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A reevaluation of computer use

(The original publication of this chapter follows Chapter 35 by approximately five years.)

Chapter 35 addressed the then-current status of the use of the computer in the design and analysis of building environmental systems as it was in October 1975. In relating that status to the immediate past and the immediate future, the following statement was made: "enormous sums of capital have been invested throughout the past decade in seeking methods to use the computer advantageously in this field; many efforts have failed. However, at this time a plateau has been reached from which computer technology will doubtless move into a lasting and functional pattern."

Computer technology misused

Unfortunately, in some respects we witnessed in late 1979 a gross misuse of computer technology, which must be recognized and understood and then be openly discussed among competent and experienced system designers.

The problem appears to be the result of a certain overzealousness or optimism on the part of some scientists and technicians as to the capabilities of systems analysis programs in and of themselves and the exactness of a unique algorithmic approach, negating the possibility of correctness in all others. The result is, simply stated, that those who have unfortunately been so misdirected have essentially replaced the concept of the credentials of the engineer or analyst with the credentials of the computer program!

In some cases, this overzealousness has

resulted in the abandonment of valuable published data, because they were considered inexact when compared to the belief of what the computer could provide.

Computer not always necessary

Consider some examples of the problems identified. First is the problem of estimating annual cooling energy requirements. This is admittedly less than an exact science, and needless to say, the best that one can hope to achieve with manual techniques is a good "estimate" based on two things—statistical correlation and the skills of the analyst. At a time when the industry has a greater need than ever before (because of the energy situation) to estimate the annual energy burden resulting from cooling systems, the *ASHRAE Handbook & Product Directory* (1976 Systems volume, Chapter 43) has removed the information that appeared in prior editions and in its place inserted a discussion of what could be done if a valid computer program were developed or available. Yet with a good statistical data bank, including such variables as design load, weather, solar characteristics, and system types, a *good analyst* could very likely make a reasonable estimate. Thus, instead of abandoning the manual methods in favor of a possibly unavailable computer program, we should be improving the manual methods. There are times and circumstances when the use of the computer is totally unnecessary and unwarranted.

A second example of a serious misunderstanding of the use of the computer has come from the developers of some of the most heavily funded energy analysis programs being promoted for use today. The programs have been said to be valid only for comparative evaluations of alternative buildings, systems, or energy sources, *not* to provide absolute quantitative answers. Yet, any analyst who has attempted to use a systems analysis (or energy analysis) program for the purpose of conducting an exploratory energy audit is quick to recognize that for a given set of input conditions, the answer he seeks must be in the absolute, not the comparative (see Section IV). This "comparative" concept appears to be a holdover from the time when such programs were used or marketed primarily for the purpose of selecting a building energy source rather than for the purpose of analyzing all aspects of the building energy dynamics. It might be mentioned at this point that the difference in the purposeful use of a program may dictate its contents; when used for auditing or as a design aid, a program that is all-inclusive (loads, energy, economics) is considerably more cumbersome than one that allows the analyst to move in and out as the intermediate data are generated.

The third example is probably the most serious insofar as the future stability of the industry is concerned. This specifically addresses the problem of replacing the credentials of the engineer or analyst with the credentials of the computer program. This concept, which has been legislated in at least one state and appears to be actively promoted by some bureaus of the federal government, is that of "certifying" computer programs that an analyst can use to analyze the energy consumption of building systems. Such a concept must inevitably lead to determining what programs will be certified, which in turn leads to the rejection of the use of those programs that do not comply with the requirements for certification. Consider the implication of this philosophy. It is analogous to

commissioning a skilled and experienced engineer in bridge design to design a bridge but making it a condition of the commission that he can only use a given computer program (with which he may be unfamiliar or uncomfortable) to do all his structural analysis. One might ask, if the constraint on the commission is the computer program, what is the need for the designer? It would seem that the only logical way to achieve a design whose responsibility can be laid to an individual is to allow that individual to select the analysis procedure upon which *he will stake his reputation!* Any other concept invalidates the age-old approach that has been applied worldwide to responsibility in the engineering profession.

Recognize misuse of computers

Not only has this misguided concept been slipped into the legislation under pressure of unwitting legislators, but there has also been considerable pressure on the American Society of Heating, Refrigerating and Air-Conditioning Engineers to get into the business of either certifying computer programs or developing standards for such computer programs. That Society has undertaken numerous studies in committee, and several of its members have on their own conducted studies subsequently reported in symposium papers and other Society programs and publications—most of which have proved conclusively that *in comparing system analysis programs, the analyst has more impact on the answers (or output) than the specific differences among the programs.*

The areas of misuse of computers or of computer technology discussed above—whether it be the problem of overreliance upon computer technology, when the mode of manual calculation is required, or the trend to replace the analyst's credentials with those of the computer program—must be recognized and considered in view of their impact upon the profession. If not, the public, so long served by responsible practitioners in engineering, will be the loser.