empirical studies in this area necessary. They can help to develop a basis on which an optimal adaptation of computer technologies to individual human needs can be achieved.

It should be obvious that the design of man-computer interfaces should be done in close cooperation between computer scientists and social scientists. Both of these disciplines have a part in this task according to their specific know-how and methods.

Being computer scientists, we could only give a first and rather ideal contribution to the component 'user'. It nevertheless formed a basis on which we came to results for improved interface design.

2. A New Taylorism?

Our approach has been to apply different methods and means of description to man and computer. Another possibility is that of taking the same way to examine both, man and computer, within a common model.

One of these latter approaches is based on the idea that both man and computer are information processing systems ((see NEWELL/SIMON 72;CARBONELL 69; MILLS 74; MILLER/GALANTER/PRIBRAM 70)): "Regard men and machines as equal status components for system operations with equal requirements for development, state-of-art projections, and improvement, according to their own characteristics." ((MILLS 74, p. 5))

This leads MILLS to the conclusion: "A system depends on its components. The architecture of a system specifies the types of men and machines required, as well as how they are to interact as a system operation, i.e., the selection and arrangement of the system components, as well as detailed instructions for their behaviour." ((loc.cit.))
But he admits: "It is much more difficult to predict human performance than a machine performance. Sometimes the human fails to live up to a requirement." ((loc.cit., p. 4))

Though such approaches might lead to partially meaningful results, we think that in general they do no justice to users at a man-computer interface. The behaviour of men is too complex to be totally represented by formal models nor to be exactly planned ahead of time. "Common sense cannot be automated, no matter how much chess playing can." ((HOLT 74))

The information processing approach tries to formalize human intellectual and psychical processes. KIRSCH remarks that the human cognitive information processing system thereby is seen as a pure instrumental mechanism to control and regulate the interior and exterior behaviour of men ((KIRSCH 73, p. 563)). This reminds of taylorism and scientific management; supporters of these schools tried to rationalize physical processes in the industrial production. But when applying their results to real life situations they found negative impacts which questioned their first success in many cases.

The same is to be feared for the above mentioned theory of men as information processing systems, as one can see in the discussion of management- and information systems ((see KIRSCH 73)).

To counter the problem of a "taylorism at a high scientific level" ((see KIRSCH 73, p. 563)) we have to develop an image of man as a complex, social being: Man should be free to become emancipated in a technical environment. This opinion aims at a humanization of computer applications, that means, a strategy against taylorism in the design of man-computer interfaces, but for a widening of the present room for the user's

behaviour and decision making ((see TIETZE 74, p. 311)). Our report tries to contribute to this special aspect.

3. Problems of the Acceptance of the Results

Of what use are the results of this report? As we mentioned before, there are very few research projects on the design of man-computer interfaces with an emphasis on the human side of the system. Therefore this report is only a beginning and cannot present final design criteria.

If you look at the reported results - especially those of part III - you might consider them as rather trivial. Most of the recommendations can be found elsewhere, too. Also most of the dialog techniques in part II are known. But only in recent time these concepts have been linked together.

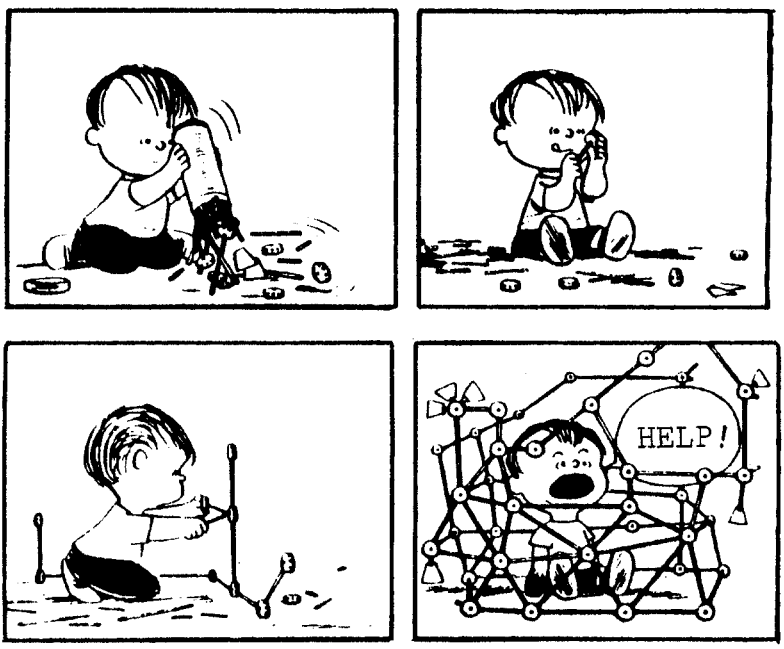
Like STELLMACHER ((in STELLMACHER 76, p. 383)) we think that our "catalogue of design criteria consists partly of obvious things. The more it is astonishing to see that most of these criteria are not at all met in existing systems or only in a small amount." Many query languages might look different if their designers had had a list of design criteria as we presented in part III of this report.

This shows one of the main problems in this area: Designers do not have the appropriate awareness nor the knowledge which is necessary to do user-oriented interface design . Therefore the corresponding topics (human requirements, human engineering ...) must be included in the curricula for system designers, computer scientists etc. All people involved in system design are to be made responsible for their product and it is necessary that they are aware of this. Additionally they must know which technological options they have.

User-friendliness is a typical concept relying on so-called "soft facts": it cannot be precisely defined and quantified. Therefore it will always tend to be displaced by so-called "hard facts" (technological and economical 'necessities').

Supporters of arguments basing on soft facts need a much more powerful position in the design process to get their suggestions accepted. ((see KIRSCH 73, p. 565))

Thus concepts for user-friendliness cannot be enforced in general. But there is a growing awareness of their necessity. "Increasingly there is an intellectual recognition of the fact that all systems are man-machine systems and that if the human part of the system is not performing effectively then it is unlikely that the technical part of the system will be efficient either." ((MUMFORD 71, p. 918))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INDEX