GIVING DESIGNERS THE SKILLS THEY NEED
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Today's Situation
Graduates from the Institution of Engineering Designer's (I.E.D.) engineering design courses in the U.K. form a minority of designers employed in manufacturing industry. For many years to come, attracting more undergraduates into engineering courses will have little effect on this situation.

Whilst the engineering design syllabus has evolved it fails to respond to the progressive loss of engineering manufacture to third world countries. The environment in which engineering designers work also has serious shortcomings about which nothing is being done. Additionally, most engineering designers either lack key skills needed today in industry, or work for company managements which have no perception of the benefits of developing and applying these.

Management Skills
Only about one management graduate in twenty will work in the manufacturing industry. For this reason the special management skills needed there are not taught at degree level or available as short courses. Manufacturing industry is therefore flooded with management graduates who have no basic understanding of it. In particular the fact that design commits 80% of manufacturing cost is generally neither recognized nor managed in industry.

Faced with low cost foreign competition such managers cut budgets and sack staff. If such measures fail they then subcontract manufacture to Third world countries.

The lack of design management coverage in engineering design courses has led the Engineering Council to create courses on the subjects concerned, but these fail to cover the key subject of how design determines product cost and how this can be improved.

In the 1960s four British engineering institutions ran short courses on this, but faced with passive opposition from industrial managements, all abandoned them. Such opposition to clearly successful methods remained an unsolved problem until 1998, when its psychological origin (cognition error) became clear and measures to deal with it were developed. Both the I.E.D. and Royal Aeronautical Society (R.Ae.S.) can, and should, be criticized for failing to follow up this important opportunity.

Skills Now Lacking In Design Offices
Engineering designers, who are often under-qualified, now work commonly for managements who have no understanding of desirable skills and methods in design.

Shortage of designers and cut budgets prevent design innovation, in particular of cost management through design which can prevent loss of manufacture to Third World countries.

Earlier research has indicated the principal skills (amongst others) which are lacking in design offices:
Knowledge of competition - 65%
Design review methods - 55%
Design for economic manufacture - 55%
Computer methods - 55%
Reliability methods - 55%
Materials selection - 55%
Creative design - 50%

Many of these needs could be met by company specialists or local universities but too often are not; a couple of exceptions were:

- Rolls Royce Bristol - During production of each aero engine type, cost engineering through design saved on average three hundred million pounds.
- Bristol Guided Weapons - gave designers all the skills they needed, and of design-for-economic-manufacture so successful that it had to be kept secret for forty years. The results were:
    * Initially product development 20% faster than competitors.
    * Later, repeated on time on budget product development.
    * Huge cost savings on manufacture which enabled Bristol to join the British Aircraft Corporation and funded the development of the BAC 111 aircraft.

Industrial Need
As an example, medium sized industries were asked 115 questions on practical methods of product cost reduction. On average only thirty such methods were in use at the time. There are now more than twice as many methods available, of which British industry knows nothing.

Necessary Action

1.   History shows widespread ignorance of necessary skills in design offices. The appropriate action is to **Determine** which skills are lacking and **Do** something about it. The preferred method would be confidential questionnaires to be completed by working designers, and appropriate National and In-company action.

2.   In-company the action is to give staff those skills from internal or local sources. In Australia staff needs can be investigated on the internet using open learning material.

3.   Nationally the action is to make them available to both design and management undergraduates. In Australia cost reduction through design is already available as open learning material.

4.   Shortcomings of perception by management graduates in industry must be faced and dealt with. In Australia, structured multidisciplinary teams can collaborate in open learning.

5.   Reduction of product cost through design achieves over 20% manufacturing cost reduction but requires 10 % more design effort. The financial benefit to companies is very large and easy to determine but special measures are immediately needed to increase the effective design effort so that the benefits can be quickly gained. The Bristol Aerospace Centre should give detail on how this was done.

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References.
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3. IED questionnaires to industry. 1998.