INFORMATION TECHNOLOGY IN DESIGN: A PERSPECTIVE

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ABSTRACT. *In October 1990 a small group of people met at Ross Priory on the shores of Loch Lomond in Scotland to celebrate 21 years of computer aided building design. The calloboration - called CAAD Comes of Age - took the form of a seminar with papers presented by academics and design practitioners whose experience of this subject spanned these formative years during which the subject has grown from the minority time interest of a few eccentric academics into a multi-billion dollar business. A number of the papers and much of the discussion focused on what had transpired over the 21 year period and how the evolution of the subject corresponded to the predictions which had been made at various times in the past. This paper gathers together some of the perceptions which emerged from the event.*

METRICS OF GROWTH

Perhaps the best metrics of growth of the use of computers in building design have been priovided by the UK Construction Industry Computing Association (CICA).

For most of its 22 years, the CICA has charted the availability of applications software and, during the 80's, the level of uptake by the building industry. This historical archive provided the basis for the Building IT 2000 Project [1] which predicts the likely take up of various information technologies by the year 2000.

Figure 1, produced by the CICA, charts the cumulative availability of different types of CAD software over the period 1975-1988, and the rapidly increasing number of UK firms using computers from 1973 to 1990.

Profile

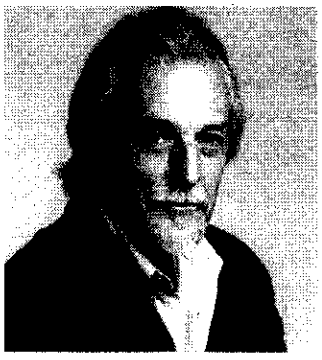

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Figure 1

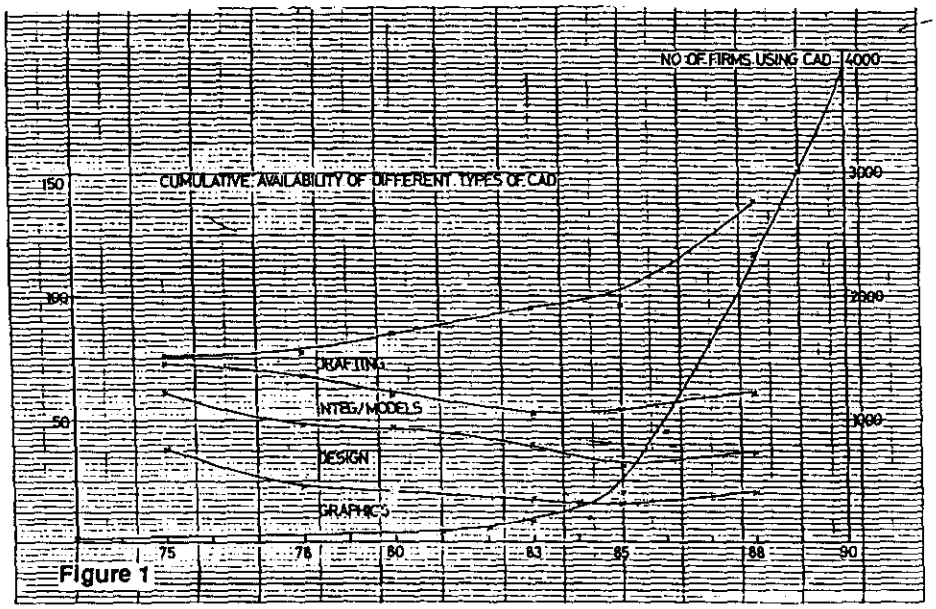


Figure 2

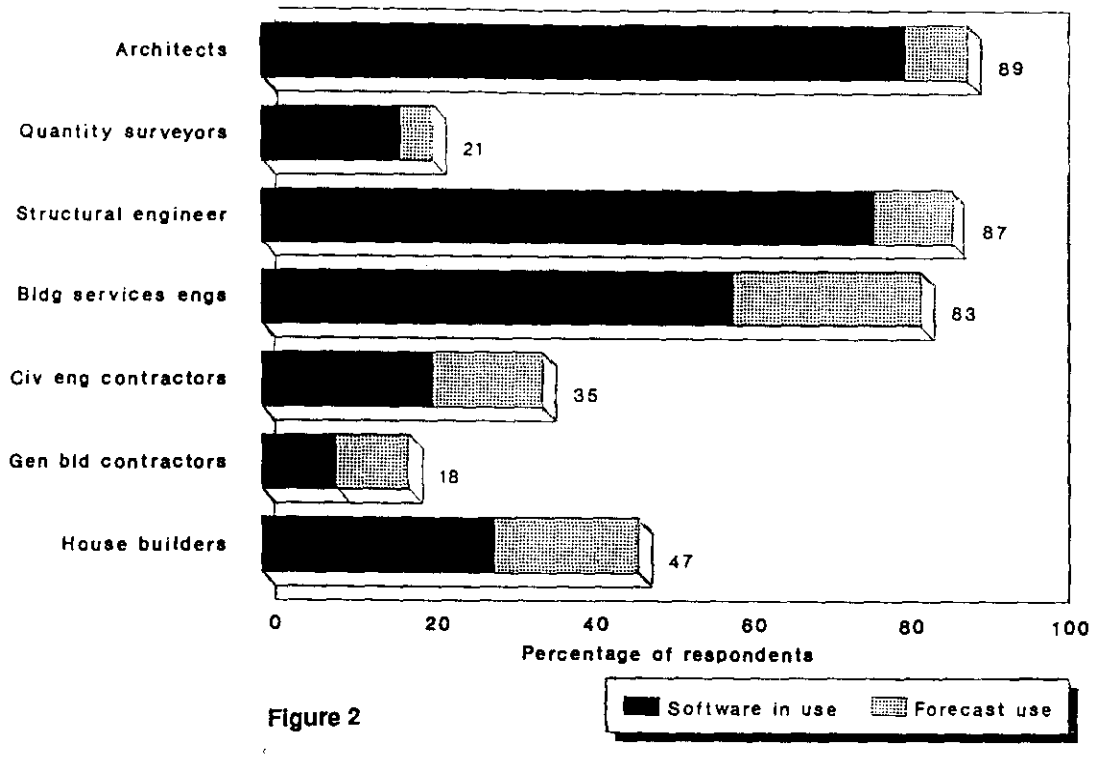


Figure 2, taken from the CICA publication Building on IT for 90,s [2] shows the 1990 and planned future on CADD software across the range of building design consultants.

PROFESSIONAL PERCEPTIONS

In 1977 in The Automated Architect [3] Prof Nigel Cross of the UK Open University attempted 'a kind of technological assessment' which concluded that CAD would have large effects on the design process but little effectiveness in terms of improving the design of buildings. He identified a number of areas or issues in which the growing use of computers in building design could be seen as offering either a promise or a threat to architectural practitioners. These promises/ threats were, for each issue, set out in starkly contrasting terms. For instance, on the issue of 'freedom or drudgery' the promise/threat were expressed as:

promise: the boring 'grunge' work of detailing, scheduling, drawing, etc is taken over by the machine, leaving the architect more time and freedom to pursue the creative aspects of design.

threat: considerable time, money and effort are spent in 'machine minding' - punching cards or tapes, writing programmes, tracing errors, maintaining the machinery and waiting for it to be repaired after breakdowns.

In 1990, at the Ross Priory seminar, Cross put these 1975 promises and threats to the 10 participants, asking along a five-point scale of just how true (or untrue) each promise and threat had turned out to be. The results for two of the more important issues are summarised below.

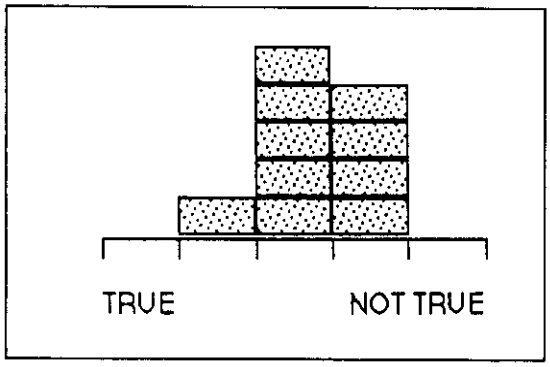
1. Help or hindrance?

THEN

Promise

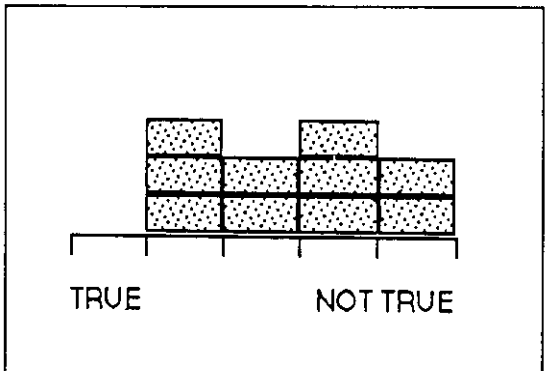
The architect is portrayed as skilfully operating a battery of sophisticated design aids ranging from a semiautomatic drawing board to large-screen CRT displays of 'walk-around' views of the proposes building.

NOW



Threat

The architect is seen surrounded by a buzzing, flashing, chattering confusion of computer hindrances poorly designed to match his limited human abilities in handling quantitative data.



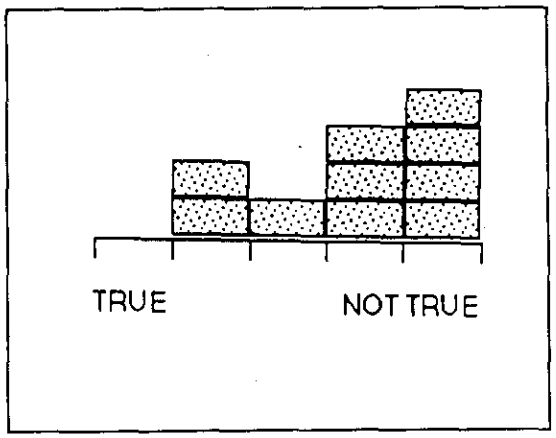
5. Variety or rigidity?

THEN

Promise

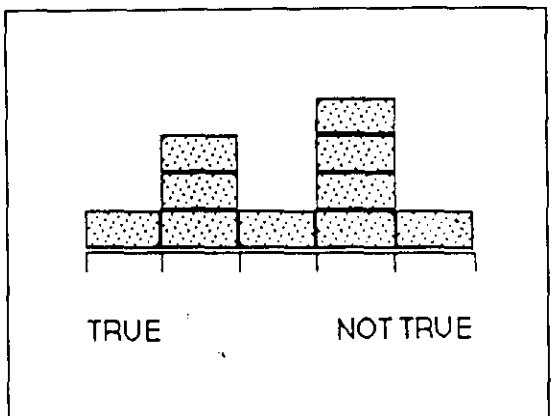
The architect approaches more nearly his ideal of the Renaissance 'Universal Man', handling, with computer help, a variety of design projects with consummate creativity.

NOW



Threat

The architect is dominated by the 'change agents' who create the computer programs and systems, rigidly constraining the projects the architect may take on and the types of solution he may propose.



WIDER SOCIAL IMPACTS

The wider social impacts of the increasing use of the information technologies on the building industry was the subject of a major report [4] sponsored by the Commission of the European Communities in 1985.

The report identified a number of likely impacts on design practice, on the education of building designers on the relationship between design and construction and on the relationship between client and designer.

In tabular form (Table 1), the report attempted to summarise, over various timespans, likely impacts of the application of emerging technologies and to anticipate the educational and research responses which would be needed if maximum advantage was to be taken of the opportunities offered.

CONCLUSION

The rate of development of the information technologies over the last 21 years has been phenomenal. In such a rapidly changing technological environment it is extremely difficult to predict with accuracy the timescale for changes in the way we carry out building design. It is fairly clear, however, that the pioneers of computer aided design of building correctly predicted the general thrust of the impacts of computers on the practice of building design; indeed, even virtual reality was anticipated in the early 70's. If

Table 1: Time-scales for actions and outcomes in CAAD

	Immediate (now)	Short-term (5 years)	Mid-term (5-10 years)	Long-term (10 + years)
Technology	Micros Drafting system Performance models	Super micros Partially integrated systems Early expert systems	Worldwide networking Expert systems Fully integrated systems	Computer ubiquity AI and natural language systems
Applications	Spread of use of computers in offices Drafting	3-D modelling for visualisation Regulation revision	Performance specification Solid modelling for appraisal	Participation Client-oriented CAAD systems
Impacts	Expense/time to implement Job differentiation; losses and gains	Shortage of qualified people Shift from private to public sector Demise of medium size practices	De-skilling Responsibility and liabilities Breakdown of professional boundaries	Improved building performance Higher grade professionalism De-professionalisation
Education	Architectural students awareness and familiarisation System evaluation Teacher education	In-service training and re-education Clients awareness Undergraduate CAAD systems	Post-graduate and mid-career CAAD education Undergraduate syllabus changes	Computer-assisted learning in design
Research	Monitoring of spread of CAAD Evaluation of CAAD education experiments Validation of existing programs	Human-centred CAD systems Kernal and shells for integrated CAD Interfaces and knowledge bases	Systems for naive designers Computer-assisted learning systems	Optimisation in design Non-traditional ways of communicating with computers

aided design is to be realised, urgent research and development effort needs to be focused on a number of related topics, including:

a. better ways of graphically hypothesising design alternatives.
b. systems for design decision-making which support the integration of the full range of cost and performance criteria.
c. faster feedback of cost and performance consequences of design changes.
d. the establishment of explicit cost/performance criteria for different building types.
e. client oriented CAD systems which facilitate building management.
f. multi-media techniques which replace folded paper drawings in the presentation and communication of design ideas.

Above all. we need to educate architects and engineers to manage the new technologies with authority and imagination.

REFERENCES

1. **Construction Industry Computing Association.** 1992. *Building IT 200 Project.*

2. **The Construction Industry Computing Association.** 1990. *A survey of information technology trends and needs in the construction industry.* Building On IT For The 90's.

3. **Nigal Cross.** 1977. *The Automated Architect.* Pion.

4. *The Social Impact of Computer Aided Architectural Design.* 1986. Design Studies, Vol. 7, No.4.