Make the right move when buying CAD/CAM

ADE Analysis and Design Engineering provides a practical guidance on what to look for when choosing the right CAD/CAM system for your needs.

ANY SERIOUS investigation of CAD/CAM should commence with a feasibility study, which has an audit of current procedures as its main focus. All too often the starting point is a grand tour of the system vendors which sets the scene for the ensuing exercise of solutions searching for problems.

The feasibility study should identify and quantify workloads and resource utilisation in the engineering departments. Most production engineers are accustomed to having detailed statistics on workloads and resource utilisation available for management control and ad-hoc decision making purposes such as machine tool purchases.

The equivalent statistics for drawing office activities are rarely available. The reaction to such questions as how many drawings are produced per annum, what proportion are assembly drawings, and how much of their time do the draughtsmen spend drawing, is usually blank looks, "it varies" or "it is impossible to estimate"!

Among the techniques that can be used to find answers to these questions is an analysis of drawing registers. This is often an easy means of establishing the total number of drawings produced in a year. As a supplementary check it is useful to check the purchased quantities of drawing office stationery.

Rule of thumb

Sub-dividing these totals by drawing size and by drawing type, (ie component, assembly and schematic) is essential. It is also worth comparing drawing output with the rule of thumb which suggests an average output of one drawing per man-day. Thus a 10 man drawing office would typically produce of the order of 2000 drawings a year.

The applicability of general purpose computer aided draughting techniques can best be assessed by analysing a sample of drawings. Provided that steps are taken to ensure that the sample is representative, a sample of 100 drawings is usually adequate for most small and medium size drawing offices, at least for an initial assessment. The analysis should include estimates of the manual draughting time and modification work for each drawing. It is also worth assessing the content of each drawing for those features which favour the use of computer aided draughting techniques, ie repetition, cross-hatching and the use of standard symbols. The results will give an indication of the potential productivity gains for each type of drawing.

Activity sampling is the most effective method of determining how the draughtsmen spend their time.

The data gathered by activity sampling is invaluable in assessing the maximum workload, to which CAD/CAM techniques could be applied. The salesman who claims that 10 people could be saved from a 20 man drawing office if a 2:1 productivity ratio were realised, is talking rubbish. If the 20 men only spend one third of their time draughting, then the 2:1 productivity ratio will probably only apply to this proportion of their work and thus the maximum saving would be 3.3 men.

The existence of families of similar drawings is one of the factors which most strongly favours the use of CAD/CAM techniques. If similar drawings exist but the family groupings and their extent is not obvious, then the application of a geometry classification coding system to a sample of drawings is often a worthwhile exercise. Normally, the Opitz system or a simple tailor-made coding system can be used for an initial assessment. Once the sample of drawings has been formed into family groupings, the amount of similarity within each group can then be assessed. The aim is to establish what scope exists for the application of the parametric design techniques which are available with some CAD/CAM systems.

Design procedures should be analysed to identify the level of formalisation of procedures and the amount of repetition involved. If found to be significant then the possibility of encoding these procedures into computer programs should be examined. Where applicable, a stand-alone bespoke package or a program interfaced with a standard CAD/CAM system can often lead to far more substantial savings than is ever possible with a standard, general purpose system.

These various analysis techniques will yield a quantified and objective basis to the feasibility study. However, strategic business factors of a more subjective nature can, and often do, play a part in the decision to install a CAD/CAM system. For example, widespread use of CAD/CAM among competitors can be a powerful motivating factor.

The use of CAD/CAM for tendering can lead to substantially improved enquiry-to-order conversion ratios by establishing a higher technology image and better communications with the customer, or by enabling more design alternatives to be considered, thus resulting in a better or more cost effective proposal. Among other benefits which are often used to justify CAD/CAM at the strategic business level are: reduced lead times, reduced production costs, reduced work-in-progress, improved resource utilisation, and better design.

If management has identified the need for improvement in one or more of these areas, then appropriate studies will be required to determine the input that CAD/CAM might achieve. The technology is too expensive in terms of cash and management resources required simply to go ahead as an act of faith. Also remember another rule of thumb that 'any venture into a new area of technology will cost three and a half times the original estimate because of unforeseen difficulties'.

The feasibility study should show an outline justification case for CAD/CAM or, alternatively, an indication of other measures which are considered more appropriate. For example, if the main benefit sought is simply to reduce draughting time, then functional draughting is one alternative which has the advantages of low cost and low risk.

Phase

The company should also be able to produce a clearly defined set of applications, ranked in order of priority. Initially this is required as one guide to system selection but it should also be used as a basis for developing the implementation phase. A formally defined implementation plan is an essential precursor to a smooth and rapid introduction of CAD/CAM. Without one the project will lack clear direction and there are those who will take the opportunity to simply play with the system or to use it for their own ends rather than those of the company.

Finally, any feasibility study

should be able to produce a set of system selection criteria. These should take into account the factors arising from the proposed mix of applications and other relevant requirements such as the need for compatibility with other computer based systems. The aim should be to identify the key criteria and to relegate the mass of other desirable features to a list of points to be considered.

Ultimately, the decisions on whether to buy CAD/CAM and which system to buy are the company's alone and cannot be abdicated by hiring a consultant. Rather, the role of the consultant during the feasibility study and system selection stages should be viewed as providing a better foundation upon which to make these decisions. Given the scales of cost and risk associated with CAD/CAM, one or two per cent added to the former can be very worthwhile if the latter is reduced significantly.

One of the easiest ways of wasting money is to hire a consultant without a clearly defined objective and programme of work. To an extent, as with employees, consultants should be subject to management guidance and control. The consultant's terms of reference must be sufficiently detailed to facilitate this control. All reputable consultants will prepare terms of reference after an initial visit to establish the requirements and whether they are able to satisfy them.

A consultant's proposal should include: a brief outline of his understanding of the current situation and requirements; a detailed programme or work specifying the duration of each activity; and a fixed or a maximum price for the programme of work.

Obtaining and comparing proposals from two or three consultants is one important part of selecting a consultant. However, in interviewing consultants and in arriving at the short-list a number of factors should be considered.

Virtue

For example, what is his experience in CAD/CAM? Ask how many assignments the consultant has undertaken, what these involved and in which industries. Obtain references. Establish whether they have installed and used CAD/CAM systems themselves and if they have experience in tailoring or developing CAD/CAM systems.

Also check on his qualifications and background. The CAD/CAM consultant should have both engineering and computing skills. Very few have adequate strengths in both areas and all will have a leaning to one or other of these by virtue of their initial training and work experience. During the initial stages of feasibility study the consultant with the engineering background has pehaps more to offer as he is more able to communicate with engineers in order to establish and clarify their requirements.

What is his relationship with suppliers like? Some consultants have vested interests in certain CAD/CAM systems and vendors. Provided that these interests are fully disclosed then any possible bias is known and can be allowed for. Even consultants who have no financial interests in any system will clearly have preferences derived from previous experiences. If he does not admit to any then he is either being dishonest or alternatively he lacks experience in CAD/CAM.

The small consultancies generally have lower overheads and thus are able to offer lower fees or a more detailed study for the same fee. The usual argument in favour of the larger consultancy is that it has more staff, does more assignments and therefore has a wider experience. In the particular case of CAD/CAM this does not yet apply as none of the larger consultancy organisations has built up the depth of knowledge and experience possessed by some of smaller organisations who have been working in the area longer. ■