The use of equipment life-cycle analysis to identify new service opportunities

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THE USE OF EQUIPMENT LIFE-CYCLE ANALYSIS TO IDENTIFY NEW SERVICE OPPORTUNITIES

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ABSTRACT

Purpose:

This paper describes a methodology that has been used successfully to assist two manufacturers in identifying opportunities for developing services based on the equipment they sell. This approach helps to link both product and service development in a more holistic manner.

Design/methodology/approach:

Each workshop started with a theoretical introduction to the equipment life-cycle (using an approach based on the total cost of ownership) with the car as an example. The participants were then invited to consider two cases in the following order:

i. the equipment life-cycle analysis of a car;
ii. the equipment life-cycle analysis of specific equipment (relevant to the team from a particular manufacturer).

After mapping out the life-cycle, the participants were then asked to identify service opportunities based on different life stages in the equipment's life-cycle. The customer value proposition canvas was used to help them to understand the customer's needs at each stage and to align their service value proposition accordingly.

Findings:

The first case allowed the participants to work together in a way that was non-confrontational. By doing so they were able to learn how to use the tool to develop a deeper understanding of how product-services systems are viewed by the owner rather than the supplier of a piece of equipment. The shift of focus, from a supplier-oriented to a customer-oriented point of view, allows a company to react to new trends improving its competitiveness.

The second case built upon their newly acquired servitization understanding allowing the participants to consider how their customer's needs change during the full operational life of the equipment. The equipment life-cycle the participants constructed provided them with a new framework to identify new, different or additional services during the operational life of the equipment, including:

- new services that they did not provide;
- timely injection of new technology to reinforce their monopoly position on the equipment;
- end of life options to prevent cannibalization from the second-hand market.

Using this simple visual approach based on the 'customer value proposition canvas' is it possible to identify new services or to develop ways to inject new technologies into the installed base of equipment. This allows manufacturers to identify, create and deliver customer value over the full operational life of the equipment.

Originality/value: This approach provides a methodology that allows manufacturers to start to visualise clearly how their customers use the equipment that they have supplied enabling their teams to discover new services and then to create the customer valuation. Use of the car as an example provided a neutral platform allowing them to become accustomed to the tools before moving into their own products and the services required to support them.

Keywords: Servitization, equipment life-cycle, value proposition.

1. INTRODUCTION

Neely (2007) states that manufacturing in developed countries is under intense pressure from new competitors and that manufacturers cannot longer compete purely on cost. He also views servitization as a way to compete through diversification against these challengers and a way to hold or even grow the profitability. Cohen (2006) confirms that services have, in general, higher profitability than the core manufacturing businesses.

Even though the concept of servitization appears to be essential for the survival of today's manufacturing companies, it seems that it is not fully established. Manufacturing firms often have difficulty understanding the service needs of their customers for the full operational life of the equipment supplied (Baines and Lightfoot, 2013 and Fischer, 2012). To investigate this problem, three workshops were held with two different firms. During the workshops the equipment life-cycle was considered using on the total cost of ownership approach (Ellram, 1993) and the customer value proposition (Anderson, 1999 and Osterwalder 2014). The objective of this approach was to identify new services and associated customer value propositions. The use of these tools was as a prototype for encouraging a Service Design Thinking (Stickdorn, 2012) approach to increase the openness and creativity of the participants.

The main sections in this paper include a literature review where the two tools are introduced; a methodology section describing how the 3 workshops sessions were arranged, a section that describes and discusses the results; and closes with sections for conclusions and recommendations.

2. LITERATURE REVIEW

2.1 Equipment life-cycle based on the total cost of ownership

The total cost of ownership (TCO), sometimes called life-cycle costing, is a cost management methodology that analyses all costs associated with the equipment during its life. Ellram (1993) describes this for capital equipment and recommends that all of the life-cycle costs should be considered, including the equipment disposal. Wynstra (2005) takes this a step further saying that the costs drivers or tasks, which the customer (or the owner or operator) is exposed to, should also be included. Wynstra (2005) also provides a supporting and updated framework that identified some of the activities and when in the life-cycle the different phases occurred. Hurkens (2004), takes the TCO model a further step forward by considering the total value of ownership concept (TVO). The relationship between price, TCO and TVO is shown in Figure 1 and is similar to the modelling approach used in project finance where all costs and revenue streams are considered, albeit on a single piece of equipment basis.

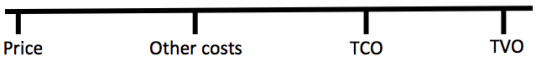

Figure 1: Evolution of cost models identified by Hurkens (2004)

Singh (2008) describes how the operational life of the equipment can be broken down into distinct activities (or cost drivers): planned and routine maintenance, emergency-breakdowns and repairs, and renewal. This breakdown would include all necessary spare parts that may be required during the operational life of the equipment. Singh's (2008) list does not include other activities e.g. leasing, financing or rental activities that may be required, whereas the TVO model of Hukens (2004) could also be thought to include these 'financial' value adding activities. Stockgi (2012) presented the generic equipment life-cycle in a visual form shown in Figure 2 although it fails to identify CAPEX (or capital expenditure) related costs during the operational period focusing purely on OPEX (or operational expenditure) costs.

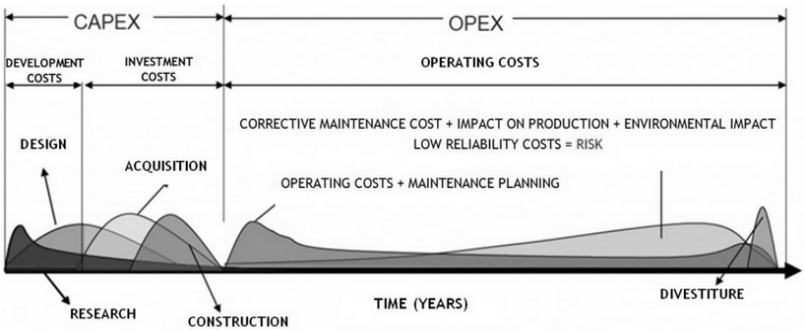

Figure 2: CAPEX and OPEX on a generic lifecycle (Stockgi, 2012)

Understanding all the components or cost drivers for the total cost of ownership provides the supplier with a detailed understanding of costs and possible value added opportunities (Wynstra, 2005). Wynstra's (2005) paper also confirmed that only a few suppliers identify value-added services on the basis of TOC throughout the life-cycle of the equipment.

2.2 Customer value proposition

Anderson (2006) makes it clear that suppliers should focus on value rather than simply costs and in particular, create clear customer value propositions for the products and services that are offered. This should be either at a customer level or a segment level. Osterwalder (2014), also acknowledges the importance of understanding the customer for a successful value proposition. He provides a visual design-oriented approach to create the value proposition that Anderson (2006) recommends. According to Osterwalder customers will experience pains and gains when performing a task or a job. A successful value proposition will increase the gains for a customer and reduce their pains. However, it is important to prioritize both the pains and gains and to address only the most relevant for the customer. A combination of Anderson's (1999) concepts of price paid and the value received is compared with a modified version of Osterwalder's customer value proposition. In this modified version, the value creation/destruction is compared to the gains and pains (Figure 3).

2.3 Best practice in workshops

Workshop success can be improved by using structured visual approaches to decision making according to Stickdorn (2012). Further analysis can (and in some cases must) be completed outside of the workshop with the full team or part of the team reforming to review further the analysis. Stickdorn (2012) recommends that multi-disciplinary teams should be used in a workshop environment to ensure that wide ranges of inputs are captured and so that commonly held assumptions can be challenged. Where possible a 'user' should also be included in the discussions.

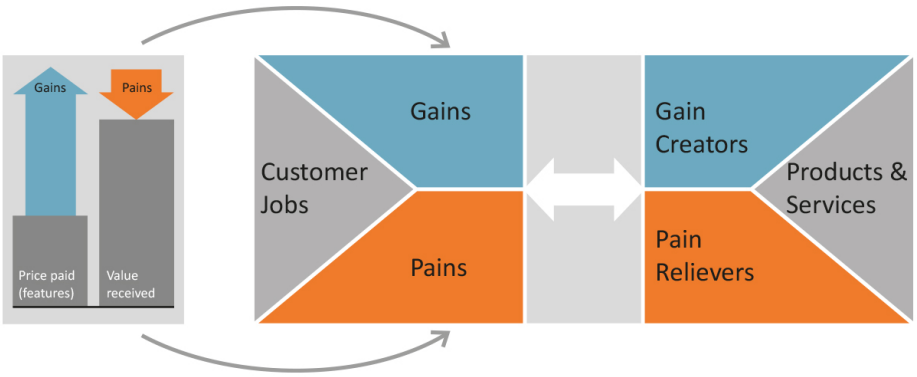

Figure 3: Value proposition design
based on Anderson (1999) and Osterwalder (2014)

3. Methodology

Two different firms were selected for the workshops to allow prototyping; the participation of the firms was needed to provide direct feedback of the applicability of the tools being tested. Both workshops were introduced in a similar way to reduce the variability, first with some theory and then a test case based on the car. They were then provided with the opportunity to use the tools based on products that they offer to their customers. A log was made of the sheets created and a list of new ideas to work on at a later stage.

3.1 Selection of the teams and team members

Mixed teams were used for the workshops to provide a wider range of inputs with the expectation that fewer issues were likely to be missed out as a result. Selection of the teams was based on the brief: "teams should be interdisciplinary and should include service employees, colleagues who interact with the customer or even customers themselves.".

3.2 Workshop structure

The generic agenda for each of the workshops was:

1. Introduction
    - To ensure a minimal level of service understanding.
    - To share information on service know-how.
2. Car example
    - To provide a 'safe' environment to learn:
      - Cradle-to-grave equipment lifecycle.
      - Customer value proposition for one important activity.
3. Own product
    - To provide a cradle-to-grave equipment life-cycle.
    - To provide a customer value proposition for one activity.

The agenda was designed so that everyone would have at least a limited understanding of services and opportunities to work together. The teams were instructed to work together using Post-its in a creative risk-free environment based on the approach described by Stickdorn (2012). This was deliberately used to allow all participants to take an active role in the process. Poster-templates were also used so that the team members could actively engage in the workshop. A blank template was used for both the car and the company-specific equipment life-cycle. Figure 4 shows an example of the completed life-cycle of a car using the poster template from the workshops. Figure 5 provides an example of the value proposition for the car associated with the modification of the car from petrol to biogas.

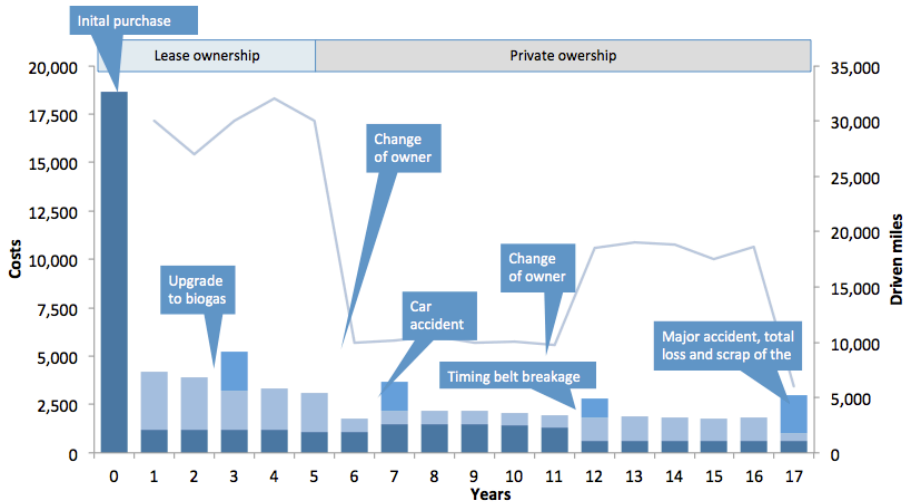

Figure 4: Cradle-to-grave life-cycle of a car

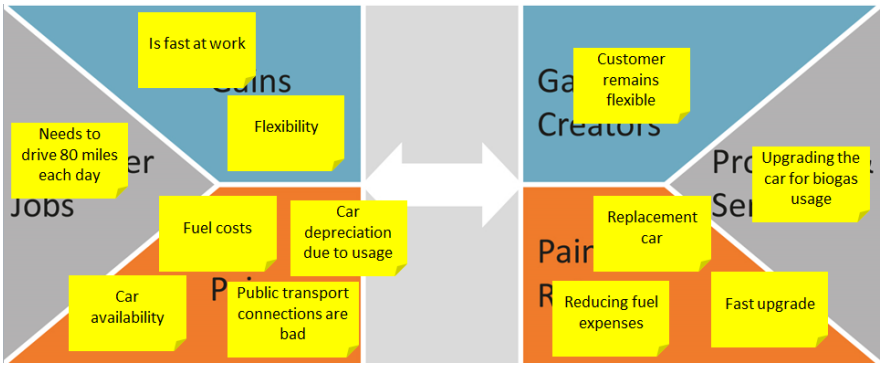

Figure 5: Value proposition canvas for a car engine upgrade/replacement

4. Results and discussion

As described by Neeley (2007) and Cohen (2006) it is essential for manufacturing companies to understand the service needs of their customers. Without this understanding they will offer the wrong services with little value addition or no service at all. The combination of the two tools presented will allow suppliers to gain a more comprehensive image of their customers and to align their service offer accordingly. This section describes and discusses the results from three workshops using the cradle-to-grave equipment life-cycle combined with the customer value proposition.

The two companies were from very different segments with different specific products and services (Table 1). Nevertheless, both were able to use the tools to identify new services for their customers. The life-cycle helped them to identify appropriate points in time for the injection of the new services (including options for end of life) and the value proposition design allowed them to align their ideas with their customer's needs.

	David Brown Gears	**Skan**
HQ	UK	Switzerland
Sales	120GBP Total / 70% service	80MCHF / 20%
Employees	700 total / not given	320 / 70 services
Segments	Industrial gear boxes	Medical and lab equipment
Workshop focus	1. Gearboxes for coal mills (engineered)	1. Isolators (engineered) 2. Flow cabinets (standardised)

Table 1: Overview of the two companies

4.1 Visualisation and mixed teams

The workshop participants valued the structured visual tools to help them identify the services required for the operational life of the equipment. This finding was in agreement with the literature and the author's experience of running workshops. Prior to using the visual framework some participants had some difficulties describing the full range of services and their timing.

The use of mixed teams helps to provide a range of inputs from more technical to commercial ideas and is in agreement with Stickdorn (2012). It provides an opportunity to service teams to describe customer value more clearly to their colleagues. More experience is required to identify the 'optimal' team mix for such workshops although the use of customers in the process was considered in a positive manner.

4.2 Feedback on the car example.

The use of a car as a neutral example to allow the participants to become comfortable with the tools was a very helpful one. It provided a framework where the groups were able to grasp the concepts that are required:

- they identified the services and in some cases started to provide estimates of costs;
- with a detailed example they were also able to identify the customer value proposition both at a rational and on an emotional level.

4.3 Feedback on the company specific examples

All teams were able to (with different levels of success) identify services, using the cradle-to-grave life-cycle, that equipment owners and operators require to achieve the outcomes they were demanding. Some participants expressed their surprise in being close to the product and still being able to identify new services. The mixed teams used the cost drivers identified by Singh (2008) to create groupings of associated tasks. This led to a visualization of the cradle-to-grave life-cycle similar to the Stockgi (2012) approach in Figure 2.

Interestingly, using the newly discovered activities one group started to construct a total cost of ownership model for a new 'rental' business model. The format of the cradle-to-grave life-cycle template provided a format where they could, as a team, visualise the necessary tasks and start to 'model' the costs. Both companies identified the equipment end-of-life phase as a potentially under-explored opportunity that may have benefits for both the customer and the supplier.

The importance of response with emergency access to spare parts came to light when discussing the customer value proposition. Using mixed teams helped the customer pains and gains to be clearly described for access to spare parts in an emergency: two teams agreed to redesign their processes. The objective of their redesign was to make it easier for the customer to contact them and then to ensure the appropriate information was exchanged, allowing the spare part to be more rapidly supplied with less risk of an error.

4.4 Lessons learnt

The combination of the cradle-to-grave equipment life-cycle with the customer value proposition provided a visual tool around which the teams could discuss and improved communications amongst those present. At each workshop the following new ideas were discovered:

- end life opportunities – control of the second-hand market;
- upgrade opportunities – triggers for upgrades;
- service triggers that come from spare parts sales – providing new sales opportunities.

The approach improved customer understanding by identifying:

- that some customers may have the initially purchased the wrong equipment;
- some customers need more assistance before they can purchase services;
- that the tools can help to understand the value propositions of today's services better;
- that customers in the same segment may experience different pains and gains (suggesting segmentation may not be correctly applied).
- that trigger point and events in the lifecycle are essential to identify appropriate points of time for new technology or services injections

4.5 Integration of the equipment life-cycle with the customer value proposition

The life-cycle shows how the customer is using a specific product and when the costs occur and is in general agreement with the TOC/TOV models described by Ellram (1993), Singh (2008) and others. The model also helps the supplier to understand what activities or tasks the customer encounters during the full lifetime of the equipment. Together with the value proposition canvas based on Osterwalder (2014) this approach provides a powerful methodology to identify key opportunities for services during the life of the equipment. It can help to identify areas where costs can be reduced or other service areas where it is becomes possible to increase the perceived value of the service offering. An example for the car life-cycle with the customer value propositions overlaid is given in

Figure 6. The examples developed by both firms only considered single events and were considered confidential.

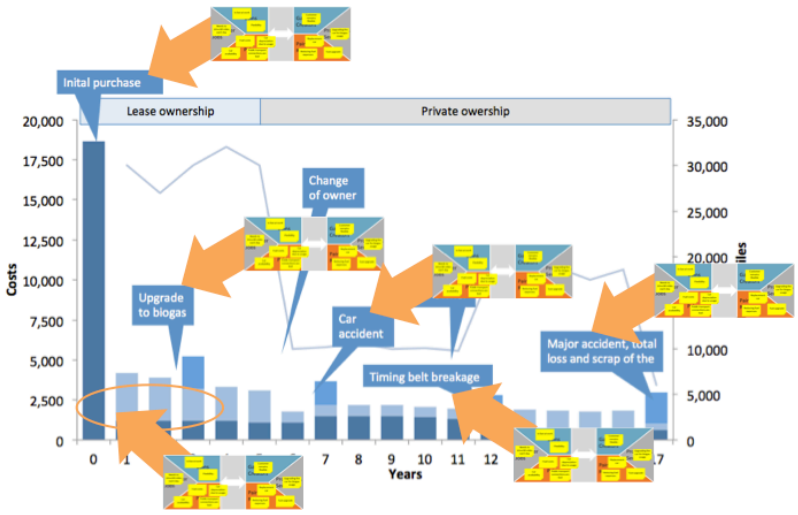

Figure 3: Every activity should have a customer value proposition associated with it

It was clear after the workshops that all of the tasks should have a customer value proposition associated with them and this is confirmed by Anderson (2008) and Osterwalder (2014) who state that a customer value proposition should be created for all products and services. Before the workshops, it was considered that this might not be the case. However, the insights that it provides into customer drivers suggest that good practice would require this. Side discussions concerning the customer journey during the creation of the customer value proposition suggests that this may also be a useful tool to be employed where the customer interactions are either major pains or gains.

4.6 Anticipated extensions to this methodology

It is anticipated that by extending this methodology it should be possible to:

- estimate the total market value and identify the share of spend (or faithfulness);
- forecast sales with timing of owner's spends;
- identify trigger points for conversions, modifications and updates;
- combine with the customer journey mapping.

5. CONCLUSIONS

The prototyping of the combination of the two tools was successful. Using the equipment life-cycle generated from the total cost of ownership in a visual way and combining it with Osterwalder's (2014) customer value proposition was considered an interesting approach as a prototype. The workshops proved helpful for the firms, enabling them to identify new services and to understand why customers may require them. The three teams from the two companies were able to identify new ideas using this approach and understand how their customers might benefit from the new (or improved) services.

The approach was experimental, but discussions with the teams and their managers suggested it proved useful in helping them to discover new/hidden services for their products. Discussions also suggested that there were potential improvements and extensions that could be developed without increasing the complexity of the process.

6. RECOMMENDATIONS

The tool should be improved and used in a number of additional workshops to provide it adds value to service development. Most important to understand are its limitations – when to use it and when

not to use it. In particular it is recommended to consider the following improvements to this methodology to:

- test the combined cradle-to-grave life-cycle and customer value proposition for a number of industrial products;
- test the anticipated extensions (eg market valuation, sales forecasting, share of spend and upgrade trigger points) with manufacturers;
- work with a product development team to understand the 'optimal' time to upgrade from the manufacturer's perspective;
- add to the methodology the customer journey (at least for emergency response activities);
- use review the business models associated with delivery of each customer value proposition.

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