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## **USING PRODUCT & PROCESS DESIGN TOOLS TO IMPROVE SERVICES**

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### **1. Introduction**

Employment in the service sector in industrialised countries now exceeds that in manufacturing. In Europe and USA 80% of people are now employed in services and even in Japan employment in services started to exceed manufacturing this century [Sakao & Shimomura 2004]. Therefore, engineering designers must turn to the service sector for new opportunities and by doing so, will find many of their existing skills can be adapted to this wider market. This paper looks at some of their skills that can be so applied.

Existing product and process design tools (currently used by practitioners in manufacturing) that can also be used with services will be described. Then, a different way of approaching the concept stage when designing services will be included. Also here is introduced 'Life Style Study' as a trigger for service design to be used in conjunction with blueprinting. In this, the existing tools used in the creative concept stage of the design process can be used but need a different emphasis.

### **2. Blueprinting**

Initially this paper will describe how a Blueprint fits in with the models of the design process in the development of a service. A Blueprint is defined as a process broken down chronologically into sequential constituent stages. The process involves describing, in small detail, the various stages of the delivery of a service. In other disciplines it is sometimes called a Project schedule, Project or Process Plan, or a Process Map. Blueprinting is a simple but effective way of identifying areas for improving the way in which an organisation delivers its products and (mainly) services. Look at the process. Look at the customer chain and understand how customers relate to the process. This will identify bottlenecks and areas where the service quality may be improved. One then designs the problems out of the process. This also has the affect that service quality, which tends to be mainly qualitative and therefore difficult to measure, can be made more quantitative by giving the service process the appearance of a production line.

Blueprinting, as a method for designing services, was first proposed by Shostack [1984] and later developed by Randall [1993] and others. Only recently, but increasingly, blueprints have been used much more widely in the design and quality improvement in services (for example Meyer M. H. & De Tore A. [2001]). But writers and researchers have not fully realised that design models – the process by which product and service design can be managed – can be linked with the use of service blueprints. This allows certain existing process design tools and techniques to be used to greatly advance the design, development and improvement of services. It will now be shown that blueprinting fits neatly into the stages of the service design process.

### **3. Design Processes**

A service cannot be effectively designed without a design process as this will ignore the existing competencies and resources available to, or needed by, the designing organisation (time, activities, cost people concurrencies etc.) To a lesser extent, it is unlikely that an effective service could be designed without the use of a blueprint (customer activities and parallel activities), as this shows the interactions by/with customers and this almost defines a service.

Design models have been around for some twenty-five years and these show the broad sequence of the (highly iterative) stages for the design and development of new products. These have grown in complexity over the years since Pugh presented his model of Total Design back in 1982. They now start from an idea or trigger (fitting in with the corporate strategy) and going right through to the termination and disposal of the product [BS 7000 – 2 1997 and others]. Part of this is the product design and the process design (the method of manufacture) and it is on these that this part of the paper will now focus.

By knowing the design process model it is possible to work out the time for each stage of the design and the time that each stage should take. From this it is also possible to identify concurrencies that will indicate where greater communication is required but also where there can be savings in the project timescale. This indicates the total time and cost of the design (hopefully, with some accuracy, very early in the process). It will also be possible to identify what people will be needed and where they will be needed in the process – which should also show when they will be needed. From this design process model it will further be possible to show priorities against other projects occurring within the organisation and, as a result, any delays likely due to the clash in the requirement for limited resources between projects.

Hollins & Hollins [1991] developed models for use in the service sector and in 1994 the British Standard Institution published a Guide on service design management that also included a service design process model. This standard is being updated [BS 7000-3 2006] and the broad process model around which the standard was written is shown in figure 1.

The detail stage of the product design and the process design must occur together if the eventual product is to be easy to produce, and therefore inherently of higher quality and lower price. In the design of a car this would be the actual design of the car model and the design of the production methods, machinery and tools to produce that model.

In a service the delineation may not be so clear-cut between product and process. In many cases the production and consumption may occur together so customers and service providers together are part of that process. The product itself may be intangible, like legal advice, but in such cases the service delivery may be clearly specified and could be shown in a blueprint.

Most services ride on the back of products. In the supply of car spare parts it could be that the manufactured part and the service part (and therefore the blueprint) almost occur in sequence. So one of the main delineations of a blueprint is between the customer involvement and what goes on in parallel but without the customer directly being involved, which could be called ‘the line of involvement’.

### **4. The Link Between Design Models and Blueprints**

Design Models are normally presented as a vertical sequence whereas the presentation of the service blueprint is normally presented horizontally so where does the blueprint cross the design model? In a simple blueprint that covers just the progression of the customer, and parallel activities that occur as the customer passes through the process, the blueprint can almost be considered as a production process. This being the case, much of the production process design techniques can be applied to improve the blueprint. After all, it was the linking of product and process design in manufactured products in Japan was one of the keys to improving quality and lowering costs that first enabled them to win world markets. The improvement in aspects of quality has already been described in the work of Meyer M. H. & De Tore A. [2001] and De Brentani [1991]. This can be taken further to apply more of the tools of TQM to further enhance the quality of the process such as benchmarking, production planning techniques and process layout etc.

So it is clear from this that a service blueprint is really a demonstration of service process design and this fixes its position firmly in the total design process from the detail stage through to implementation and subsequent product and process improvement (although the iterative nature of design may mean that it is considered earlier in the process).

Blueprints should always be presented with a base of time and this is essential for determining the parallel stages, the concurrencies, the total time and therefore, cost. The production tools that can be applied in this new context will include Value Analysis, TQM, and Line of Balance, queuing techniques and JIT.

## **5. How Service Design can be improved**

If a blueprint will show the stages that the customer passes through when they use the service and the parallel activities that occur at the same time (if sufficiently well constructed), it will also identify bottlenecks that may slow or reduce the quality of the process. It will also show who will be involved in the delivery of the service (and therefore potential skill shortages). From this can be identified the timescale for the service delivery and the potential costs. It will also show the critical path upon which any delay will result in a delay in the total process.

It will now be shown that Just In Time (JIT) can be applied more easily, with greater effect and better results in the service sector than in manufacturing. Much as Work-In-Progress (WIP) slows the lead-time in manufacturing, the application of JIT in a service situation can make the passage of customers through the system to be more efficient. In manufacturing WIP takes up space, increases transport distances within the operation and ties up capital. All of this also applies to customers in the service sector - only more so. Waiting customers before or between stages of the process (e.g. at a hairdresser's shop) have to be housed in comfortable (expensive) surroundings and are likely to complain if kept waiting – lumps of metal do not! Furthermore, the one real failing with JIT in manufacturing is the potential build-up of finished stock if the capacity planning is inaccurate. This is the worst type of stock as all the value has been added and the items then have to be stored – slowly depreciating (finished cars in a field waiting to be sold). In a similar service situation when the customer has finished they pay and go – there is no finished stock.

In JIT bottlenecks in the production process can be identified and eliminated and whenever this occurs, the process becomes more efficient. This efficiency often appears as a reduction in lead-time. In the service situation, this is shown as a faster through-put of customers, a reduction of queuing and a more effective utilisation of space. The analogy of 'daily deliveries' can be drawn with the use of an appointment system where suitable.

Aspects of capacity planning can also be applied. To optimise the use of plant and equipment it is necessary for management to appreciate how demand varies over the weeks and year. Most of these are applicable to services with the exception of holding stocks, as, by definition, a service cannot be stored. In a service (such as transport) the demand in services can change by the hour and the process must be designed to accommodate these swings. Figure 2 shows the variation in demand that occurs on one London Tube line. This is a far more difficult situation than would be found in manufacturing. Knowing the variations it is possible to plan breaks, maintenance, restocking and stocktaking and even where aspects of automation would be beneficial (bank ATM machines, automatic ticket machines, Oyster Cards etc).

To look upon a service as just another application of manufacturing techniques would not have met with Shostack's [1984] approval. 'The operations side of services often use work flow design and control methods such as time-motion engineering, PERT/GANTT charting, and quality control methods derived from the work of W. Edwards Deming. These procedures control provide managers with a way to visualize a process and to define and manipulate it at arm's length. What they miss is the consumer's relationship to, and interaction with services. They make no provision for people-rendered services that require judgement and a less mechanical approach.'

All still true but one should not lose sight that improvement can be brought about by the 'mechanical approach' and by using the latest developments in production engineering and that these can lead to greater consumer relationship and interaction. By applying these to the blueprint, efficiencies can be

achieved which benefit both the supplier and the customer and need not damage these 'customer relationships'. Therefore, the blueprint needs to be analysed using the same tools that would be used in analysing a production process - which was entirely what Shostack was against.

In Shostack's original article a time study element was included and over the subsequent twenty years (actually longer if one includes the earlier work of Herzberg et al [1959]), such an approach of payment by quantity is now discredited and is 'anti TQM'. On the other hand, improvement through reduction in time for the service can benefit all concerned and allow more time 'for making people special' as well as a faster throughput of customers and hence profit.

Blueprints have been proposed as a method for improving service quality but these tend to omit many of the more important qualitative measures such as Mystery Shoppers (the measures from these can also be quantitative). In this, the measurement of the quality of a service is through getting 'customers' to use the service and judge the effectiveness of each stage. Mystery shoppers are now widely used in the service sector such as by transport companies (air and train), pubs and hotel chains and before it can be applied some form of interaction of the customer with the service supplier needs to be identified and the process drawn. Typically, this is through some form of blueprint. Bottlenecks can also be identified.

## **6. 'Lifestyle'. A different view on creativity.**

'Lifestyle' could give a good indication as to the new products that people may want and, in turn, include what companies should develop and market. This goes a bit beyond giving the customers what they want from the usual findings of market research. It involves developing services that relate to what might improve the way people live, without them obviously being aware that they might even be needing them. This is most effective when undertaken in conjunction with a blueprint.

This is the type of thing that would emerge through a slightly different view of the market. Rather than asking people whether they want a particular product or service, it starts by asking what people want to improve their lives. For example it could be that they want to look and feel good, be stress free, have more time to do what they want and live a long time. Trying to satisfy these aspects of their lifestyle can drive the clothing industry, health club/fitness industry, cosmetic industry and, probably even, the cosmetic surgery industry.

Taking this further, what are the subsections of these? People like to alter 'time frames' and video recording is an example of this. They want to see at one time some programme that was shown at another. They also want to have more time - hence all the labour/time saving devices that have been promoted for more than a century, from vacuum cleaners to microwave ovens. They also want a good time, hence leisure pursuits and the holiday industry.

A possible good extension of looking at lifestyles is to consider different scenarios of people's lives and then see if there are profitable services that can be introduced and supplied by a company. For example, consider a person's typical day and see how it unfolds - what goes wrong? What don't they like? One can learn far more about potential new services through looking at what people do not like rather than what they do. People do not like cleaning their cars (could dust be removed by an electrostatic charge being applied to the car?) People do not like travelling to work (beam me up Scotty?) How can your company develop a service to improve people's lives at a price that they are prepared to pay for these services?

It will mean that (only in these cases) service design will start with a concept stage prior to both the market and specification stage of the Total Design Process. This will be followed by a further concept stage. The existing methods can be used but the overall 'frame of reference' will be shifted to apply this thinking in a new way.

### **6.1. For an example of this 'Lifestyle' concept development: a variation of the 'People Carrier'**

People take turns to do the school run. Is there a market for a new product variation for a service in this area? How would the design of a car be changed if it were modified for the school run? It would perhaps need multiple keys for multiple person use and those who used it would need to be logged (via the door lock?) Could the rear seats and seat belts be designed to take, say, four children instead of

three adults or there be child seats if used for a nursery group? Perhaps it could be fitted with a smaller engine but a better clutch for the short, low powered multiple stop journeys. The car would need phone links to allow users to contact all the other people in the group. It might even need some kind of satellite navigation link to indicate to other parents where about in its trip it is, or if certain roads on that journey were jammed as this would then indicate a the need for a different route and timetable for pick-ups. Some form of 'estimated time of arrival' would also be useful. Of course, all this would also work if fitted to a school bus in rural areas where these are more prevalent.

Suddenly, one has developed a new niche in the overcrowded and highly competitive people carrier car market. This doesn't mean that there is a market for such a service that would require such a product. It just indicates that there might be a possible new unexplored direction that might have a market. This could then be explored through more conventional marketing research methods.

The scenario developed above is just a fairly 'blunt' example but the principle could be extended to any range of services built on as an extension of what any particular company is doing. The question that needs to be asked to trigger this line of thought is 'where can our existing products and services be adapted or extended to new profitable areas?' It is not really a 'what if?' analysis. It is more of a 'people do this so how can we make their life in this context easier or better (at a profit)?' Most of the ideas that come up from such an analysis will usually involve the linking of existing products and services to make new ones. It might, though, indicate a need for radical advances to fulfil the envisaged (but unproven) need.

All such scenarios should constantly be questioned. For example, if a study of a waiting room in a GP's surgery indicated the need for more comfortable seats and entertainment, the question ought to be posed 'why are these people having to wait in the first place?' This might lead to improvements by applying JIT techniques as described earlier. Invariably, such a scenario analysis will involve blueprinting what people are currently doing and then identifying the areas for potential improvement through new products and services and then applying the proposed potential improvement and then redoing the blueprint to see how the service has been improved. Changes in one aspect of a blueprint may cause problems, bottlenecks (or further opportunities) in another part of the blueprint.

The focus all through has to be on more profit and within a company's abilities, available or obtainable skills, financial reach or strategy then forget the whole thing and look elsewhere.

Of course, there can always be problems with developing such ideas. Having identified the scenario and taken the idea as far as a potentially new product or service it is still important (vital) that market research is undertaken to see if people actually want the product. For example, people watch TV a lot and they are on the move a lot. One would think that a small hand-held TV would be a big seller. As many have found, portable TVs are not.

The school run car idea described earlier would not work for any company not currently involved in some aspect of the subsystem needed to make it work. To move onto another lifestyle concept. Gardening is popular with retired people but aspects can be hard work. First identify the hard bits and then identify the product/ services to make it easier (could even be a gardening service). One has to be careful that this process does not end up in a series of second-rate 'gimmick' products the like of which appear those magazines that get pushed through our doors. Such items tend not to do the company image any good.

On the other hand, a clearly demonstrated advantage can be exploited and promoted. Such was the case with the Dyson vacuum cleaner, which really did work better for longer than those with a bag. With his next major design, the washing machine, the stated advantage – a bigger load and your clothes cleaner – was not seen by many to be such an advantage to command the very high price, which was significantly more than the competition. The question that should have been asked was 'do you feel that the washing that comes out of your washing machine ought to be cleaner?' Most people would probably think their washed clothes were clean enough and they didn't need to pay more to get them almost imperceptibly cleaner. As for the greater wash load in the Dyson, probably most do not do such a large load of washing. Those that do – maybe families with a large number of children, may not be wealthy enough to purchase such a high cost machine. This is moving away from lifestyles to just product advantages but it should demonstrate that the lifestyle advantages identified really must be advantages that the consumer wants and wants enough to pay for.

## 7. Where this would be used in the design process

A typical brainstorming session with all the accepted rules [Osborne 1993] is the ideal forum in which to consider and expand lifestyle ideas. Those involved should be asked to consider problems, what generally irks them or activities that they undertake that might be suitable areas for improvement. These could make the agenda for the meeting. Initially each could present their main ideas (but not solutions). If several people mention or empathise more with certain ideas or problem areas these ought to be considered first. It is best to consider one area thoroughly rather than flit between themes without getting to the root of any. Decide on one important area then undertake a brainstorming session around this. All normal rules of brainstorming must still apply with suitable leadership, rest periods and adequate time to solve the problem.

Now unlike most design, no Market Research has been done prior to the brainstorming session and the urge to just get on and develop the potential new service must be avoided. All this is at the low cost end of design, but will involve people's time and the lost opportunity of them not doing something else. Furthermore, to explore fully just the 'best' idea will take more time than the brainstorming sessions that occur with the more normal concept stage of the design process.

The first assessment of the ideas will be against the main management guidelines [Hollins & Hollins 1991]. Normally new concepts would be judged against the specification, but there is no specification with these yet. With each lifestyle improvement concept will need to be listed the customer benefits and where the organisation can make their money. Also associated with this evaluation should be an indication of how easy it would be for the company to do and if any radical changes or additions would be needed to the organisation's working to be able to take on these concepts. Obviously, the least disruptive concepts are likely to be the most suitable.

A variation of the concept assessment matrix is one way of comparing concepts. Now do the market research and write the specification. The problem with so much design is that the designer starts at the concept stage and then ignores market research and writing a specification. What is proposed here is an exception. As an indication, customers want services that are easier to use than those already available.

As an example of a bright idea, Simon Majaro has questioned why car alarms rely on noise. He has proposed an alarm that send out a strong smell to scare away thieves – an example of analogy perhaps taking the idea from the skunk.

## 8. Conclusion

The service blueprint should be considered as the service process design. This allows the blueprint to be analysed using production tools. Through applying these to the blueprint efficiencies can be achieved which could benefit both the supplier and improve customer relationship management.

New services can be identified in a different way and this can be called 'Lifestyles'. These would be identified earlier in the design process than the usual Concept stage of design but would then be the input into the design process and developed through established means.

Recently, there has been speculation that the latest tools and techniques presented at conferences 'have not had the expected impact' [Lopez-Mesa et al 2004 and others]. The academic advances seem to be moving further beyond the reach of users and are not being taken up by practitioners. An advantage of that stated in this paper is that tried, tested and accepted tools are shown to be usable in a wider context to where they are currently used. This means that these workable tools are more likely to be adopted in these wider contexts.

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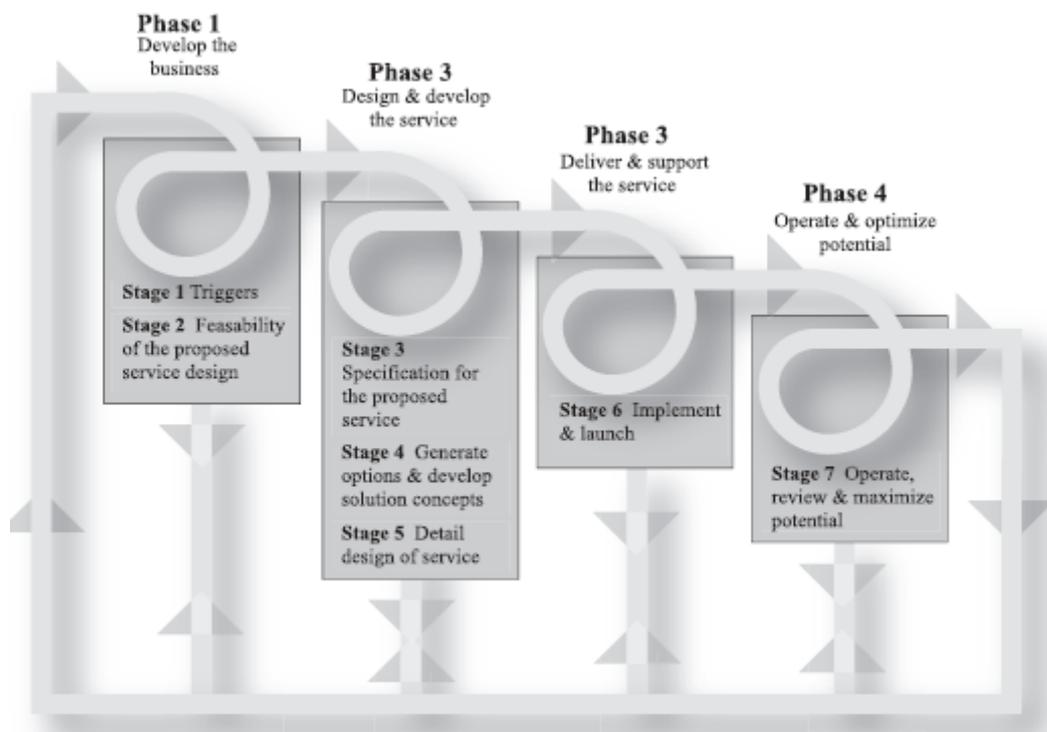
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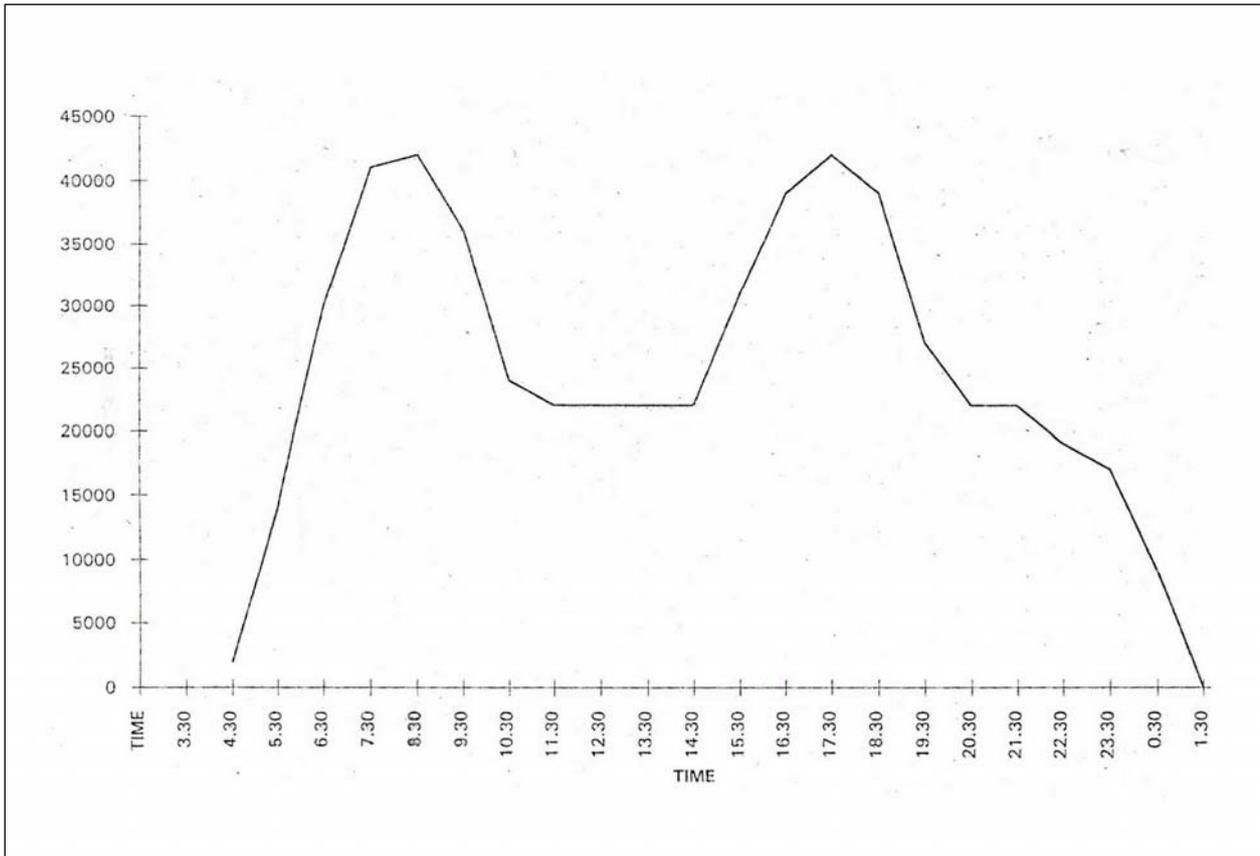
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**Figure 1** The figure around which BS 7000 –3 (2006) is based  
 (courtesy of Gill Wildman of [www.plotsite.co.uk](http://www.plotsite.co.uk))



**Figure 2 The hourly demand (in passenger numbers) for the Metropolitan Line on London Underground**