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WHEN EVERYTHING SEEMS RIGHT AND IT STILL GOES WRONG – A CASE STUDY

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1. Introduction – The road to Hell is paved with good intentions

Few case studies describe a product failure yet often more can be learned from a design failure than a success. This case has the added interest in that it describes a design project involving three quite different companies operating at a great distance from each other. This paper describes how an apparently ideal combination of partners failed in the design process. It, also, proposes some observations that could be adopted in similar multi-company/ multinational joint venture design projects.
The author was Non Executive Director in Company A at the time that this case study took place.

2. Background

It seemed like the perfect combination. Company A, based in the southern states of America, identified and patented a new technology that allowed part of an item to go cold at the press of a button. This was an invention that could lead to a very successful product having clear advantages over processes currently used.
Company B, the second company, based in the UK, could sell this innovation once developed, as they had extensive experience in the market where the product could be used and they possessed all the necessary test and verification equipment that could be used in the product development process.
Company C already produced some of the raw material that would be used in the design but, also, being a large and successful company, had adequate finance to see the idea through all the design stages and into production.
On paper, with the combination of these companies, it would appear that the project couldn't fail but it did. The author was actively involved in the project so had first hand access to all the project details.

3. Communication – You can't make a silk purse out of a sow's ear

There was initially a tie-up between these two small companies A and B and at the low cost, early stages of the design process [Design Council 1985] there was sufficient finances available to fund this highly innovative product. Being a new concept the time taken, the cost and the risk of failure was always likely to be higher than in an improvement to an existing product using a known and tried concept [Hollins and Hollins 1991]. Thus it soon became apparent that more finance would be needed to complete the design and development process and productionise the item than could readily be made available by the two small companies.
In these early stages of the product development the communication between the company A and B had been satisfactory, aided by many trips from America by the head of Company A (often included as part of visits on more profitable business trips). But the development of the product was slower

than it needed to be due to limited finances available as the cost of the project essentially had to be covered by profits from existing product sales and specified in the development budget. The affect of a slow and fast rate of investment is shown in figure 1. This results in the product reaching the market later and this could affect subsequent sales. Of course, there were differences of opinion between the two groups in the direction and emphasis in different aspects of the project but these tended to be resolved easily. The 'scientific' side being led by company A and the market knowledge side led by company B.

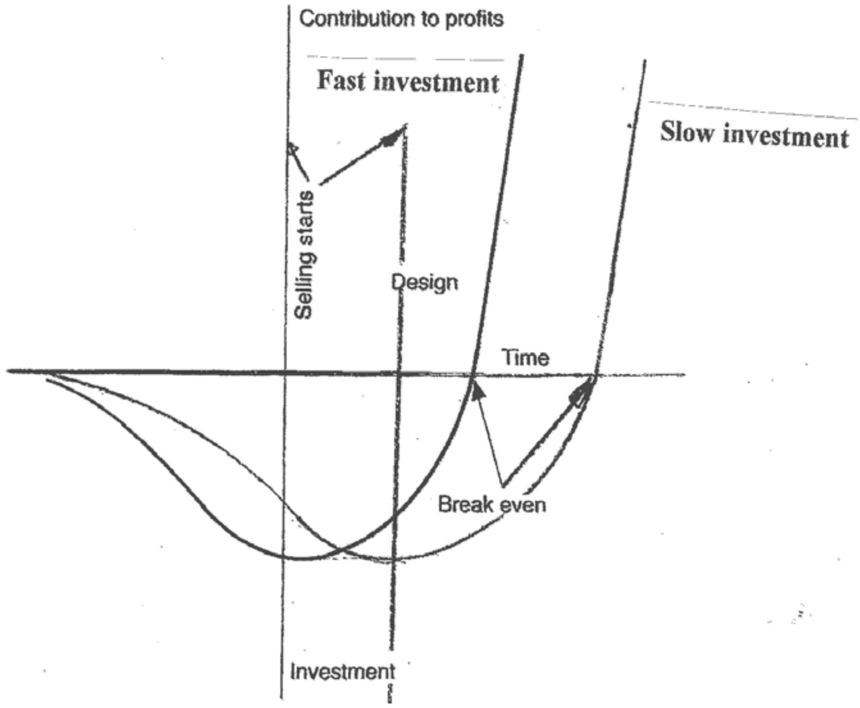

Figure 1. The affect of investing in design

4. 'Keep your cards close to your chest'

Even at this stage there were problems in that company A would not provide enough prototypes to be tested in company B's sophisticated test equipment. This perhaps demonstrated a lack of confidence in their own work in company A or a feeling that any faults discovered by company B could be used negatively in discussions. This could also have shown a lack of confidence in their relationship with company B. The net result was an insufficient set of accurate test result data on which to base further design improvements. In retrospect, already in the process one could see that the demarcation lines drawn were too strong. Company A (leading the scientific side) tended to ignore design improvements proposed by company B, ignoring the latter's vast experience in developing design solutions (albeit less scientifically based) to their home market. This was similar to the 'over the wall' design as first described by John Crawford of Cranfield University in the mid 1980's. It also ignored the observations of Osborne [1993] that the most senior people or specialists do not necessarily have all the best ideas at the concept (creative) stage of the design process.

5. 'Many hands make light work'

The tie-up with company C seemed likely to solve all the problems. They already produced the chemical that could be modified for the design and they had adequate finances to fund this development including all the high costs associated with productionising the process which is typically almost half the total cost of any manufactured product [Hollins & Pugh 1989] figure 2.

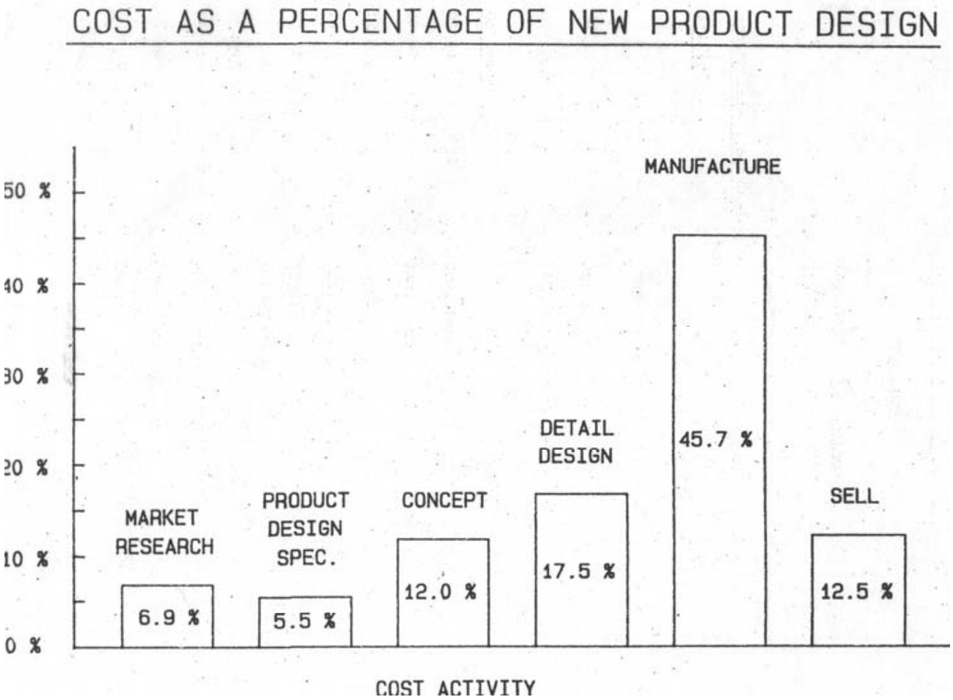

Figure 2. The cost of the various stages of the design process

The joint agreement gave each of the three companies a third share in the new company with the development being done by companies A + B with the funding to be made available by company C and initially this worked well. This was potentially an innovation which is defined as 'the transformation of an idea into a novel saleable product or operational process in industry and commerce or into a new service' [BS 7000 – 10 1995]. This is essentially, 'an invention in its first market form', so the time for the various stages of the design proved difficult to predict. The timescale for this highly intensive scheme began to fall behind schedule, but the expenditure of the project up to this point was still relatively low.

6. 'He who pays the piper calls the tune'

At this stage of the development company C set milestones and stage gateways [Cooper 1988, BS 7000-3 2005], which had to be achieved before the next financial investment for the development to companies A + B were triggered.

Something, often assumed in the relevant design literature, is that the milestones to be reached by each stage gateway should be on a logical progression to the successful conclusion of the design process – which is a successful profitable product operating within its market. Unfortunately, ignoring the advice of company B who knew the market, these milestones bore little resemblance to the real needs of this known market but were more related to the relatively unsophisticated test (proving) equipment owned by company C. This implied a lack of trust (as well as careful financial management) by C that they were not prepared to accept the test results that would be supplied by B.

The dilemma then arose, should companies A and B develop the product according to the needs of company C or do they go for the market requirements? The main reason for products failing is 'not understanding the customer requirements' [Cooper 1988] but in this case B really did understand their customer needs. The pragmatic decision was taken – develop the needs of company C and take the money. After all, this would be a stage towards the needs of the market. The alternative would be to abandon the whole programme or develop the product at a much slower pace than before using the small development budgets of company A and B. The available budget would then be hardly adequate to fund such a large venture, especially at the later stages of the programme. It was decided to combine working to the specification milestone and take the cash injections as each milestone was achieved.

7. 'Too many cooks spoil the broth'

One of the successes of the Japanese industry has been explained as the close link between product design and process design (design of the method of manufacture). Up to this point, the scientific approach taken by company A had not fully considered how the product could be 'ramped up' for production. It should be said that company A, throughout the development, had considered the cost element of each aspect of the design. Perhaps, more than was considered necessary in company B as it is a high added value market. Even so, at this detail and embodiment stage [Pahl & Beitz 1996] of the design process there had been little real thought given to how the product could be manufactured in the large quantities anticipated.

Both companies A and B had always realised the potential of the product and if it could be mass-produced at low cost, as entering new markets could then become open to the device. A decision had been taken, early on by A + B, not to quickly 'commoditise' the product, that is, mass produce for low cost high volume markets. In time, this would eventually come about as part of the slow build up that they could be able to afford. Like any new product (DVD players for example) the initial product is introduced at a high cost and in small quantities. Then the price and costs fall. This is due to the high cost of R & D being paid off and the initial high introductory promotion that can be allowed to slow as customers become familiar with the product. Also, the high cost of productionising and automation (if any) can more easily be clawed back. There would, of course, be an element of 'skimming' the market – charging a high price for a product in a market where there are no direct competitors.

[Best 2005], amongst others, has discussed how people purchase new products that are introduced on to the market. Initially, the purchasers are called 'innovators' and in the next stage of the product life cycle they are called 'early adopters'. These people do not mind paying the high introductory price because they want the special features of the product (or want to impress their neighbours) The first part also applies to organisations who see the benefits and are rich enough to utilise these within their products. As production builds, economies of scale are introduced and competition appears, the price will fall and this results in greater market penetration. The product will eventually become a 'commodity' that can be afforded by almost any user. In this case Companies A & B were keen to slow the onset of this stage as they were not easily able to ramp up production and also they wanted to 'cream–off' the profits available from a rich sector of the market for several years before allowing the price to fall. This would also allow a slower and more controllable rise in their abilities to produce for the bigger market.

With the finance available from C it would be possible to quickly move towards commodity markets. The design could be produced not only for the high cost, high value market but also for products such as moving flowers, chocolates in hot countries or other lower value products. This could have damaged the likely advantage of the product for company B. But, on consideration, it was realised that as they held one third of the shares in this company, they would still be capable of making good profits with the increasing demand from these larger markets from this patented product.

8. 'In the land of the blind the one-eyed man is king'

The productionising of the potential product was taken up by company C as they had a vast experience in both batch and mass-production. Unfortunately, the vast experience of this company did not include knowledge of the specific techniques needed for this development. Company C tested many of their own prototypes but, when samples came to B for test on their more advanced equipment, it was clear that they were a long way from being satisfactory in terms of the markets needs or even the criteria for acceptability as required by C. For a product to succeed it must demonstrate advantages over that already on the market - benefits which may also be 'Unique Selling Propositions' [Dibb, Simkin, Pride & Ferrell 2001, Hollins, Blackman & Shinkins 2003]. Competition is always wider than most companies realise [marketing myopia Levitt 1961]. As the product was performing, it was not competitive with company B's existing offerings. Nor was it sufficiently reliable for the very demanding pharmaceutical market [Hollins and Pugh 1989]. Lack of 'empathy' between the participants meant that it was difficult to sort out the problems in frank discussion.

9. Conference calls don't work

At last there was a degree of concurrency within the design process (that is, doing aspects of the development in parallel to save time) as the product design and process design was occurring together. But one of the most important aspects of simultaneous engineering is the need for effective communication – and this did not occur. Communication across countries proved to be a problem. Initially, the various parties made visits for face-to-face meetings but this was expensive. Then telephone conferencing was used and, at first, this was thought to be beneficial, as it was not expensive and saved valuable director time spent in travel when compared to face-to-face meetings.

After a couple of months of such negotiations they were abandoned in favour of a return to face-to-face meetings. This was because the barriers between the three parties seemed to be growing. The 'non-verbal' communication was missing and, after some phone meetings ended in acrimony and arguments and phones being 'slammed down', it was realised that communication really is better when undertaken round a table. The informal discussion on the weather, family and social events tends to be missing in a formal link-up and a 'them and us' situation is enforced. This was partly overcome by the parties all meeting together in the US for a social get-together, where talk of work was out and the aim was purely to have a good time. In spite of this, although it did improve the situation, the work rifts were never entirely overcome.

10. Concurrency

As greater effort was put into productionising greater became the problems with concurrency. Concurrent engineering works well when the detailed stage and the tooling up for manufacture takes place in parallel. This is more difficult in an innovative product that, by its very nature, is not fully understood [Hollins & Hollins 1991]. In this development the attempts were being made to productionise at the concept stage, where fundamental changes were being made to the design. This caused much 'stalling' in company C where they would start to embark on production tools only for the basic elements of the concept to be changed by company A rendering the new tooling obsolete.

A lesson to be learnt here is that Concurrent Engineering can only be effective when the basic concept has been finalised (agreed and signed off). Production Engineers (or those implementing a service) require stability in the design to be able to, at least, draw up the tooling or methods of implementation. Concurrent Engineering does NOT mean that all stages of a design process can be undertaken in parallel. At many stages (and between several of those stages) concurrency is inappropriate.

11. The Product Champion

What the project really lacked was an independent Product Champion. This has been defined as 'a person dedicated to the promotion and introduction of a new product, although not necessarily responsible for any aspect of the programme' [BS 7000 – 10 1995]. A Product Champion was needed to fairly overcome the natural differences that occur within any product development. The ideal person to be a Product Champion needs to be an enthusiast but also a realist who can see the big picture. There are natural differences that appear. For example between marketing and production with the former requiring products made to match the needs of every customer and the latter needing economies of scale and it is the product champion who can resolve differences.

As an example, some years ago the author was involved in consultancy with a company that made wind generators. Senior managers who were extremely competent and well qualified made technical decisions but their abilities were focussed on the small area of their expertise. In a particular project a product champion was selected who was aged twenty-five. He was not as senior as the other managers involved but he was capable of seeing the 'big picture'. Each manager would give his or her expert opinion and the young product champion then decided the overall direction for the project. In this particular project it worked.

Usually differences of opinion, when they occur do so between different departments with different priorities but all within the same organisation. This was magnified in this case where the participants were from different companies. Within a single company it should be fairly easy to ensure that the Product Champion is an individual working with the best aims of the company at heart. But in this case, (and similar multi-company projects) who could be an impartial Product Champion? In this project a person from company A was the nearest to being the champion but this was never altogether accepted by the other companies or very successful.

Over the months effective communication became less efficient as the various groups battled with the difficulties that arose in the development. A satisfactory solution in this project was never found and a search has not found anything researched that solves this problem. How can an independent product champion be selected in multi-company developments?

Perhaps an outside consultant would have helped to solve the problem. But this would come at significant cost if someone was to have sufficient involvement in the project to know the 'ins and outs' of each company as well as being able to understand the technology.

12. If at first you don't succeed…?

It was company B who left the syndicate first. Company C felt that their input and expense justified them in taking formal leadership of the project by asking for a 50% share of the product. Company B felt that this undervalued their contribution and would render them and company A very much the minor players in the subsequent decision-making. Their 1/3rd share of the company set up to develop the company was worth nothing on paper and this was then handed over to the other two companies. Company B did leave the syndicate with an agreement (and contract) to undertake prototype testing and to market the eventual product in Europe - when eventually successfully developed. This development is continuing. Company B keeps a 'low profile' interest in this project but have directed their interests in new (and successful) directions. Of course, there was a lot written off in sunk costs, wasted time and lost opportunity costs. But as with any decision on sunk costs what has gone, has gone and the decision for future action must be made on the basis of what is considered best for the company in the future.

13. Observations on the project

In retrospect, one could see that the demarcation lines drawn were too strong. Company A (leading the scientific side) tended to ignore design improvements proposed by company B, apparently forgetting the latter's vast experience in developing design solutions (albeit less scientifically based) to their home market. This was similar to 'over the wall' design and also that the most senior people do not necessarily have all the best ideas at the concept (creative) stage of the design process [Osborne 1993].

The study shows the importance of specifying the <u>right</u> milestones in a stage gate process [Cooper 1988]. In this project they were related in terms of technological 'breakthroughs' rather than the needs of the market. This contradicted the evidence that people buy 'benefits' rather than 'technology' [Hollins & Hollins 1999]. This can result in the development of a working product that does not fulfil customer requirements – which is known to be the main cause of product failure.

The study also describes the importance for agreeing, at the low cost early stages of the design process, the sequence in which different markets should be penetrated as this will further determine the type of technology that would be appropriate.

A lot has been made of video and conference calls in multinational projects. Certainly this saves money and time but in this case the loss in the informal and non-verbal communication had serious damaging effects on the trust between participants and likely success of the venture. A social get together partially overcame this problem which involved a social evening where talk of work was taboo. Although this partially cleared the air there remained a lack of 'camaraderie' between certain participants for the entire project.

Leadership (a product champion) is necessary in a design project [BS 7000 – 2 1997] but it can be difficult to identify an impartial leader when separate companies are involved. It must also be recognised that the richest and largest company may well harm their own position by taking a too dominant role in the leadership and operation of such developments [Badke-Shaub & Stempfle 2004]. In this case, company C, through making the largest financial investment in the design, demanded a dominant role on the proceedings. The results confirm that understanding of technology and the market can be equally as important as adequate finances in engineering design.

Overall, it can be seen that much of that advised in the design literature holds true but in some areas, the reasoning and advice is rather too simple.

13.1 'A rolling stone gathers no moss'

The project is still progressing and will eventually enter the market. Company B left the project and gave up their shares in the consortium but have an agreement to test samples and sell the subsequent product. Company A and C are still modifying the design and working on a product that can be reliably produced in batches but it is anticipated that the product will appear albeit later than originally anticipated. It is still expected to be successful but in a smaller market that was originally anticipated.

14. Conclusions

It is hard enough to develop a successful product within the bounds of one company. It is even harder when three companies are involved and each may have differing interests, strategies or objectives. This study shows what is likely to happen in similar situations where companies are involved in design alliances. The problems described in this paper do not appear in other writings on alliances as most concentrate on the advantages but fail to point out the pitfalls that this real case study uncovered.

Furthermore, in small organisations, the success or failure of an engineering design project can significantly alter their entire strategy as the strategy is more associated with the design success of individual projects than would be the case in a large organisation.

Independent leadership is vital if those from each company are to feel that their company is getting a fair deal. With small companies, this can be both difficult to achieve or expensive if outside independent but knowledgeable, expertise is to be used. Managers in all three companies have learned from the experience and would probably do things differently if the situation appeared again in the future. Perhaps, even in business 'it is better to have loved and lost that to have never loved at all' (Shakespeare).

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