SAVING A THOUSAND MILLION POUNDS AT ROLLS ROYCE BRISTOL

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Ken Dangerfield was one of four British engineers who achieved such a large cost saving, turning loss making projects into profitable ones, generating more exports, and permitting the development of others which can then be afforded. His 1998 lecture on how he achieved this runs to 35 pages, Rolls Royce has lost the original but the summary which follows discloses his essential methods. Of course he had to overcome problems to achieve these things, which all engineers and administrators must learn to deal with. If Manufacturing Industry were to do the same, the Nation would be billions of dollars better off every year.

INTRODUCTION

In the early 1970s it was already clear that the Concorde had become too expensive for airlines to buy it. At British Aircraft Corporation, Harold Matthews had started cost engineering with detail designers and was routinely cutting cost by 20%. Hugh Conway, the managing director of Rolls Royce Bristol, learned of the need for this and he appointed Ken Dangerfield in charge reporting directly to him. Ken was helped by the fact that the Production Engineer for each component was identified before design started.

Ken's core group of eight people recorded both costs and benefits. It took very little time for benefits to exceed costs as self-defence by design and production was stopped in favour of simple and obvious solutions to problems. The core of his method was that "designers and production engineers must seriously challenge each other's work in a vigorous and persistent manner," as had previously happened on the Bloodhound weapon system. Thus he would have avoided the Airbus error of plastic wing leading edges. He recorded the cost saving and cost of introduction for each project his team worked on. The emerging production costs exceeded the contract price. Meetings with design chaired by production showed no promise of a solution.

Ken set up a cost reduction scheme to simplify shape, relax tolerances, optimize surface finish, match design with machine capability, etc. It resulted in a 12% cost reduction programme which Ken ran. Sir Stanley Hooker saw it achieve 24% cost reduction in 18 months, and extended it to auxiliaries causing 24% reduction in price of the fuel system.

Ken's conclusion:
To persuade your suppliers to take equivalent action, first start outing your own house in order and then help him do the same.

This programme rapidly became overspent on its allocated budget and "as an economy measure" (!) the Ministry of Defence stopped Cost Engineering. The Company countered this by a formal proposal to increase Value Engineering tenfold. When MOD heard of this the company was forbidden to make further proposals! The Company recorded that £170 million had already been saved at a cost of only £3.4 million, so the MOD Director had not been allowed the luxury of not knowing what he would have turned down. The final savings exceeded three hundred million pounds but the return on investment could not be seen.

Eurofighter

In 1992 the programme was having cost problems and Germany and Spain wished to withdraw. The Minister promised to read Ken's1982 brochure which had convinced the Ministry of Defence. Nothing was done; overspends have continued on the project resulting in massive losses.

Pegasus Engine
Pegasus was the vertical takeoff engine invented by Sir Stanley Hooker. This was developed on a e Cost Plus contract which gave Rolls Royce no incentive to reduce cost. By September 1983 the contactor's proposed savings to MOD and DOD of £32 million at a cost of £0.5 million. This offer was not taken up at the time.

The V2500
This engine was a version of the RJ 500 with the best possible fuel consumption. The Bristol team set targets for cost but when the work was transferred to Derby they were not picked up.

The Final Step
In 1983 the cost engineering activity was audited by a Head Office team and a favourable report issued. The Bristol commercial director proposed to fully integrate the cost management procedures into the day to day routines at Bristol. A few weeks later a company-wide reorganization prevented this being done.

Consultancies
Ken Dangerfield left the company in 1984 and took up consultancy for seven companies which had products selling for about half a million pounds and lasting ten or twenty years. In all cases they denied themselves large cost reductions by claiming a shortage of designers, which at the time they could readily have overcome.

Ken Dangerfield"s conclusions:

1. The procedures, results and conclusions are also valid in these other industries.
Non technical directors have great difficulty in accepting design as a profitable investment.
Designers lack the credibility and directors have a lot to learn about design's cost potential.

2. Design as an investment - Investment in machine tools brings returns of about 20 to 50% per annum. Investment in design cost engineering brings returns never less than 100% per annum, and commonly 200 to 500% per annum.

3. Typical value to a company - Nontechnical managers should evaluate engineering costs up 10% and manufacturing costs down 20%. Typically operating profit is trebled and return on investment more than trebled.

4. What is wrong? - Why do design initiatives such as Value Engineering and Design for Life Cycle Cost die? Individual functional directors have individual goals which their staff must share; cross-functional activities will therefore die. Kens conclusion is wise and of great importance:
As long as the design-production interface cuts through the middle of the design chain, cost will be out of control, the losses undetectable and the company will not address their proper goal. The Cure is to make the Design Director responsible for process embodiment and process detail until delivery, reporting directly to the Managing Director. The Production Director is responsible throughout for production operations.

Lessons for Today's Manufacturing Industry

The methods were used for ten years at Rolls Royce Bristol, with total cost savings of billions of pounds. Among the initial achievements was the rescue of a major aero engine from loss making and many lessons were learned about how to set up cost engineering in- company so that it grows and survives. But:

1. The Ministry of Defence regularly killed cost reduction by design; they must be educated out of it as it has cost the Nation billions of pounds.

2. Most approaches to cost Engineering have died due to management ignorance and departmental opposition; department heads dislike external control of their department staff.

So:

3. What works best is top-level support for leading interdepartmental cost reduction at all stages from requirement to late manufacture.

4. Presentation of benefits must use discounted cash flow otherwise the great benefit of immediate rather than later action is obscured.

5. Shortage of designers is used as excuse for lack of immediate action. Designers can only spend half the week drawing while the rest of the week is spent chasing information for design. So get others to offer it on time! Concentrate on important urgent items only! And there are plenty of design consultants and unemployed designers available.

6. Management is unaware that cost engineering can readily double the return on investment of European Aerospace.

7. Widespread Management ignorance ‘ensures’ that funding for design has no capacity for cost reduction activities. Ken Dangerfield, rightly, used part of his cost reduction to fund design better.

A cost reduction of 30% would mean there would be no risk from Third World competitors, often 100% more sales with greater employment, and more net profit for the National Economy as well as relieving pressure on the Defence Budget. The Nation would be crazy not to do it. Start by educating eight key industry sectors.

Reference

1. Dangerfield, K. "Directing and managing cost-effective design - successes and failures” published by the R.Ae.S. on 27 January 1998 (Note: the R.Ae.S have lost the original, and cannot find a copy! The Institution of Engineering Designers does have one copy.)