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ESTIMATION OF EFFICIENCY OF INNOVATION PROJECTS IN QUALITY MANAGEMENT SYSTEM

The paper presents Quality Management System as a system of management and supervision of organization relating to quality. The given example shows, that in estimation of innovative projects efficiency taken in QMS it is not enough to limit oneself to analyzing chosen positions of costs – for example only the quality costs. This paper has concentrated on the estimation of ex ante estimation of efficiency of planned pro-quality projects, undertaken on the level of exploitation QMS compatible with demanded ISO norms, series 9000: 2000.

INTRODUCTION

The companies in the present day market are required to satisfy more and more various and often changing needs of the consumer. It relates to those firms, which offer consumer goods. Existence of those companies depends directly on the acceptance of its offers by the clients. Offers must be rightly chosen to a given part of the market (terminal group). It means that first of all the prices and quality of the offered products must be rightly chosen.

For small and medium companies the price and quality are basic instruments of competition. The price of products determines the height of net profit margins, which influences the value of return of retail /selling. It means that when we know the price and profit margins we know the top level of prime costs of the company. The main aspects which determine competitiveness of a considerable class of companies are:

- products fulfilling the requirements of the customers and

- level of prime costs, including costs which a company bears in order to reach these abilities.

The first factor determining the '**marketability**' of products is the revenue of the company. Second – the costs which determine the level of profit margins reached by selling the products. Maintenance or reinforcement of a competitive advantage of a company calls for running a current estimation of efficiency of projects which are being realized. It particularly relates to the innovative projects that are being realized as quality management system also called pro-quality projects.

1. THE CONCEPT OF EFFICIENCY OF PROJECTS IN QUALITY MANAGEMENT SYSTEM

Quality Management System has been defined as a system of management and supervision of organization relating to quality. This paper has concentrated on the estimation of *ex ante*, therefore, the estimation of efficiency of planned pro-quality projects, undertaken on the level of exploitation (maintenance) QMS compatible with demanded ISO norms, series 9000: 2000. The estimation of efficiency of these projects is realized in economic categories in the context of their influence on the profitability of the whole company. The method is useful in choosing among alternative projects - those most efficient (profitable) for a company in a short and medium (up to a year) planning horizon.

Efficiency of projects in QMS is defined as the growth of an indicator of profitability of a company. The indicator of efficiency of QMS projects in a period T is:

$$WEPSZJ_T = WRP_T - WRP_{T0}$$

where:

$WEPSZJ_T$ – the indicator of efficiency of QMS projects in a period T,

WPR_T – the indicator of company's profitability in a period T,

WPR_{T0} – the indicator of company's profitability in a base period T_0.

2. KINDS OF DECISION-LIKE SITUATIONS

Making a decision about a choice of action in order to increase the competitiveness in QMS calls for establishing its economic effects on a company. It implies an estimation/assessment of rightness of a decision taken in QMS in context of profitability of the whole organization. It especially relates to two types of decision-like situations.

The first type of decision-like situation deals with minimizing the costs of the quality in a given class of quality of the products. The point is therefore to establish such a cost structure, so to reach the exogenously given/in advance agreed upon class of product quality – accepted by the market at a given price. The aspiration for a decrease in costs should not constitute the only goal of these companies – it cannot have a negative impact on the quality of the products.

The second type is connected with a change of product quality classes. This change, on one hand, is connected with higher costs that have to be incurred, but on the other hand, an increase in the value of sales is expected, that is a result of increasing the prices. Increase in the sales revenue occurs only if a consequent realization of the rules of market segmentation is carried out and if the higher quality class, and thus a higher price are accepted by the clients.

In an evaluation of accuracy of the indicated types of decisions, it is not enough to analyze the quality cost structure, but referring it to products' sales revenue and to the value of the engaged capital. It means that there's a need to apply (with reference to a considered range of project efficiency estimation in QMS) the **integrated approach** taking into account both the balance data area and the profits and losses account data.

3. METHOD

The method of efficiency estimation of considered projects boils down to designating changes of chosen company's economic indicators. Those changes show efficiency of projects being realized in QSM in context of their influence on profitability of the whole company.
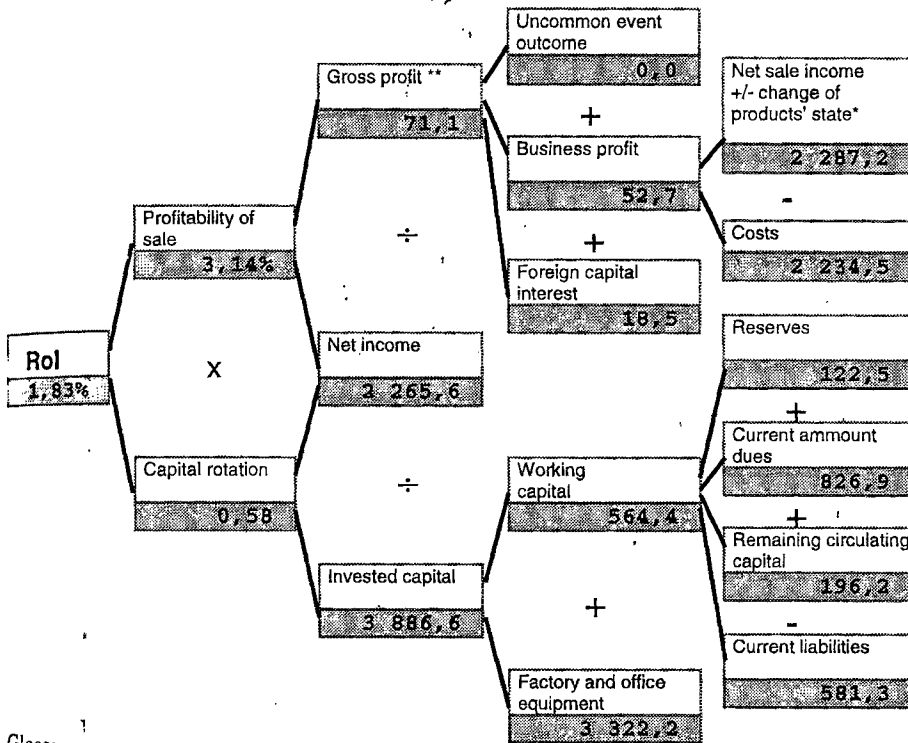
Gloss:

(x) – product, (÷) – quotient, (+) – sum, (-) – remainder

*   - product state change (increase – negative value, decrease – positive value)
*   - gross profit excluding foreign capital interest costs

Fig.1 Simplified graph of RoI indicator
Source: self work based on (Kluge, 2001)

The choice of the most profitable alternative of the indicated project requires carrying out of a wide **variation** of different potentially possible solutions and choosing the most profitable alternative. The basis of a rational economic choice of such projects is a possible wide-ranging variation of acceptable project solutions in successive phases of the preparation of their realization. A condition for a choice of the most profitable variant is a consideration of the biggest number of solutions that are possible (Piasecki, 2001, pp. 541). The choice comes into being because of variations of various

alternatives of these projects in a company. In order to carry out this variant, the so called **'scenarios technique'** has been used. It consist of creating a number of future scenario variants through description of events that may happen within the company and around it in the future. The scenarios may deal with the future of the company and its surroundings. The scenarios of the company's future, as well as its surroundings are a base for determining the company's aims and working out its strategy (Bieniok, 1997, pp. 11) (Gierszewska, 1997, pp. 49).

The procedure of making the company's future scenarios boils down to working out a number of variants (various versions) a probable timeline of events, respectively to which various project plans are projected, i.e. company's operation strategy.

The scenarios of the company's future may include (Gierszewska, 1997, pp. 50):

- a quick growth – that needs applying an expansive strategy,
- moderate growth – usually based on previous operations or maintaining the position on market and financial conditions,
- limitation of operations – by, e.g. reducing the range of operations,
- alike growth – based on extrapolation of previous processes,
- new (different) growth – quality different from previous tendencies and processes.

The project estimation method in QMS includes company's future scenarios. A moderate growth has been assumed. The estimation of scenarios boils down to a comparison of economic indicators describing various states of the examined object. In particular it boils down to a comparison of RoI indicators, profit from business, quality costs and prime calculation costs objects. The assumption is that realization of fundamental estimation, is realized using a system of indicators and an auxiliary estimation dealing with the company's prime costs area.

Fundamental estimation of the efficiency of the projects in QMS follows on the basis of changes of indicators that are included in Du Pont' system (see Fig. 1). The main indicator is the return on investment –RoI. The rest are: return on sales and business profit. The analysis of the reasons for changes in those indicators concerns the net profit margins for the sold products (calculation objects).What is especially estimated are the changes in incomes and costs, including quality costs for particular products. It is assumed that the sales revenue is above zero. It means that the method does not work during the period in which income equals zero.

The change in value of the RoI indicator shows an influence of the actions taken from the point of view of the capital owners. The change of the value of the business profit shows an influence of the general intra-company innovative ventures (not devoted to particular products) for the relation between the income value and costs projects. In order to pinpoint business profit net sales income change of the state of products needs to be taken into account. Operational action costs, remaining operational costs, and financial costs as a foreign interest capital are included into the costs.

The analysis of the causes of changes in profitability resulting from taking actions in QMS, realized in the context of sales revenue, shows an influence of the decisions taken in the area of sale. It especially concerns changes of quality classes and prices of the products.

The auxiliary estimation of QMS projects efficiency concerns the prime costs area of a company. It concerns costs value changes, especially quality and prime costs. Changes of the quality value costs illustrate an influence of projects taken in QMS on a

structure and a company's prime costs rate. The change of quality costs value illustrate an influence of projects taken in QMS on a structure and the rate of the company's prime costs. The change of calculation objects prime costs value shows the impact of innovative projects on the rate of net profit margins gained for these objects.

The value of particular cost positions are set on the basis of procedure in establishing prime costs. The costs are realized in sections: according to: the type of the costs, the place where the costs have arisen, or the calculation objects.

4. EXAMPLE

A company which manufactures products P1...P6 is considered. The company administrates QMS. This example shows an application of studied method of estimation of efficiency of actions realized in QMS in a company (see Kużdowicz P., Kużdowicz D., 2003). It was limited to operations in a sale area with a class quality of product change.

What is analyzed is the process of controlling the material quality as well as correcting actions in the purchase department. The initial situation is shown on a set of indicators on figure 1. The initial value of the RoI indicator is therefore 1,83%. The assumption is that sales revenue will increase due to an increase in the amount of products sold, which is caused by an increase of clients' acceptance of the offered products. What is anticipated is the products' prime cost, sales revenue and the RoI indicator would all increase.

The change of product quality class comes from an application of better and more expensive materials. What is therefore changed is the price of material purchase (10%). It implies a decrease in estimated times of processing. The time devoted to controlling of the material has decreased (from 1,2 to 0,2 h/process) as well as the time necessary to correct operations (from 0,2 to 0,1 h/process). These operations deal especially with faulty item complaints. As a result of the decrease in the amount of time needed to realize the above processes one employee from the *department of quality maintenance* has been laid off. Because of the change of product quality class, provided that the prices are constant, the rate of product sale increases by 25,5% on average.

The increase in income implied by the sale increase caused an increase of RoI indicator to 6,83%. The increase in sales revenue (to 2 988,2) was bigger than the increase in costs (to 2 769,7) caused by an increase in production. Therefore, taking the above actions in QMS gives a possibility to increase the profitability of the company in a given horizon. It means that the actions are effective.

Tab.1: A table of unit costs and profit margins

Inventory \ Products		P1	P2	P3	P4	P5	P6
Prime cost		699,48	472,57	512,96	226,55	218,44	260,69
	before	(719,25)	(481,41)	(524,31)	(236,24)	(228,68)	(271,41)
Including:							
Quality cost - purchase		0,27	1,28	1,46	0,92	0,76	1,09
	before	(1,56)	(7,40)	(8,49)	(5,35)	(4,42)	(6,29)

Products / Inventory	P1	P2	P3	P4	P5	P6
Quality costs - manufacture	0,00	4,14	4,14	1,63	15,08	1,63
before	(0,00)	(4,01)	(4,01)	(1,58)	(14,62)	(1,58)
Net profit margin	-279,48	167,43	127,04	23,45	31,56	-10,69
before	(-299,25)	(158,59)	(115,69)	(13,76)	(21,32)	(-21,41)

The analysis of the causes of changes in the RoI indicator was carried out in the context of unit costs and margins (see Table 1). The limitation of a range of material quality control caused the purchase of materials of higher quality. It caused a decrease in the unit quality costs of the purchase processes. What also decreased was manufacture processes' quality costs. It comes from the limitation of correcting operations in this range. The decrease in quality costs' value compensated for the increase of materials purchasing costs and finally caused a decrease in unit prime costs. The adopted structure of production and sales in a company determines the influence of an action taken on a value of particular costs.

The system/example above shows that in the estimation/assessment of the efficiency of projects in QMS it is not enough to limit oneself to an analysis of a position of chosen costs – for example only the quality costs. It implies a necessity of taking into account more indicators describing the situation of a company in relation to a planning horizon that is analyzed. It proves the rightness of the necessity of applying the **integrated approach** hypothesis in an estimation of QMS projects' efficiency. The realization of process cost calculation as opposed to a traditional calculation allows us to estimate the results of decisions taken in relation to processes realized in QMS.

5. SUMMARY

The given example shows, that in estimation of innovative projects efficiency taken in QMS it is not enough to limit oneself to analyzing chosen positions of costs – for example only the quality costs. It especially relates to projects connected with a change of the quality class of the offered products. It implies a necessity of taking into account a greater number of indicators describing the situation of a company in relation to the horizon of planning being analyzed. It proves the rightness of the necessity of applying the 'integrated approach hypothesis' in estimation of QMS projects' efficiency. The process costs calculation realization as opposed to a traditional calculation allows an estimation of decisions taken in relation to processes realized in QSM.

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