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WHAT IS SUCCESS AND FAILURE IN PRODUCT AND SERVICE DESIGN?

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1. Introduction

It has been estimated that a new product is introduced every 3 ½ minutes but research has shown that most of these new products fail. When one attempts to define what actually constitutes a success or failure in design and to whom, the picture is not so clear but there is a general consensus that it is too high. There is also general agreement that the best way to attempt to eliminate failure is right near the start of the process. It is here where most of the main reasons of failure are rooted (Market Research and Specification) and, therefore, through doing these stages correctly it is easier to identify and eliminate failure at the low cost end of the design process. Figure 1 shows that relatively early in the design activity the decisions taken will commit the operation to costs which will be incurred later.
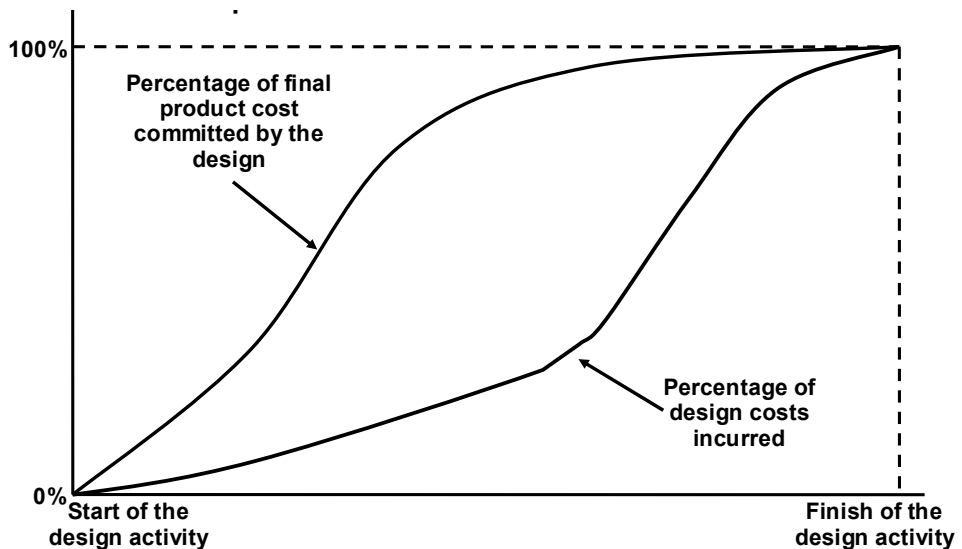

Figure 1. The early stages of the design process are the most important. [Berliner C. and Brimstone A.]

It must also be remembered that even a well organised new product department will have almost as many product failures as successes. Financial planning must take into account the fact of life that the cost of at least half of the development budget will be wasted on new product failures. Failure is a

natural part of success and any good organisation and manager must accept a certain amount of failure whenever people are trying something new. It is certainly not good design management to claim that their design department or organisation do not have failures as this is hiding from the truth. This does not mean that they should tolerate the obvious stupidity that has been demonstrated in many product and service failures.

This purpose of this paper is to confront this confusing aspect and to identify potential 'danger areas' in the total design process up to, and including product disposal. From this are drawn solutions and conclusions that should assist in the management of design.

2. What is failure?

If a company produces no new products they will just decline and fail. If they design failures, they will go out of business far more quickly. The main causes of failure are marketing failure, people don't buy it; financial failure, it doesn't make any money; technical failure, it doesn't work and political failure, the source of failure is action by the government. In Hollins & Shinkins [2006] political failure is omitted as these types of failures are invariably linked to another type of failure. For example, the poll tax introduced by the British government in the late 1980s was a political failure, but it also failed through being a market failure, people considered it unfair; a technical failure, if people decided they didn't want to pay it was difficult to collect and a financial failure, it has been estimated that the scheme lost the British government £18billion.

Right at the beginning of the design process it is often difficult to judge a technical failure as these can occur almost anywhere in the process through an inadequate specification, using the wrong concept, faults in the detail or in poor implementation. The other main reasons can usually be identified early on. Market failure is the most common reason for a product or service to fail. Financial failure occurs when the cost of design and implementation of the service have not been sufficiently thought out in the specification stage. The cost of failure must also take into account and cover the waste of exhibition, catalogue and promotion costs, the waste of money and time of setting up the service side and the waste of time for the sales people trying to sell the product when they could be selling something else. Any manufacturing time is wasted and the stores and service space taken up with what is, effectively, expensively produced scrap. This indicates that the actual cost of design failures to an organisation is much higher that most people realise

3. Design Success

What constitutes design success is also unclear. In simple terms a product or service can be considered a success if it makes a profit [Hollins and Hollins 2002]. Even this is not as simple as it sounds, because the profit must include the interest payments on the money borrowed or the loss of interest if an organisation takes it out of the bank to do the development.

There is a further dimension to this, that when a company is developing a product they are not using the time to do something else, which may include developing a better product. This could be called lost opportunity costs, which was discussed by Starr as long ago as 1963. Of course, the development cost must include all aspects, including the promotion and marketing costs and this would be part of the specification in any organisation using total design. It may also need to include the cost of disposal. The extreme example is nuclear power stations, where the actual disposal was not considered when these were designed, they were actually designed not to be taken apart and this has left us with an expensive decommissioning legacy that only government is prepared to take responsibility for in an otherwise privatised industry.

So even the simple measure of profitability is not as clear as would first be thought. There are other measures of success, for example, a new product could bring good publicity to the company, and it could raise the profile of the organisation, or even gain it a reputation for being at the forefront of their market. Some products may be considered flagship products, such as, Concorde, which BA used to show potential customers that they were at the forefront of technology and aeronautical transportation.

4. Defining success in the process

One of the problems identified in new product development is the drift in what constitutes success as the design process progresses. Companies start out with what they perceive is a success and this usually is a product that will bring in a satisfactory Return on Investment that will please shareholders and not damage the reputation of the company or the saleability of other products in the company range. It is only after a period of time, when these feature that make up a successful product look less likely to be a success, than those involved try to save face by redefining success.

More recently, the potential success of the 2012 Olympics has been redefined as being the number of gold medals won by the UK, the redevelopment of a poor area or even the legacy value of the sporting facilities left behind. One such claim made to the author was 'what value do you put on the smile on the faces of children?' that the Olympics would bring. It is suggested that all of these may well be justified as long as they are secondary to the profitability of the entire event. Furthermore, it cannot be assumed that the winning of the Olympic bid was the only way that this rundown area of London would be developed. It might well have been more profitable to all parties to develop the area without the interference and disruption that arranging it all around a three week sporting event of 2012 would impose.

Looking through the various pieces of literature of new product development and design, there is almost nothing that specifies clearly the precise point in the process, where design success should be defined and how it should be defined. Clearly this must be in the first 15% of the process, as mentioned above and certainly at every stage of a stage gate process [Cooper 1999]. It is proposed that success is defined in the original design brief and, if it is to be a financial measure, it would need to specify the return-on-investment and the timescale by which profitability should be achieved, including the cost of money. This would need to be refined through the process and this is most likely to be part of the full specification following the initial market research. Note that it states refined and not redefined especially if the financial measures are replaced by something that is not a quantitative metric.

4.1 Success to a customer may not mean success to the company

So far success has been discussed from the point of view of the organisation, but part of this defining success must include consideration of success from the customer's/stakeholder's point of view. It is important that success includes both of these groups. Recent examples of schemes (schemes have to be designed too) that pleased the customers but not the companies that organised them include the following that emanated in the UK: Hoover wiped out a whole year's profit in their free flights to USA scheme, people who purchased Hoover vacuum cleaners and washing machines were then offered free flights to the USA. People purchased Hoover products just for the free flight and then sold on the Hoover products at a low price. Hoover could not meet this demand for flights and the market for their products was damaged by a flood of second-hand unused products that came on sale. This may well have been a contributory factor in the acquisition of Hoover by Electrolux.

Another example is the cosmetic company Avon; customers could receive vouchers for a mobile phone if they spent £15.00 on Avon products. The company anticipated a demand of 60,000 that would take up this offer and they were forced abandon the scheme when demand rose to 750,000.

It would appear that customers also have a long memory. People who purchased a kitchen up to £5000 from Texas, the DIY chain, were told that if they kept their receipt they would get a full refund after ten years. The holding company, Hilton, were surprised when ten years later customers sent in receipts forcing the company to pay out £11million.

In Christmas 2006 Thresher, the off-licence company, sent vouchers to a select group of people allowing them 40% off purchases of wine and spirits. On the voucher it said that it could be sent to friends, the voucher then appeared on the internet and half a million customers called in to the 2000 shops requesting the discount.

The above examples show that it is very important that the full ramifications of all such actions are fully considered at the outset. It is not difficult to scenario plan any such scheme or the effects of any such design or, in fact, any such company action prior to it being implemented. This is another aspect

that ought to be in the specification stage of the design process and shows that the spec. compilation must be undertaken by all those who can have an affect on the eventual success of the product (or increasingly, service). It is really another application of risk analysis, but is a necessary part of design and, therefore, any design must satisfy customers and the company. The former so that there are repeat purchases and no ill effects on the company's reputation and the latter to ensure profitability.

Some authors include communication as another source of failure and, certainly, examples include the Challenger that crashed because the information about the sealing capabilities of a 0 ring at sub zero temperatures was not communicated to mission control at NASA. Another example is the Mercedes A series that journalists found would almost topple over during the 'elk test'. In this a car is swung on full lock on one direction and then back in the other direction (as if to avoid a child on the road). This delayed the market introduction by a year, cost an estimated £1000 per vehicle to cure the problem and resulted in a car with a very hard ride. The surprise was that this was discovered by journalists, but had not been discovered within the design teams of Mercedes. This suggests a communication problem or, worse, that certain engineers were aware of the problem, but were too 'nervous' to declare it. Both of these communications failures described were also technical failures, so could be fitted under the three headings given above.

The communications problems may also be due to 'Over the wall' design in which the Market Researcher has an idea and throws it over the wall to the 'designer'. This person sits in a window-less box and spends all day twiddling with the CAD equipment. The designer then throws some drawings over the wall to the 'production' or 'implementation' people. They develop it and throw it over the wall to the sales people 'here it is, get out and sell it'. Product development involves every one who is needed to create a successful product or service. This means that New Product & Service Development involves not only sales, marketing and production (or implementation) but also customers, suppliers, financial departments, in fact, all who can make a contribution to the success of the product or service.

5. Other products and services are superseded

These need not be commercial failures. If a company enters a market near the start and makes sufficient money during the mature phase of the product life cycle and then leaves the market as it goes into decline, then this is good product management. The problem occurs if a company enters a market late and leaves it without having made a suitable return for the financial outlay made. This is when it becomes a failure. For example, if a company spends six months in preparation for a 'trend' product that has a fashion of only three weeks then they could well have a failure on their hands. Another example could be a company that is now designing new VCRs when the market is moving to other ways for recording and playing entertainment. Generally, as time passes, products and services are replaced by newer ones. This should not, in itself, be regarded as a failure.

6. Spin-offs

Another delusion is that an organisation can make a big profit from all the `spin offs' that come from a new product failure. As a `spin off' from a dish of mould, Penicillin was one hell of a profit maker (albeit for the wrong people) but there are cheaper ways of developing the space blanket and non-stick frying pans than going to the moon. David Farrar, formerly of Cranfield University, investigated 'spin offs' from various products and found that pound for pound the `spin offs' from Concorde and the space race were actually less profitable than with most other products.

7. The number of failures

American observer Van Halen stated in 2006 that 'every day, many people have great ideas, less than 1: 1,000,000 of these ideas will reach the market place'. Of course, most of these ideas may have been dropped because the person wasn't in the right place to do anything about them, but they could be considered failures. There are different figures for the amount of failures that occur throughout the design process. Figure 2. shows a histogram from an amalgam of results from various researchers. Perhaps what is more important is the cost of these failures.
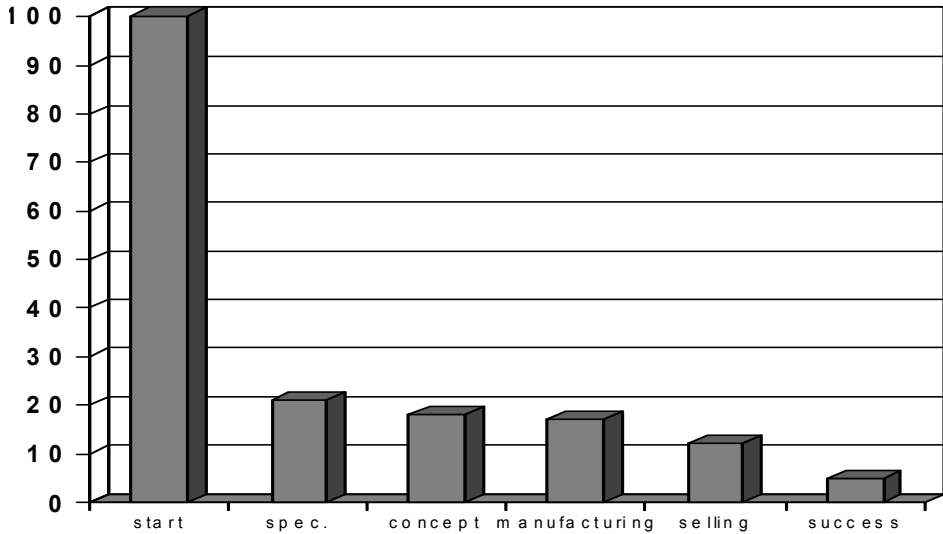
Figure 2. Failures in the design process: The number of designs left at the start of each stage
Hollins W. & Hollins G. (2002)

Figure 3 shows that a product or service that is identified early in the design process as a potential failure and eliminated is good design management. Eliminating such failures enable those involved to devote more time to something potentially more profitable. For the organisation, it means that a greater focus and concentration on fewer and potentially more successful products will enable these products to reach the market earlier.
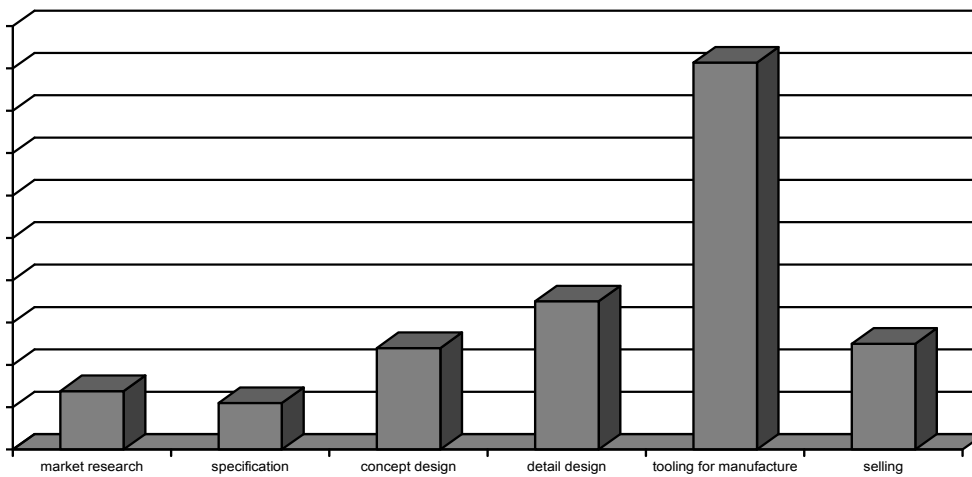
Figure 3. The percentage showing the cost of each stage of the design process. Hollins W. & Hollins G. (2002)

This has further advantages in that any interest repayments can start earlier, the product may appear in the product life cycle, allowing higher prices to be charged (skimming) and, in such cases, the company will get a reputation of being ahead of the field (for example Sony) the effect that, with a

reputation for being such a company, employee morale will go up. Therefore, there are several advantages to applying rigour early in the process to eliminate potential failures and this can only be done if success has been also specified and defined in real terms again at the start of the process.

The problematic failures are those design ideas that are taken through the whole of the design process with all the associated costs only to fail when put onto the market. These account of almost 66% of new designs.

8. Not enough failures?

It was said earlier that the failure rate of new products and services is much too high and needs to be reduced. It could be suggested that, perhaps, it is not high enough. From what has been said earlier, the problem is more likely to be the cost of these failures.

Reducing the investment in failures can be a major step forward in the management of products and services. Consider the cost of the various stages of the process. Initially these are relatively low as there are not many people involved, no investment in capital equipment or materials and most of the work (market research etc.) is still only on paper. As the design progresses the costs increase dramatically, especially during the implementation stage. The early stages or 'front end' is the low cost end. A product failing at the market research end of the process is much less expensive, and therefore, far less dangerous to an organisation than one failing after it has been put on the market. So this is where design managers must concentrate their efforts.

9. Learning from failure

Failure should be a learning experience and documented so that it does not occur for the same reasons in future. Research undertaken by Topalian and Hollins [1998] for BS 7000-1 [1999] gave an insight on how those people that were dealing with planning products for the longer term coped with design failures. The thread that ran through these findings was that those people learn from failures and learn how to avoid making the same mistakes the next time.

Several organisations had a formal evaluation process that was used whenever a project was abandoned to see what lessons could be learnt from the failure. These did not take the form of apportioning blame but were used to improve the existing processes. Encouraging experimentation and accepting failure was a feature of the most successful innovative organisations. One director said: 'The trouble here is that we do not have enough failures...with every failure we learn so much'. Another said: 'We do learn a great deal from technical failures. We...consult the problem and then come out with products that are even better'. Certainly some of those interviewed in the research considered a 'failure to be a waste of time and money' and that resources were 'too thin on the ground' to risk failures but these were in the minority!

10. The Affect of Innovation

An innovation is an invention in its first marketable form (an often misused word). The very fact that it is new means that it takes longer, because those designing it are not familiar with all aspects of it. It also costs more, as the increase in design time is a financial investment. It is also more likely to fail. This is because market research is more difficult with something that is unfamiliar to potential users. It is rare that an innovation has no competition from something that already exists on the market so this latter point can be partly overcome by identifying the potential benefits of the new idea and then researching if potential customers want these benefits. Having said this, it is the fact that the failures of innovative products tends to be higher than those for product improvements. On the other hand, if a company designs and innovation that people want, it is likely to be a big success because (by definition) there will be no exactly similar product on the market.

11. Technological Challenges and Opportunities

The days when designers and others forced IT and other technology onto inappropriate processes seem to have passed. The misused application of technology can turn a bad process into a slightly faster bad

process which helps the customer little and can increase costs a lot. We have become wiser and now apply technology to genuinely improve products and services. Technology can improve services and can be used to make people feel special and individual. At its basic level it can be seen in 'junk mail' how a large mail run can still include the names and other details of the individual that make the recipient feel 'special'.

We are starting to realize that people do not buy technology, they buy what technology does. This means a greater emphasis in design, through the use of ergonomics or human factors engineering, to make products easy to use so that customers fully benefit from the technology that is on offer. There is no point in expecting customers to read user manuals as they get more bulky with more technology and they are usually badly designed in themselves. If a product or service is difficult to use, it is not the fault of the user but the fault of the designer who didn't take their brainchild sufficiently far enough forward in the design process. Ease of use has been found to be near the top of what customers want from a product - along with reliability (often achieved through quality), safety, aesthetics and value for money. Generally, if products are designed for the old and disabled they will be easier for use by everyone. This is known as 'Inclusive Design' (see BS 7000-6).

Consider one of the great examples of this is the computer mouse. An easy-to-use but sophisticated idea that makes us use more of what our computers can offer. In another example, a franking machine had thirty buttons on display and this just confused users. Some research identified that over 90% of users only used three of the buttons. The housing was redesigned to show the three most used buttons and the rest were put under a flap with a notice advising that those needing more features would find these under the flap. The final design looked better and was easier to use by the majority of users.

In a less successful example, computer terminals used for billing in Kwik Fit tyre and exhaust centres were made with a large space between buttons as it was known that the employees would be using it with gloved hands – which showed a good insight into the difficulties of the operators. This was a good feature but spoilt because instead of using a QWERTY keyboard, they used ABCD etc. The employers hadn't realised that many of the employees had a computer at home and were comfortable with the standard keyboard layout.

When introducing technology that will be used by the 'masses' it has been found to be successful to introduce just one or two new aspects at a time and then introduce more technological sophistication when users have become familiar with the first level of technology. An example of this was the successful introduction of bank cashpoint telling machines. It was possible to add more features when first introduced but these were held back in the early design so that customers would become used to the whole new concept. The early models were also designed so that additional features could easily be added. This aspect of design is known as Platform Products [Wheelwright and Clark 1992] where a basic production platform is developed with the intention of building new features into it at a later date. Black and Decker is one company that is very successful at this.

12. Conclusion

It is too simple to state that profitability is the only measure of design success but it remains the main one if companies are to survive and prosper. Within not-for-profit organisations, such as charities or local government authorities, 'profit' is not the main focus but it is still necessary to work within a budget and to maximise the potential within that budget.

It is necessary to define at the outset what other measures of success should be incorporated especially at the selling and service end of the process right through to the eventual disposal of the product. It is also necessary to define what constitutes a failure so that a product design can be recognised and appropriate action taken as soon as this point is reached, which may involve abandoning the project to devote scarce resources better on something else.

Success for the customer may mean failure for the company and the reverse is also true. For example, a company that makes a good profit from a help line base in a low wage economy may be alienating their customers and jeopardising their company future. This is all part of relationship marketing [Baran J. Galka R. and Strunk D. 2007].

A simple way to judge the success or failure of a new product from the company's point of view is to consider the question - would you have liked your money invested in it?

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