

**PRODUCT COSTING AND PRICING METHODS
APPLIED BY ENTERPRISES WITHIN
THE WARMIŃSKO-MAZURSKIE VOIVODSHIP**

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Key words: methods of cost calculation, simple division based costing, equivalence number based costing, product pricing, costs.

Abstract

Cost is one of the main criteria of the assessment activities of the company, hence the issue of control, ways to reduce and manage costs occupies an important place in the management of business entities and constitutes the focus of managers.

The main aim of this paper was to determine the methods of costing used by the surveyed enterprises in the region of Warmia and Mazury. The paper also examines the methods of product pricing.

The research, which is based on responses from 169 companies with at least 50 employees, confirms that the application of specific costing methods depends on the type of production, the volume of production, and the organisation of the business processes. The most widely used methods were simple division based costing (23.7% of surveyed companies) and equivalence number based costing (11.2%). The research also revealed that over 14% of the surveyed companies did not use any calculation of costs, whereas pricing decisions were usually (72.8%) based on a cost formula.

**METODY KALKULACJI KOSZTÓW I CEN WYROBÓW STOSOWANE PRZEZ
PRZEDSIĘBIORSTWA Z WOJEWÓDZTWA WARMIŃSKO-MAZURSKIEGO**

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Słowa kluczowe: metody kalkulacji kosztów, kalkulacja podziałowa prosta, kalkulacja współczynnikowa, formuły ustalania cen, koszty.

Abstrakt

Koszty stanowią jeden z głównych mierników oceny działalności przedsiębiorstwa, dlatego problematyka kontroli kosztów, sposobów ich obniżania i zarządzania nimi zajmuje ważne miejsce w zarządzaniu jednostkami gospodarczymi i stanowi centrum zainteresowania menedżerów.

Głównym celem artykułu było zbadanie, które metody kalkulacji kosztów jednostkowych wytwarzanych produktów są najczęściej stosowane przez przedsiębiorstwa województwa warmińsko-mazurskiego oraz jakie formuły wykorzystują one do podjęcia decyzji cenowej. Badaniem objęto 169 jednostek, zatrudniających ponad 50 pracowników.

Wyniki przeprowadzonych badań potwierdzają, że zastosowanie określonej metody kalkulacji zależy od rodzaju i wielkości produkcji oraz organizacji procesów gospodarczych. Najszersze zastosowanie znalazły kalkulacja podziałowa prosta wykorzystywana przez 23,7% badanych przedsiębiorstw oraz kalkulacja podziałowa ze współczynnikami stosowana przez 11,2% ankietowanych przedsiębiorstw. Wśród badanych firm ponad 14% ankietowanych firm nie stosowało żadnych kalkulacji kosztów. Decyzje cenowe natomiast najczęściej (72,8%) opierały się na formule kosztowej.

Introduction

Currently, businesses operate under strong pressure from competition. Market conditions are characterised by aggressive competitors and increasingly demanding clients, leading companies to question their competitive strategies and highlighting the importance of effective information and costs management systems.

In order to become more efficient and to improve internal and external communications, there is a demand for accurate financial information on internal processes and the costs associated with them. According to Réka, the quality of decisions in productivity management and measurement is closely correlated with the quality of management, costing, and productivity measurement systems (RÉKA et al. 2008, p. 1533).

Over the past two decades, the productivity of results measurement systems has evolved. Within the frameworks of these systems, three major trends have been identified:

- productivity measurement using both financial and non-financial productivity indicators has become commonly accepted;
- the relationship between the strategic planning process and measurement of the results has been strengthened at the enterprise level;
- enterprise results are no longer perceived solely from an economic perspective, they are also now measured from a social and environmental perspective (TAICU 2011, p. 293).

Enterprise results measurement is not possible without also accurately determining the associated costs of operations. In an environment with increasing requirements from managers regarding cost information, new and complex costing systems and cost computation methods represent important

innovations in an organisation. They not only allow computation of costs, but also an analysis of these costs and measurement of the results.

The main goal of costing is to determine the unit costs of the products manufactured or services provided, including a breakdown of these unit costs. Moreover, the aim of the cost computation(s) is to provide data to determine cost levels, to control costs (and pricing), as well as to generate information to identify the cheapest sources of financing and the most profitable methods of using such resources. The choice of computation may also drive the selection of an accounting policy – one that best supports the calculation of, and reflects the estimates of, per-unit product costs. Therefore, the selection of computation procedure(s) is consequential.

Computerised processing, which has increased the scope and breadth of accounting data and has unleashed the potential of software to process information, has led to a decline in processing costs, further increasing the value of costing.

Methodological assumptions of the study

Given the role that costing plays in an enterprise, a main aim of the study was to determine which manufactured unit cost computation methods for products and services are applied the most frequently at enterprises within the Warmińsko-Mazurskie voivodship. Given that an appropriate unit cost determination is also of key importance in determination of the optimal product price, the formulas that are employed by enterprises to make pricing decisions were also investigated.

The survey encompassed 169 entities that employed over 50 people, that were included on the list of 1,286 business entities prepared by the Voivodship Statistical Office in Olsztyn, that satisfied the criterion of employment, and that consented to complete the survey questionnaire¹. Descriptive statistics elements were then used to process the data obtained from the questionnaire-based survey.

Among the enterprises surveyed, limited liability companies (LLCs – 90 enterprises) and joint stock companies (31 enterprises) were most prevalent, followed by cooperatives (15 entities). The surveyed group also included other commercial companies (partnerships, registered partnerships and professional partnerships), individuals, state-owned enterprises, and state-owned organisational units.

¹ Non-random model for sample choice was applied, the so-called sample of convenience (FRANK-FORT-NACHMIAS, NACHMIAS 2001).

The majority of surveyed entities employed 50–100 people (converted to full time job equivalents). Almost 25% of enterprises employed 101–250 people. Enterprises employing over 250 people represented almost 20% of the surveyed sample.

Private companies funded exclusively by domestic capital represented the largest group in the sample (67.5%). Conversely, enterprises wholly owned by foreign capital represented the smallest group (5.3%).

The surveyed enterprises belonged to various segments and sectors of the national economy. Among the 169 surveyed enterprises, 32 were manufacturing companies, 31 were service companies, and 15 were trade companies. The other entities conducted mixed operations.

The enterprises were also diversified with regard to their financial results. Enterprises with profitability (ROE) within the range of 0%–5% represented the most populous group. Only three of the surveyed companies achieved profitability exceeding 20%, while almost 25% of them were operating under a deficit. Enterprises with revenues exceeding EUR 5 million formed the most populous group (31.9%), followed by enterprises with revenues within the range of EUR 0.8–2.5 million (30.8%). Enterprises with assets less than or equal to EUR 1.5 million were most prevalent (40.8%), followed by enterprises with assets exceeding EUR 5 million (21.9%).

Costing and pricing methods

Many classifications of calculation methods are found in the literature. The most prevalent methods are division based costing and cumulative costing; however, each of these methods possesses a number of variants. Assuming accrual of costs as the criterion, a single-step computation (where the unit cost of product manufacturing is determined using a single computation encompassing all components of the production cost) and a multiple-step computation (when clearly separated phases occur in the production process) are treated as separate techniques in unit cost computations (NOWAK 1996, p. 56).

Regarding the timing of the computation, the initial/ex ante computation (prospective-prepared before producing the product or providing the service) and the result/ex post computation (retrospective-made after completion of the production process) are identified (*Leksykon Rachunkowości* 1996, p. 72). Regarding the scope of costs considered to determine a unit cost, full costing (encompassing all the costs incurred, including indirect costs) and partial costing (encompassing only the variable costs related directly or indirectly to the computation units) are identified (GABRUSEWICZ et al. 2000, p. 134).

Division based costing is used to determine a unit cost for products that are mass-produced or products that are manufactured using a modular process with simple production techniques and technologies. It is calculated by dividing the sum of total costs incurred during a given period (both direct and indirect) by the number of units produced. The major variations of division based costing include:

- simple division based costing applied in enterprises that manufacture uniform or modular products, with numerous similar products, requiring similar raw materials and similar processes (standard components),
- equivalence number based costing,
- division based costing with deductions in the case of ancillary products (one main product with side products) (NOWAK 1996, p. 53, *Leksykon Rachunkowości* 1996, p. 73).

In enterprises that manufacture a wide range of products that are diversified with respect to volume of production, design, and manufacturing process (SKRZYWAN, FEDAK 1984, p. 204, GABRUSEWICZ et al. 2000, p. 156), i.e., in the case of unique products or products with long development, production, or manufacturing cycles, *job costing* procedures are typically applied.

Job costing is characterised by separate costing for each cost object represented by an individual job order, i.e., cost per product or project. In this computation, the direct costs are allocated directly to the appropriate cost object based on the source of the cost, while the indirect costs are added to the direct costs based on a prorated or formulated estimate.

From the perspective of the organisation of the production process and the cost objects to which direct costs are allocated, job costing is divided into: (*Rachunek kosztów...* 2003, p. 198)

- *contract job costing* (sometimes referred to as surcharge costing) (*Podstawy rachunkowości zarządczej...* 1999, p. 39), which is applied when production is for custom orders, i.e., in the case of unique units and narrow product mixes,
- *batch costing*, which is used when similar products are produced in batches (mass-produced) according to weekly or monthly production plans (batch frequency).

Another method of costing is *multistage costing*, which is applied in cases when separate phases exist within the production process during which materials and semi-finished products are gradually transformed into the finished product. These distinct production stages permit grouping of costs and accounting for each stage. Two basic methods of multistage costing exist:

- process costing, which is applied in the case of mass-production, and
- staged costing, which is applied when the production process of a given product consists of a number of technical process stages during which defined semi-finished products are produced (NOWAK 1996, s. 56).

Determining an appropriate manufactured product unit cost is also critical for determining the optimum product price, as enterprises typically use so-called cost-based methods' for making pricing decisions. In this case, the cost base that is determined using full cost accounting or variable cost accounting is the starting point for determination of the product price.

The *cost plus pricing formula* is an example of such a method. Prices are established by adding a defined (unit) profit amount to the product unit cost (*Rachunek kosztów...* 2003, p. 182, DOBIJA 1997a, p. 153, DOBIJA 1997b, p. 121, GABRUSEWICZ et al. 2000, p. 319). The *cost plus profit on capital pricing formula* is another pricing method. Although it is similar in its design to the cost plus formula, it considers a wider range of economic components. In this case, prices are related not only to the production costs but also to the invested capital necessary for product production and distribution. In making pricing decisions, management attention is focused on estimation of normal production levels and sales costs related to products, as well as on guaranteeing ROE or ROI that is consistent with the long-term profitability of the enterprise. This formula, similar to the cost plus formula, does not consider external factors in the enterprise pricing policy and consequently it should not be used in enterprises operating in competitive markets. Only enterprises with no competitors offering compatible products can apply this method (*Rachunek kosztów...* 2003, p. 185).

Conversely, the *gross margin based pricing formula* dismisses fixed costs from its formula. This formula is predicated on a demand-driven market, taking into account both internal and external relationships in setting the optimum price (*Rachunek kosztów...* 2003, pp. 187–188). Consequently, this formula is commonly applied in a “seller’s market”, i.e., when the market accepts virtually any price offered by the producer (SOJAK 1994, p. 190).

In determining prices, one should consider the fact that relying on cost information only, with disregard of other external factors, may lead to setting an inappropriate sales price and, consequently, to lack of consumer demand (BUCZKOWSKA 2003, p. 82).

Results of the study of costing and pricing methods used in enterprises in Warmia nad Maury

The survey indicated that simple division based costing was used by 35.5% of the surveyed enterprises and was the most frequently applied method of unit cost computation for products and services (Tab. 1).

Table 1
Scope of application of unit cost computation methods for products and services in the surveyed enterprises

Item	N	%
Simple division based costing	60	35.5
Equivalence number based costing	40	23.7
Job costing	19	11.2
Contract costing	32	18.9
Process costing	10	5.9
Other costing methods	5	3.0
None	24	14.2
Total enterprises surveyed	169*	X

N – number of responses, * – number of respondents
Source: own work.

Equivalence number based costing was ranked second (23.7%). Process costing was the least popular method. It is worth noting that job costing, which, in a similar survey conducted in 1998 with 200 enterprises in Poland was shown to be used in more than half of the surveyed enterprises, was used relatively infrequently as of the current study (11.2%) (RADEK, SCHWARTZ 2000, p. 67).

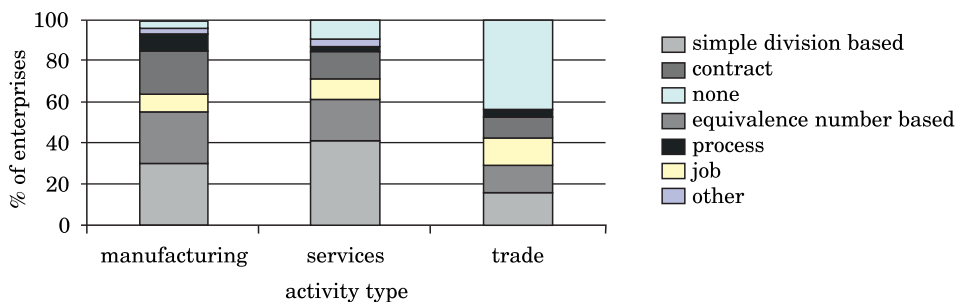


Fig. 1. Unit cost computation methods for products and services vs. the predominant type of activity in the surveyed enterprises

Source: own work.

From a predominant activity perspective (Fig. 1), the simple division based method, which is applicable mainly in the manufacturing units of departments involved in mass or long batch production facilities with a single, uncomplicated product, was most frequently used in the manufacturing enterprises. As there were only a few entities that manufactured one type of product, this

method was not highly utilized². Furthermore, this cost method was often used in concert with other costing methods associated with an auxiliary production function (e.g., different cost method for warehousing, utilities, etc.) due to the complexity of the production processes. This method was also popular as a result of its simplicity and low cost of implementation. Among the enterprises surveyed, the simple division based costing was applied the most frequently by enterprises from the following industries: chemical and pharmaceutical manufacturing, textile and garment production, and water and energy supply.

The decision to use equivalence number based costing is driven by factors similar to those for simple division based costing. However, equivalence number based costing is typically applied in entities that manufacture different products on a mass scale using the same raw material and similar processes. As indicated by the survey, this method was applied most frequently in chemical, pharmaceutical, leather, food and meat processing, and service enterprises.

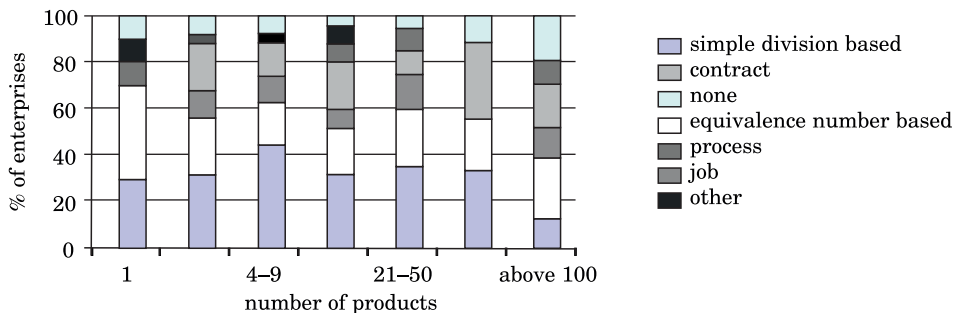


Fig. 2. Unit cost computation methods for products vs. the number of products offered by the surveyed manufacturing enterprises

Source: own work.

None of the surveyed enterprises that manufactured homogenous products used job costing. Similarly, this costing method was also not used by enterprises that offered a wide variety of products (over 50 products). Nevertheless, it was used by almost half of the manufacturing enterprises (Fig. 2).

A relatively low percentage of manufacturing enterprises applied contract costing, which implies that the majority of the surveyed companies were of the mass-production-variety, with very few of them providing specialty individualized products (or services). Another probable reason for a dearth of contract costing is the high cost associated with this method – each contract is unique

² Among the 200 Polish enterprises that responded to questionnaires in 1998, simple division based costing ranked second to job costing (RADEK, SCHWARTZ 2000, p. 67).

and requires the dedication of resources to link the direct costs to individual contracts. Nevertheless, this method provides more accurate product costing because the costs of an individual order (contracts) are calculated on a case-by-case basis. Contract costing was utilized mainly by construction enterprises, machine and metal industry enterprises, and paper industry and printing enterprises.

Process costing was applied in business entities in which mass or large batch production progressed through numerous consecutive production process stages. It was encountered mainly in the food and meat industry, in the textiles and garments industry, and in the chemical and pharmaceutical manufacturing industry.

Regarding other costing methods, the respondents indicated various versions of job costing, e.g., product range costing, comparative costing, and results costing. No costing was applied in more than 14.0% of the respondent enterprises, of which 66.7% were trade enterprises (which partly explains the absence of costing procedures), 20.8% were service companies, and 12.5% were manufacturing enterprises with a highly diversified range of products (more than 100). Offering a large number of products makes the application of costing procedures more difficult, but it does not justify neglecting unit cost computation for the products manufactured, as this computation is the baseline for setting the optimum prices for products and limits losses resulting from plummeting prices encountered in the free market.

The application of different costing methods for determination of unit costs for products or services is linked to the application of specific pricing formulas. The pricing formulas for products or services that were applied at the surveyed enterprises are presented in Table 2.

Table 2

Pricing formulas used in surveyed enterprises

Pricing formula	<i>N</i>	%
Cost formula	123	72.8
Comparative formula	44	26.0
Result formula	21	12.4
Other	2	1.2
None	5	3.0
Total enterprises	169*	X

N – number of responses, * – number of respondents

Source: own work.

A cost based formula was used in the vast majority of enterprises (72.8%) for pricing products and services³. It was applied by 75.0% of respondent manufacturing enterprises. Similarly high percentages were recorded among

service providing enterprises (73.0%) and trade enterprises (69.5%). The cost based formula was used equally extensively in enterprises offering just one product as in those offering many different products. This formula method is relatively simple and easy to apply, which allows enterprises manufacturing a diversified range of products to update their prices on a frequent and regular basis.

All of the enterprises from the leather, automotive, paper, and printing industries, as well as 80.0% of chemical and pharmaceutical industry enterprises, used a cost based pricing formula. The popularity of the cost based formula resulted from a congruency with adopted accounting principles and an ease of ability to automate the recordation of costs into financial statements (income statement). Moreover, the decision to use this method was supported by the ease of obtaining the necessary data for application of a cost based pricing formula.

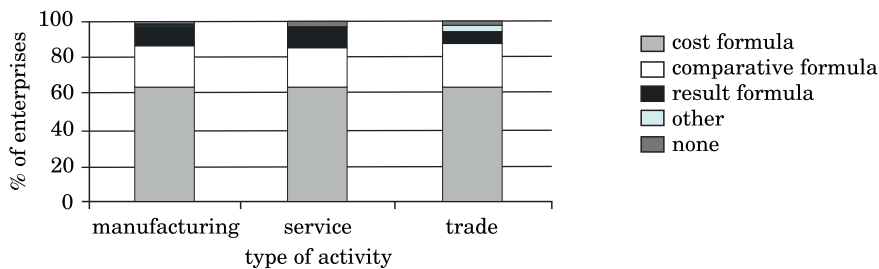


Fig. 3. Pricing formulas vs the predominant activity type in surveyed enterprises

Source: own work

One weakness of the cost based pricing formula method is that it is supply driven and ignores external relationships, e.g., competing products and their prices, in making pricing decisions. Consequently, this formula does not require an organization to rationalise its internal enterprise activities. The popularity of the cost based formula for pricing suggests that the majority of enterprises do not see the negative consequences of this particular weakness⁴.

The comparative formula enjoys significant popularity (26.0%), particularly among manufacturing enterprises in which 50.0% use it, in part because of the ease of its application (Fig. 3). This formula is particularly popular among

³ A very similar result (71.8%) was obtained from a study conducted in 1997 by the Department of Enterprise Management, Warsaw School of Economics, involving 500 of the largest Polish enterprises (MIELCZAREK 1999, p. 20). A similar result (70%) was also obtained from the survey of 60 enterprises in 1998 (SZYCHTA 2001, p. 116).

⁴ Per J. Turyna and B. Pułaska-Turyna, over 30.0% of American enterprises apply the full costs method to price their products (TURYNA, PUŁASKA-TURZYNA 1994, p. 90).

enterprises in the timber industry, in which 60.0% of the respondent enterprises used it.

Conversely, the results based formula application requires higher management awareness. Pricing with this formula is only possible in those enterprises that maintain fixed and variable costs accounting. Among 28 enterprises possessing variable costs accounting, 21 used this formula to price its products. The results based formula is more popular in service enterprises than in trade ones, and is more popular in “modern” industries such as chemical, pharmaceutical, paper, and printing. This method is predicated on knowledge of the relationships between turnover and costs (separation of fixed and variable costs), which translates into the (target) profit level. It is worth noting that those enterprises that priced their products according to the result based formula showed the highest profitability (exceeding 20.0%) over the study period.

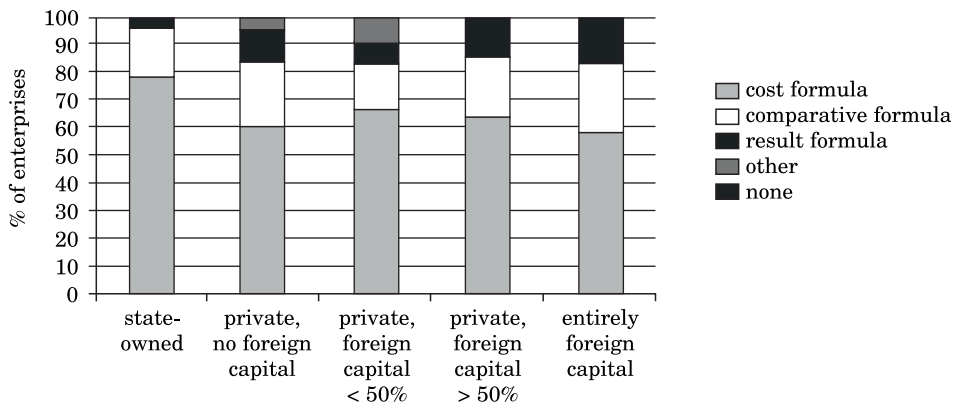


Fig. 4. Pricing formulas vs. the form of ownership of surveyed enterprises

Source: own work.

The cost-comparative formula was another pricing method used in some of the surveyed enterprises (Fig. 4). The use of no formula' was used by 3% of the surveyed enterprises. All enterprises in this no formula subgroup were private enterprises that were funded entirely by domestic capital and that suffered from low profitability, either operating under a deficit or with a return of less than 5.0%. Furthermore, almost half of the enterprises in this subgroup were trade enterprises. Lack of a pricing formula may be a consequence of the fact that major suppliers in the market dictate prices.

Summary of the results of the study

Costs are one of the main metrics used to evaluate the operations of an enterprise and, consequently, the costing function is important in the management of business entities and represents an area of focus for management.

The conducted study confirms that the application of specific costing methods depends on the type of production, the volume of production, and the organisation of the business processes. The division based costing method was found to be the most popularly used method within the surveyed enterprises:

- Simple division based, used most frequently by manufacturing enterprises in the following industries: chemical and pharmaceutical manufacturing, textile and garment production, and water and energy supply.

- Equivalence number based, used by enterprises in the following industries: chemical and pharmaceutical, leather, food and meat, and service enterprises.

Job costing was also used relatively frequently in the surveyed enterprises. It was utilized mainly in manufacturing enterprises with a small number of products. It is worth noting that over 14% of the respondent enterprises applied no costing methods. The lack of a costing procedure equates to the lack of a baseline for control of incurred costs and for optimal pricing of products.

In the vast majority of enterprises (72.8%), pricing decisions were based on a cost based pricing formula. The comparative pricing formula, characterized by an ease of application, was applied in only 25% of the surveyed enterprises. Conversely, 3% of the surveyed enterprises used no formulas to price their products or services.

Faced with extensive competition and environmental pressure, and knowing that cost information is imperative to making appropriate business decisions, every enterprise must consider which of the available costing and pricing methods best fit its specific needs. These methods should help organisations improve costing systems and establish a means of auditing managements; efforts to accurately measure costs, profitability, and results.

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