Research into Customer Preferences of Potential Buyers of Simple Wood-based Houses for the Purpose of Using the Target Costing

Marek Potkány* and Monika Škultétyová

Abstract: The purpose of this paper is to present the results of a research into the customer preferences of potential buyers of simple wood-based house for the purpose of using the Target Costing methodology. Respondents' opinions of 280 customers were obtained through direct interviews taking place at a specialized exhibition of furniture and timber constructions in Slovakia. The object of the research was a simple wood-based house, namely a weekend garden cottage, made of northern spruce at the level of target price 9,320 €. The paper contribution is represented by the use of the Target Costing methodology in the conditions of wood-processing industry while defining the customer preference for a specific product with the subsequent use for a functional cost analysis and determining the target cost index of the evaluated components. Presented results can be used as information database for decision making in the field of make or buy decisions at the level of fixed purchase prices of individual components or as the upper price limit for producing the components by the business itself.

Keywords: target costing, allowable cost, profit, price, wood-based house

1 Introduction

The current business environment is characterized by high competitiveness. In order to be successful, companies have to adapt quickly and flexibly to the given conditions, especially to the needs of customers. Gradually, costs begin to be seen from a strategic perspective and planning is undertaken in the preproduction phase, as a consequence of this stage creating the greatest impact on any future success of a product. Varying perceptions of costs and the behaviour pertaining to them also necessitates that adequate tools are developed for their strategic management, e.g. Target Costing (TC). Vedder [1] states that the origin of such a calculation technique dates back to the 1970s, when the income of the private sector in Japan experienced a rapid rise and people started to explore greater diversity in their needs.

Many research studies have for several years been connected with target costing issues. Sakurai [2] in his study writes that TC can be defined as a cost management tool for reducing the overall cost of a product over its entire life cycle with the help of production, engineering, R&D, marketing and accounting departments. Monden and Lee [3] state that TC is defined as a companywide profit management activity during the new product development stage that includes: (1) planning products that have customer-pleasing quality, (2) determining target costs (including target investment costs) for the new product to yield the target profit required over the medium to long term given the current market conditions, and (3) devising ways to make the product design achieve target costs while also satisfying customer needs for quality and prompt delivery. Petřík [4] concludes that the three main strategies for gaining a competitive edge comprise the following: cost leadership, discovering new market opportunities and differentiating the products and services. The latter of these permits the possibility of utilizing TC. This represents a special management approach with the aim of integrating the cost management oriented towards the marketplace and clients. These conclusions on the greater significance of cost management, cost behaviour analyses, and appropriate cost projection to adequate cost systems have also been backed up by authors such as Novák and Popesko [5], Potkány et al. [6] and Dejnega [7]. Krstevski and Mancheski [8] state that common to most definitions

*Corresponding Author: Marek Potkány: Department of Economics, Management and Business; Technical University in Zvolen, Faculty of Wood Sciences and Technology; Zvolen; 960 53; Slovakia, E-mail potkany@tuzvo.sk
Monika Škultétyová: Department of Economics, Management and Business; Technical University in Zvolen, Faculty of Wood Sciences and Technology; Zvolen; 960 53; Slovakia
Research into Customer Preferences of Potential Buyers

of TC is a process founded on a competitive market environment, market prices driving cost (and investment) decisions, cost planning, management and cross-functional team involvement, including the managerial accounting. Ahn et al. [9] determine nine distinct research streams that encompass further developments of the traditional TC methodology. Kocakülâh and Austill [10] in their study state that the TC concept grew out of a need for manufacturers to improve product cost management and product development. The traditional cost management, cost accumulation and allocation methods used for decades and still predominant in the manufacturing and services sectors have failed as tools for product development, planning, and cost management. This is because they focus on the product cost rather than on the expectations of customers and the product design itself. It is this field where the major potential of using the TC methodology is seen. Therefore, interesting is the fact that we have not found the issue of TC in the wood-processing industry sector in available studies.

Therefore, the aim of the paper is to present the results of research into customer preferences of potential buyers of simple wood-based house for the use of target costing method in the conditions of the wood-processing industry (WPI). The contribution of the study is the use of TC methodology for specifying the customer preferences and data for deciding about the component prices or for making the make or buy decisions.

2 Methodology

Research methodology consists of two independent phases. The first phase covered a survey summarizing the customer preferences and specifying the object of the research - simple wood-based house (garden cottage). Data collection via a questionnaire was carried out in April – May 2018 at specialised exhibitions presenting the producers of wood-based houses in Slovakia. In total, 280 respondents – potential customers interested in buying the specific product were addressed directly. The second phase included application of the TC methodology using the principles of value analysis. The entire process for applying the TC methodology can be generalized, hence the description given in the following diagram. The Figure 1, according to Hematfar et al. [11], visualizes the standard utilization procedures of TC. It also represents the graphical simulation of the procedure followed in our study. The new product was the object of our research.

We also carried out a research focused on the price level accepted by the consumer. This research has shown that the ideal target price is 9,320 €. Within the chosen methodology, some scientific methods like demands, the statistical analysis of one-dimensional data and deduction were used. Subsequently, TC methodology was applied with the use of value analysis principles. If we want to apply the calculation principles to the TC and value analysis in selected entries, it is necessary to proceed in the following steps:

- the calculation of the estimated income and the required profit based on comparing ROS parameters from the previous periods;
- the assessment of the total cost and the cost of the individual components of the cost analysis and the analysis of the functional costs; also the discrepancy between preferences and actual costs; in this step the methodology of analysis and synthesis was used.

The main idea of target cost calculation is the determination of the maximum limit of allowable cost, which should not be exceeded while running the production by any corporation. This limit is not determined according to the basic technical and economic standards of consumption in place, but on the contrary, it is determined as the...
surplus of target price after we deduct the target profit. This relationship is defined by Foltínová et al. [12].

Allowable cost = target price − target profit  

The target profit is the important element of final price. The amount of profit depends on financial goals of each corporation. Generally, it is not determined in absolute amount, but rather in percentage amount, usually with the use of return on sales value (ROS). Because of the meaning of this calculation for future decision making, we determine the target on return on sales as the arithmetic mean of historical return on sales for several periods. The older the period, the lesser the importance gravity. The return on sales in x-period (ROS\(_x\)) is determined as the multiple of several returns from foregoing periods (ROS\(_{n-0,1,2,...,n}\)) and the gravity of importance (w\(_{n-0,1,2,...,n}\)) in the n – number of periods, as shown in formula 2. This relationship is defined by Tumpach [13].

\[
\text{ROS}_x = [(\text{ROS}_{n-1}xw_{n-1}) + (\text{ROS}_{n-2}xw_{n-2}) + \ldots \ldots + (\text{ROS}_{n0}xw_{n0})]/\sum_{i=1}^{n} w_i 
\]

For the target profit determination with the use of ROS, it is possible to use the following formula 3:

\[
\text{Target profit} = \text{target price} \times \frac{\text{ROS}}{100} 
\]

Using the TC methodology can be determined by Target Cost Index (TCI). TCI determines the weight of the allowable costs from methodology and the weight of the component from preliminary calculation (Formula 4). This relationship is defined in the study by Horváth [14].

\[
\text{Target cost index} = \frac{\text{relative weight of the component from target costing methodology}}{\text{relative weight of the component from preliminary calculation}} 
\]

TCI can show three levels. When TCI is greater than 1, it is assumed that it is an inexpensive component where it is necessary to consider its quality. When TCI is less than 1, it is assumed that the component is too expensive due to its importance in ensuring customer preferences. The ideal condition is when TCI = 1. The planned level of costs incurred for the components is the same as the value at which this component contributes to the fulfillment of customer preferences. However, this situation is hardly achievable. Therefore, in this context, according to Coenenberg [15], the tolerance cost zone can also be defined. This is a kind of maneuvering space called the Target Cost Zone. For the determination of tolerance zones, according to Ehrlenspiel et al. [16], the tolerance limits can be (upper \(f_1\), lower \(f_2\)) determined according to formula 5 and 6. The q value represents the tolerance level, in our case determined at 10%, and the value x represents the relative importance of the component from TC methodology.

\[
f_1 = \sqrt{x^2 + q^2} 
\]

\[
f_2 = \sqrt{x^2 - q^2} 
\]

3 Results and discussion

Many businesses are trying to keep their market position in a competitive environment. Consequently, planning and cost optimization are becoming more important every year and must be adjusted to align with profitability expectations. That is why managers are looking for active approaches to product pricing and planning. Such an approach offers the potential of using the Target Costing. The object of the research was a simple wood-based house, namely the weekend garden cottage, made from northern spruce. Its main characteristic is a diversified structure where wood knots do not fall out. The wall profile is 50 mm wide, while the construction is secured with a double tongue and groove joint. Object area is 31.7 m\(^2\) with saddle roof with specific window, door, floor and roof components, which are presented in the following Figure 2.

Figure 2: Specific characteristics of selected product [6].

Figure 3 presents the five basic customer product preferences being the results of direct interviews with potential customers. Respondent views were obtained through direct interviews at a specialized exhibition of furniture and timber constructions. During this event 280 questionnaires were collected. The random selection of the sample is sufficient and representative in terms of the number of respondents regarding the planned number of sold products. As shown in Figure 3, the preference order from the
respondent point of view is as follows: the functional use of cottage (P1), the possibility to using the cottage outside the season (P2), the way securing the area at the time of absence (security against robbery) (P3), design and colour (P4), the possibility of cottage disassembling and moving to different place (P5). Through the recommended relationship (2) the ROS indicator was set to 2.85%. For calculating the target profit, formula 3 was used, and it comes from estimated return on sales. Target profit = 9,320 € x (2.85/100) = 265.6 €.

Consequently, it is possible to determine the allowable cost value according to formula 1. The total allowable cost of garden cottage has the value of 9,054.4 €.

The key factor of the target cost methodology is the accurate determination of the customer preferences. By means of the customer preferences and by the assessment of the relationship between customer requirements on product functions and its specific parameters, it is possible to assemble the quality-function deployment by highly qualified employee (Table 1). Important step of the TC methodology is the application of the functional cost analysis and thereafter suggesting some alternatives that will help us identify improvements that will lower the costs and will not constrain the product capacity. The functional cost analysis with the determination of relative weight of the components is presented in Table 2. Table 3 presents the basic structure of costs for specific components of the selected product. These costs were determined at the level of total costs, reached through the estimated preliminary calculation of the company.

Subsequently, it is possible to set a TCI for individual components.

Interior walls: TCI = (19.22 / 27.29) = 0.70 < 1, roof: TCI = (18.94 / 25.87) = 0.73 < 1 and other parts (insulating material, ladder, door frame): TCI = (11.50 / 28.76) = 0.40 < 1. These components are expensive due to their importance in providing customer preferences.

Floor: TCI = (6.60 / 5.56) = 1.18 > 1, Mansard: TCI = (5.16 / 1.49) = 3.46 > 1. Installation package: TCI = (5.86 / 1.46) = 4.01 > 1. These components are still within the manoeuvring space despite the TCI above the level 1. The level of costs incurred for the components is within the tolerance zone in terms of fulfilling customer preferences.

Doors/ windows: TCI = (32.83 / 9.57) = 3.43 > 1. These components are inexpensive in terms of the planned costs of their production, and their qualitative characteristics should be considered given its importance in terms of customer preference.

Target cost control diagram with the level of tolerance zones is presented in Figure 4.

Based on our results, it can be stated that windows and doors are components that may cause problems. These components of the final product are inexpensive in terms of the preliminary calculation. It is necessary to consider to a certain extent the quality of production and the choice of input materials. Therefore, it is advisable to look for cost savings for particular components, such as interior walls, roof construction and other parts (insulating material, ladder, door frame). One of the ways to reduce costs is to reconsider the appropriate supplier that provides the input material – we can search for cheaper suppliers while ensuring the quality level of the material. When buying the components, also the limit price level was determined. For the roof construction it was 1,715 € (0.1894 x 9,054.4 €), for other parts the limit price level was 1,041 € (0.115*9,054.4 €). While accepting these conditions, it is possible to launch a product with a target price of 9,320 € that would meet the customer requirements as well as contribute to creating the target profit.
Table 1: Quality-function deployment of the selected product.

| The customer preferences | The basic components of garden cottage |
|---------------------------|---------------------------------------|
|                           | Interior walls | Floor | Mansard | Roof | Doors/windows | Another parts | Instal.package | Total |
| Preference P1 (25.6%)    | 20%            | 14%   | 14%     | 14%  | 20%           | 6%             | 12%            | 100% |
| Preference P2 (24.9%)    | -              | 10%   | -       | 40%  | 10%           | 40%            | -              | 100% |
| Preference P3 (22.6%)    | -              | -     | -       | -    | 90%           | -              | 10%            | 100% |
| Preference P4 (16.5%)    | 60%            | -     | -       | 20%  | 20%           | -              | -              | 100% |
| Preference P5 (10.5%)    | 40%            | 5%    | 15%     | 20%  | 15%           | -              | 5%             | 100% |

Source own processing

Table 2: Functional cost analysis of the selected product.

| The customer preferences | The basic components of garden cottage |
|---------------------------|---------------------------------------|
|                           | Interior walls | Floor | Mansard | Roof | Doors/windows | Another parts | Instal.package | Total |
| Preference P1 (25.6%)    | 5.12%          | 3.58% | 3.58%   | 3.58%| 5.12%         | 1.54%          | 3.07%          | 25.6% |
| Preference P2 (24.9%)    | -              | 2.49% | -       | 9.96%| 2.69%         | 9.96%          | -              | 24.9% |
| Preference P3 (22.6%)    | -              | -     | -       | -    | 20.34%        | -              | 2.26%          | 22.6% |
| Preference P4 (16.5%)    | 9.90%          | -     | -       | 3.30%| 3.30%         | -              | -              | 16.5% |
| Preference P5 (10.5%)    | 4.20%          | 0.53% | 1.58%   | 2.10%| 1.58%         | -              | 0.53%          | 10.5% |
| Total                    | 19.22%         | 6.60% | 5.16%   | 18.94%| 32.83%        | 11.50%         | 5.86%          | 100% |

Source own processing

Table 3: Preliminary calculation of the selected product components.

| Components                          | Direct cost | Overhead cost | Cost of the components | Relative Cost |
|-------------------------------------|-------------|---------------|-------------------------|---------------|
| Circuit interior walls              | 1,128.09 €  | 1,342.99 €    | 2,471.08 €              | 27.29 %       |
| Floor                              | 230.01 €    | 273.83 €      | 503.84 €                | 5.56 %        |
| Mansard                            | 61.64 €     | 73.38 €       | 135.02 €                | 1.49 %        |
| Roof                               | 1,069.24 €  | 1,272.93 €    | 2,342.17 €              | 25.87 %       |
| Doors and windows                  | 395.43 €    | 470.76 €      | 866.19 €                | 9.57 %        |
| Another parts                       | 1,188.61 €  | 1,415.04 €    | 2,603.65 €              | 28.76 %       |
| Installation package               | 60.20 €     | 71.67 €       | 131.87 €                | 1.46 %        |
| Total                              | 4,133.22 €  | 4,920.60 €    | 9,053.82 €              | 100.00 %      |

Source own processing

Aladwan et al. [17] have been trying to apply a TC methodology in the field of hotel management, Lima et al. [18] in the agriculture sector and Macuda and Orliński [19] in the field of healthcare facilities. Many results can also be found in other industries [20, 21]. TC could also be used by service companies, although those companies still tend to be cost-plus oriented. The construction industry has not accepted this new approach either. Its pricing nature is usually driven by costs or top-down estimating based on rates for building elements, such as price per
square foot. This issue has been addressed for analysis of two case studies of construction firms in Great Britain, in the studies of Nicolini et al. [22] and also Perry et al. [23]. A similar result was presented in the study of Pennanen et al. [24]. Alwisi et al. [25] suggest a systematic framework called target cost modelling for the application of target costing in the construction industry. They expected to improve project performance efficiently and enhance the design process while meeting the desired overall costs. Following the analysis of available literature sources it can be concluded that that the use of TC methodology is absent in the wood-processing industry (WPI). This is one of the reasons for considering the present application innovative. Target Costing is a tool that can discover potential reserves of the company and can also provide solutions for the functional differentiation of the product. The final cost calculation as a modern method of calculation uses the principles of value analysis, while through the tools of functional cost analysis and the tools of quantity-function deployment it can create suitable conditions for the functional differentiation of the product. This approach can expose defects in the initial phase of the research and the development of the product, while 85 to 90% of capacity costs is a result of decision-making in the phase of preparation. The risk of this approach lies in the accurate market research and in determining the relative cost for specific components. Krstevski and Mancheski [8] state that TC itself is no revolution in the planning process – a focus on the customer’s willingness to pay is revolutionary and in combination with demand-based charging the revolution begins reality.

4 Conclusion

The wood-processing industry in Slovakia is relatively independent from import with active balance of foreign trade built on a domestic resource base of sustainable character. The problem is that this industry does not have the priority position in the hierarchy and support when compared to other industries. The entire industry solves issues associated with financing as well as the potential of product development and cost management. The aim of this paper was to present the application of TC methodology in the conditions of the wood-processing industry of the Slovak business environment. From our point of view, there is a potential for using the TC methodology in the sector of WPI mainly at the level of utilization of information from functional cost analysis. The main contributions of the present study are:

- The application of TC methodology in the conditions of WPI with defined customer preferences for a specific product, with their subsequent use for functional cost analysis and determining the target cost index of the evaluated components;
- Presented results can be used as information database for decision making in the field of make or buy decisions at the level of set purchase prices of individual components (doors, windows, roof construction etc.) or as the level of upper price limit for producing the components by the business itself. The target costing method focuses on market oriented management, aiming to attract and satisfy the customer on one hand and provide more efficient planning process on the other. In the case of such applied approach, we can talk about target cost oriented management.

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