Computing utilities for building designers and owners

by Professor T. W. Maver, Director of ABACUS,
Department of Architecture and Building Science, University of Strathclyde, Glasgow

Few people can now doubt that the computer revolution is upon us. Curiously, however, while we encounter computers in everyday matters such as commerce, travel and entertainment, their impact on the design and management of our building stock is scarcely discernible. One might advance a number of reasons for this state of affairs – some less than flattering to professions which make up the building industry; it is more constructive, perhaps – and certainly less contentious – to exemplify existing applications of the computer to building design and management in the hope of stimulating at least a modicum of intellectual curiosity in the topic.

Application of the computer can extend over the lifetime of the building – from inception and development of the brief to mid-life rehabilitation and beyond. Broadly speaking, current and potential applications can be categorized as those concerned with decision-making procedures relevant to the design or re-design of the building and those concerned with information-handling procedures relevant to the management of the design activity, the construction activity and the maintenance activity.

Within the latter category, acceptance of computer aids is more advanced than it is within the former category; the relevance of computer aids to payroll, job costing, critical path analysis, bills of quantities, component scheduling, resource allocation, planned maintenance etc is all too obvious. The relevance of computer aids to design (and re-design) decision-making is altogether less obvious and in need of exemplification.

Before examples are put forward, however, it is worth saying a word about access to computing facilities. As the cost of processing power decreases, it will become increasingly attractive to organisations to acquire a ‘turn-key’ system, ie a free standing computer wholly owned and operated by the organisation on which home-grown and bought-in applications programs can be implemented and maintained. For some time to come, however, many organisations will find it advantageous to get started by plugging into a ‘computer utility’. Computer utilities are operated by commercial bureaux selling computer power by the second, minute or hour over a telephone line (Figure 1). Customers dial up from simple and inexpensive terminals in order to use a wide range of applications programs which are maintained on the bureau machine. The utility concept offers the prospect of a low capital cost introduction to computer usage; as the commitment to computer applications increases, the user may find it cost-beneficial to invest in an ‘ineligent’ terminal which is also capable of operating in ‘stand-alone’ mode, thereby

Fig. 1: Remote access to a bureau computer, over telephone lines, from an inexpensive graphics terminal.

Fig. 2: Internal temperature variation over 11 days within an unheated house, produced by: a) the computer program ESP; b) monitoring of the actual house.

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Training the option of 'turn-key' and 'utility' modes of operation.

If the application of computers to design decision-making is to win ground, the 'Trojan horse' will be energy analysis. Nowhere is the power of computer-based models more in evidence than in the business of predicting the dynamic energy behaviour of buildings. Programmes now exist which will allow the building designer or building owner to investigate the consequences of alternative design or re-design strategies on thermal comfort and energy consumption.

The designer can test alternative building layouts, wall, roof and floor constructions, glazing patterns etc; the owner can test the efficacy of double glazing, shutters, cavity infill and alternative heating plant operating regimes. The accuracy of the new generation of computer-based energy models is exemplified by the comparison, sponsored by the Scottish Development Department, of the actual thermal behaviour of these houses in Livingston New Town, and the thermal behaviour predicted by the ESP program developed by ABACUS at the University of Strathclyde (figure 2).

At the other end of the spectrum of design issues from energy behaviour, is that of visual impact. Rapid progress is being made in the level of sophistication of programs which simulate the visual qualities of buildings yet at the design stage.

Figure 3 illustrates output from a program developed at Leeds Polytechnic which allows the designer to specify a viewing position. More recent developments elsewhere allow for the automatic merging of full colour perspectives, generated by computer, with colour photographs of the site. The potential of this technique for interior design is immense.

**Contract documentation**

To make the production information stages of the building design activity less labour intensive, software has been developed by a number of agencies for the automatic production of contract documentation. Developing software originated by the Edcog group at Edinburgh University, the Scottish Special Housing Association has brought into operation a superstructural package relevant to the majority of SS HA's range of houses. The package allows a rapid production of the full contract documentation including drawings (figure 4) and bills of quantities.

If the potential of the computer to building design and management is to be fully realized, the cooperation and commitment of all the professionals in the building industry is needed. Never before has there been a better vehicle for coordinating and concentrating the efforts of all those concerned to improve the quality of the built environment.

Fig. 3: Greyscale perspective views of a housing development generated by computer.

Fig. 4: Ground and first floor house plans drawn and dimensioned by computer.