Chartered Institute of Management Accountants

Value Analysis, Functional Analysis, Value Engineering and Target Costing (P2) by Norwood Whittle

In a previous article I explained the relationship between Kaizen costing, target costing, total life-cycle costing and standard costing. The aim of this article is to link target costing to value analysis, value engineering and functional analysis.

I will also be demonstrating the characteristics of these techniques to help equip you to tackle any future exam question i.e. able to accurately answer written questions, as opposed to putting forward generic/general answers that could loosely be associated with any of the techniques in this area of the syllabus.

When a company introduces a new product into the market place it can either choose to focus on costs, i.e. work towards the lowest possible cost and hopefully be able to set a selling price that secures a large percentage of the market, and achieve a high level of profit, or focus on differentiating its product to make it more attractive to customers. This article will concentrate on the cost angle.

It's important to start with target costing because it is this which effectively opens the door to the other techniques.

Target costing is an activity aimed at reducing the life-cycle costs of new products, while ensuring quality, reliability, and other consumer requirements by examining all possible ideas for cost reduction at the product planning, research and development and prototyping phases of production. But it is not just a cost reduction technique; it is part of a comprehensive strategic profit management system.

The second definition brings together the techniques described in this article. "Target costing is a pro-active cost control system. The target cost is calculated by deducting the target profit from a pre-determined selling price based on customer's views. Functional analysis, value analysis and value engineering are used to change production methods and/or reduce expected costs so the target is met".

Target costing establishes the relationships between cost, price and profit. The traditional approach to pricing centred on developing a product, then determining the expected cost based on the expected volumes, and then setting a selling price that would recover all indirect costs and generate sufficient profit to satisfy company objectives.

However, when a target costing approach is followed, the company develops a product and then determines the price customers are willing to pay. The desired profit margin is deducted from the price leaving a figure that represents the maximum total cost. The company then have to ensure the product can be produced for this amount. If this cannot be achieved, the product will not be produced. Life is obviously not this simple, other factors would need to be considered, including:

- The effects of Kaizen costing could gradually reduce the cost, meaning that over time the selling price could be reduced
- The usual reductions/efficiencies would naturally result from an increase in volumes
- The potential learning curve effects
- Usual cost reduction techniques should have a positive effect and reduce costs

It is for these reasons that a company may go ahead with production, even though the target cost is below the current estimated, attainable cost. It would be confident that reductions would accrue as above plus the company might introduce better methods of recruitment and training, use different grades of labour, buy as opposed to making some of the components and so on.

Such costs won't take place without a systematic approach to cost reduction, one approach being Value Analysis. Let us define and describe value analysis and then distinguish it from value engineering.

Value Analysis is a planned, scientific approach to cost reduction which reviews the material composition of a product and production design so that modifications and improvements can be made which do not reduce the value of the product to the customer or to the user. (i.e. quality for purpose should not be compromised.)

CIMA Official Terminology: Value Analysis is "systematic inter-disciplinary examination of factors affecting the cost of a product or service, in order to devise means of achieving the specified purpose most economically at the required standard of quality and reliability".

So, the value and quality of a product must be kept the same, or improved, at a reduced cost.

Value Engineering is the application of value analysis to new products.

CIMA Official Terminology: Value engineering is "Redesign of an activity, product or service so that value to the customer is enhanced while costs are reduced (or at least increased by less than the resulting price increase)".

Value engineering relates closely to target costing as it is cost avoidance or cost reduction **before production**. Value analysis is cost avoidance or cost reduction of a product **already in production;** both adopt the same approach (details below) i.e. a complete audit of the product.

Development of Value Analysis

Undertaking a value analysis exercise

Such an exercise might involve a series of questions, including:

- Can a different (cheaper) material be used that is better than the material currently used?
- Can a different grade of labour complete the manual tasks?
- Can the use of material components be standardised to facilitate longer production runs if manufactured internally, or gain benefits from bulk buying if purchased

It is perhaps worth taking a few lines to develop the word "value". Four aspects of value can be considered:

- Cost Value – is the cost of manufacturing and selling an item
- Exchange Value – is the price a customer is prepared to pay for the product, or service
- Use Value – is the purpose the product fulfils
- Esteem Value – is the prestige a customer attaches to the product

Example: If a customer simply requires something upon which to sit, s/he would not be willing to pay for a reclining leather chair as s/he simply requires the use value. On the other hand a second customer would be prepared to pay a premium price for a luxury item, they are prepared to pay for the esteem value.

Cost reduction does not happen by accident, it results from a systematic approach when introducing a value analysis study. Usually a company establishes a value analysis team who may adopt the following processes:

Step 1 **Selecting a product or service for study**. The product selected should be one which accounts for a high proportion of the organisation's costs, since the greatest cost saving should be obtained from high cost areas. The choice should also consider the 'life cycle' stage of the product as a product reaching the end of its marketable life is unlikely to offer scope for substantial savings.

Step 2 **Obtaining and recording information**. Questions include: what is the product or service supposed to do? Does it succeed? Are there alternative ways of making or providing it? What do these alternatives cost?

Step 3 **Analysing the information and evaluating the product**. Each aspect of the product or service should be analysed. Any cost reductions must be achieved without the loss of use or esteem value. (Or at least, cost savings must exceed any loss in value suffered, and customers would then have to be compensated for the loss in use or esteem value in the form of a lower selling price.) Questions for the analysis stage might be:

(a) Are all the parts necessary?
(b) Can the parts be obtained or made at a lower cost?
(c) Can standardised parts be used?
(d) Does the value provided by each feature justify its cost?

Step 4 **Considering alternatives.** Following analysis, a variety of options can be devised. This is the 'new ideas' stage of the study, and alternative options would mix ideas for eliminating unnecessary parts or features or standardising certain components or features.

Step 5 **Selecting of the least cost alternative**. Comparing the costs (and other aspect of value) of each alternative

Step 6 **Recommendation**. Recommending the preferred alternative to the decision makers for approval

Step 7 **Implementation and follow-up**. Planning and co-ordination of an approved and accepted value analysis proposal. The VA team should review the implementation and, where appropriate, improve the new product or method in the light of practical experience.

Source: BPP Study Text, P2

If a value analysis approach is followed the company should reap huge benefits including:

- A reduction in costs but not in quality
- Improving product quality and attracting more customers
- Increased sales might lead to economies of scale and either increase profits or reduce selling prices
- The company may decide to increase selling prices if the quality has improved

In conclusion, value analysis is not an exact science, and there is no one approach that fits all situations. Companies operate in a dynamic environment and need to be able to accommodate the emergence of new products, new competitors, and changing economic circumstances. Value analysis is simply one of the many tools available to companies when balancing costs, price and profit.

Function Analysis

Functional analysis has similarities to value engineering in that it is applied during the development stage of a new product, but it uses the functions of a product (or service) as the basis for cost management.

"Functional analysis is concerned with improving profits by attempting to reduce costs and/or by improving products by adding new features in a cost effective way that are so attractive to customers that profits actually increase".

CIMA Official Terminology: "Functional analysis is an analysis of the relationship between product functions, their perceived value to the customer and their cost provision".

Here's an example of Functional Analysis in practice from my days within the telecoms industry. This particular telecoms company was at the forefront of telephone manufacture, sales, and inventing new telephones and telephone exchanges. When a new telephone was developed, and before production took place, a target cost exercise was undertaken by the marketing team to establish what the customer would be willing to pay, and working backwards, the company could establish a target cost. At this stage a functional analysis exercise was undertaken. A complete breakdown was made of the product, in particular, listing all the functions the telephone would perform, and a second, more detailed research investigation was undertaken to establish and identify the importance the customer attached to each feature/function of the telephone. It was pointless including "nice to have" features that customers did not value, did not use, and were not prepared to pay for. When the exercise was completed the unnecessary features were removed and an overall target cost was calculated. What the company was

doing was establishing a 'use value' as opposed to simply catering for the few customers who were prepared to pay the higher price for 'esteem value'. The company was placing a cost of the provision the customer wanted and valued.

As with value analysis, a systemic approach needs to be followed by a company adopting a functional analysis exercise. The technique could involve:

Step 1 **Choose the object of analysis (product, service or overhead area).** If it is not a new product, a high volume product with a complex design and relatively large production cost is often an ideal candidate. Other reasons for selecting a particular product might include apparently high cost, low yield rates, manufacturing problems, market demand (such as remodelling required) or a need for a more compact design. The product selected will determine the precise objective of the analysis exercise (reduce weight by 25%, reduce cost by 30% while maintaining the existing level of quality).

Step 2 **Select members for the functional analysis team.** Usually six to eight members from a number of different departments (such as accounting, production, purchasing, engineering, design and marketing).

Step 3 **Gather information.** Include information from both inside the organisation (detailed design, manufacturing and marketing information, for example) and outside the organisation (eg information about new technologies).

Step 4 **Define the functions of the object.** The various functions of the product should be defined in terms of a verb and a noun. 'The major function of a propelling ball-point pen can be described as 'make a mark', but supporting functions are also required, such as 'put colour', 'guide tip', and 'prevent loss'. These, in turn, may also require their own supporting functions. (Contemporary Cost Management, Tanaka, Yoshikawa, Innes and Mitchell). Functions should be classified as basic or secondary in terms of the importance of that particular function for the product.

Step 5 **Draw a functional family tree.** The functions identified in step 4 should be arranged in a logical order in a family-tree diagram. A table illustrating the relationship between the functions and the parts of the product, as well as relevant existing costs, should also be drawn up.

Step 6 **Evaluate the functions.** Estimate the relative value of each function to a total target cost from the customers' point of view (either using market research or by each member of the team placing values and a consensus being reached for each function). This relative value provides a target cost for each function. Those functions where the actual cost is greater than the assigned target cost should be highlighted as potential problem functions (although the absolute amount of money involved should also be taken into consideration).

Step 7 **Suggest alternatives and compare these with the target cost**. Alternatives might include the use of new materials or parts, a different method of manufacturing, suggestions for completely new products or new product functions, modifications to the functions of the product, the combination of different functions or even the elimination of certain functions.

Step 8 **Choose the alternatives for manufacturing**. Assess the alternatives and choose which to implement.

Step 9 **Review the actual results.** An audit or review of the changes implemented should be conducted promptly and findings reported to senior management. This will prevent over-optimistic assessments of the functional analysis exercise and provide feedback to improve future functional analysis.

Source: BPP Study Text P2

In conclusion, the completion of a functional analysis exercise will result in a cost-effective design and will ultimately result in an improved competitive advantage.

As 90% of a product's life cycle cost is determined at the decision stage of the product, it is essential that the tightest control is exercised at the design stage. This control can be exercised by subjecting new products to value engineering and function analysis, and existing products to value analysis.

The three most important messages for companies providing products or services are:

1. Do not produce a product/service that the customer does not want
2. Do not include features that are not required
3. Do not produce in the hope that someone will buy.

Here are some examples of the techniques discussed as they have been used in real organisations:

Example 1

When Toyota developed the Lexus to compete with BMW, Mercedes and Jaguar, it employed two basic concepts: reverse engineering and target costing. In essence, it sought to produce a car with BMW 7 – series attributes at a BMW 5 – series price. Cost was the dominant design parameter that shaped the development of the Lexus, as it was later with Nissan's Infiniti.

The response from Mercedes Benz, one of the competitors who lost market share through this strategy, was to acknowledge that its cars were over-engineered and too expensive and to change its product-development process to determine target product costs from competitive market prices.

(B Nixon, J Innes and J Rabinowitz, Management Accounting for Design, Management Accounting September 1997)

Example 2

The following case study was taken from the website of the Department of Trade and industry (www.dti.gov.uk) in June 2004

With 10 staff, IBD Ltd is at the leading edge in the design, development, manufacturing and marketing of a variety of products for specialist users, mainly in the electronic instrumentation field – electrostatic field metres being a key interest. IBD makes extensive use of value engineering in product design for clients that include British Steel, European Space Agency, BT, ICI and central and local government. "Innovation is our life-blood" says IBD managing director Emlyn Jones. "And value engineering is central to this".

IBD Ltd is a wholly owned subsidiary of the University of Wales, Bangor, that won a SMART (Small Firms Merit Award for Research and Technology) award to develop an instrument to measure artificial biomembranes only two molecules thick. "Our strength lies in our ability to design to our customer's exact specification and value engineering is important in determining how to meet customer needs in a highly competitive market" says Emlyn. "It applies from the inception of the design right through to manufacture."

IBD's close connection with Bangor's School of Electronic Engineering Science helps IBD maintain best value engineering practice. The School's MEng programme, established at Bangor at the suggestion on HRH Prince of Wales, gives emphasis to value engineering as a key design methodology. But Value Management is also seen as applying to the wider organisation of enterprises as well as technology, extending into functions such as sales and administration.

"Students are taught how to apply the value engineering job plan to secure innovation in design," says lecturer Peter Hughes who is responsible for value engineering. "Value engineering is vital to good innovation and design", he says. "The key lies in maintaining a hard-nosed practical approach. Small to medium enterprises in particular should find that value engineering will give them a distinct market advantage."

Conclusion

I hope this article has helped you appreciate the main characteristics of the techniques described i.e. that are the similarities and differences. This will help you tackle any question that may appear in future exams.

My advice is to work carefully through past exam papers and attempt all questions that relate to the content of this article, and then compare your attempts to the examiners suggested answers.