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Experience in CAD 1976 - 1984

During 1976 a building modelling system (RUCAPS), developed in the UK, was used by an architectural practice to assist in preliminary design, detailed design, and contract documentation for a major Middle East University. This system was used extensively for architectural input and it was accepted that backgrounds in plot form would be issued to the other consultants concerned, none of whom operated CAD facilities and were all based in the USA.

The software was constantly developed to satisfy project requirements during the course of the project but output was limited to the production of architectural data in plot form supported by relatively simple scheduling facilities.

Based upon a reasonably successful practical introduction the software was shown to be suitable for use by architects, structural and services engineers and indicated the possibility of working in an integrated manner. This could have been achieved if other consultants had operated a similar system or agreed to share the common facilities. Inevitably the combination of consultants on any one project were varied and the benefits of CAD were still too obscure to encourage widespread investment in these facilities.

The application of building modelling facilities within a multi-disciplinary practice would be expected to provide greater benefits both in co-ordination and economics than could be achieved at that time in an architectural practice. Not only should it be possible to work in an integrated manner but also develop application techniques to deal with aspects such as cost control, briefing, and analysis facilities not specifically related to drafting. In 1978 a building modelling system (BDS) was applied to the preliminary design, detailed design and contract documentation of a major project comprising university for 8,000 students, halls of residence for 4,000 students and an 800 bed teaching hospital.

Experience available on the practical application of this software to a project of this magnitude was very limited and the project development period was restricted to 23 months. Due to the absolute necessity to achieve the target dates set by the client a decision was made to limit input primarily to architect and structural engineer making maximum use of automatic 'clash' reporting facilities and limited use of briefing facilities. The design team was organised on this basis and was smaller than would have been anticipated had the project been carried out manually.

Unfortunately this decision reduced the potential benefits to be obtained from the system but provided an opportunity for architects and structural engineers to work together in an integrated manner with a common data base. In view of the size

and complexity of what was three projects in one it was belie that use of CAD in this fashion would achieve a higher degree co-ordination than would have been possible by manual methods.

The software performed adequately during all phases of this project which was completed in accordance with the pre set target dates. Architects and structural engineers were traine to input data relating to their specific areas of responsibility and service engineers were involved to a greater degree than was originally envisaged. There was no doubt that the decision to limit input to the disciplines mentioned enabled workstation time to be allocated to maintaining a high level c co-ordination and accuracy.

Experience gained from this project indicated that major overa benefits would be achieved by extending use of this type of software to all disciplines involved. A number of problems relating to management of this CAD system were encountered:

1. Senior management must be totally committed to the concept of CAD and understand its place within the organisation.

2. CAD cannot compensate for the absence of technically proficient designers. Indeed the system tends to identify design problems at an early stage by the requirement to wo at full size in three dimensions and the development of th design from an integrated data base.

3. Input of unresolved data should be avoided unless carried out as an evaluation exercise. The greatest benefits were achieved by identifying the problem, fully evaluating and resolving and then inputting the correct solution. This w and still is particularly important where many disciplines are involved on the project and each expects to treat the information stored as being current and correct.

4. To achieve overall benefits it is essential that those responsible for input are experienced in their own discipline. The creation of specialist operators/inputter was shown to be much less beneficial than training architects and engineers to understand and use the system.

5. Projects should ideally be committed to CAD from inception To use the system simply as a drafting device is to ignore many of the benefits that exist, particularly in evaluatio of alternatives and frequently leads to uneconomic use of staff and system.

6. Whilst the particular system used was potentially powerful it was rather inflexible in certain areas. To allow a ful integrated technique to cover all aspects of project work would require increased software development either incorporated within the system or as stand alone packages.

7. The application of any CAD system must always concentrate enhancing the design processes without in any way controlling the freedom of the design team.

It has frequently been assumed that Computer Aided Design techniques are suitable for large projects with extensive standardisation and repetition. Whilst experience with these two systems would confirm that this was true it was also clear that any project, however specialised could benefit particularly if all concerned were able to use the same data base.

Since 1981 a two dimensional system (GDS) has been used on a variety of special projects of varying size and complexity without any great degree of repetition. The work has involved architects, landscape architects, mechanical and electrical engineers and interior designers. This system has been used in an integrated manner by these disciplines following the discipline adopted for the building modelling packages.

Hardware has been linked to a word processor to assist in specifications and recently a firm of Land Surveyors have automatically transferred site data from their own system without loss of accuracy. During this period the only means of providing structural engineering data has been to input specific data into the common data base and provide plots required or alternatively to provide specific plotted output which the engineer has then completed manually. This has been in spite of the fact that the structural engineers concerned have operated their own CAD software but unfortunately none of these systems have been compatible with our own and therefore data could not be transferred automatically.

With the increasing number of Computer Aided systems available to those involved in the Construction Industry the undoubted benefits of integrated computer aided design seem just as difficult to fully achieve.

In a fully integrated use of CAD it is essential to encourage both client and contractor to become involved with their consultants. In an effort to achieve this integration we have recently studied the enhancements necessary to allow us the opportunity to make further progress.

In our view it is essential to base this integration on a full 3D visualisation supported by 2D drafting and space planning software. With these facilities we believe it will be possible to develop any project from inception to occupation and beyond. This will require co-operation from software vendors to overcome the problems of data transfer within members of the project team. Experience not only in the UK but in USA and Canada clearly indicates the need for the application of integrated computer aided design.

Provided the committment of senior management is supported by enthusiasm of their staff and suitable training of the selected system, effective use can be achieved in a relatively short time, often no more than twelve weeks.

The opportunity exists by use of this technology to improve the quality of the process by which buildings are created and in doing so allow all involved in design to concentrate their time on developing the most suitable solution for every problem.