

## THE APPLICATION OF WINNING KEY METRICS IN A METALLURGICAL FIRM

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This article is focused on creating a system of metrics and its application in a metallurgical firm. Its aim is to highlight the dangers associated with the creation and application of an effective system of metrics. Its objective is also to demonstrate the process (initial steps) in the development of this system in the real family metallurgical firm. In the experimental part an example of causal links among key metrics in the chosen metallurgical firm is presented. Risks associated with the selection of appropriate metrics are presented for discussion.

*Key words:* metallurgy, metric, performance, process

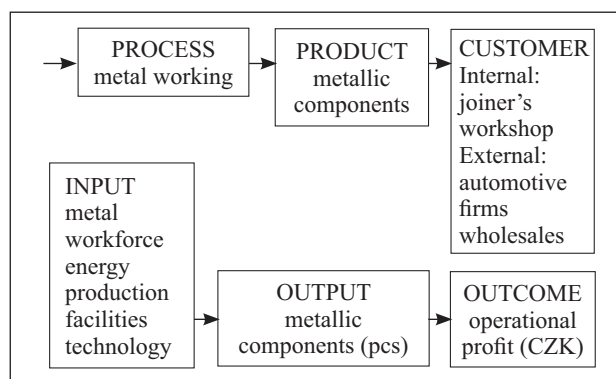
### INTRODUCTION

Competition environment puts pressure on the reappraisal of firm reporting nature and the implementation of changes in the performance measurement systems. Performance and its observing and maintaining have become not only an instrument of competitiveness but also a prerequisite for firm's existence. It is obvious that the entities of performance measurement system, e.g. particular metrics, need to be defined exactly to stimulate the desired behavior in order to attain expected results. The authors of the article emphasize that development of a quality metrics is a prerequisite for the utilization of the system of measurement in management.

This article presents some results of the research project aimed at evaluating the performance of small firms operating in the field of metallurgy. This field was chosen for its specific position. The task of the metallurgist is to achieve balance between material properties such as cost, weight, strength, hardness, corrosion, temperature extremes etc. and in the same time the environment must be carefully considered. The first part demonstrates the process of creating the metrics system for a small family metallurgical firm. In the second part summarized results of the risk analysis are presented for discussion. These risks have to be taken into account when designing an effective system of metrics.

### Experimental part

For the performance system creation and implementation small family firm was chosen. As there has not been established any central accounting and any principles of process management have not been implemented in the firm, it was not possible to brake down costs assigned to particular small business units (SBU) of the



**Figure 1** Characteristics of the 'metal working' process

firm or to processes. To demonstrate the approach to key metrics implementation and observing the performance a process of 'metal working' was chosen. By means of structured process analysis (SPA), processes at a lower level were identified: *forming*, *cutting*, and *joining*. Each of these categories contains various processes. Within those processes concrete activities take place. Storage of raw material, semi-finished products and finished products is an auxiliary process. Heat treatment, plating and thermal spraying were identified as associated processes which are not primary metalworking processes, they are often performed before or after them. Characteristics and continuity of the 'metal working' process to the previous processes and to the following ones are depicted in the Figure 1.

As the beginning of the process was determined the moment at which raw material is taken from the storing space to be formed. The end of the process is considered the moment at which the product is handed over to the external or internal customer after finishing the process of joining (a process of the second stage) and possible associated process and storing.

In looking for metrics for this concrete process a relative complexity of the process as well as demands for the

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product appeared to be a disadvantage. By applying brainstorming, the following areas of implementing the metrics for recording of desired and undesired results of the process and properties of the process and of product from the position of the owner of the metal working process (a person responsible for its results) and from the position of the internal and external customer of the metal working process were identified (Table 1).

Table 1 Potential areas of 'metal working' process metrics implementing

Owner of metal working process	Customer of metal working process
Desired outcomes	
A growing profit volume of components sales	Components in the required quality, quantity and time
Undesired outcomes	
Loss of customers	Non-compliance the terms of supply (quality, time, quantity, price)
Properties of product - outcome	
Low purchase price of components	Required quality
Properties of process	
High total productivity utilization on production facilities	Ensuring the delivery in time

The result of brainstorming aimed at the identified areas made the determination of metrics such as operational profit, the utilization of production capacity and productivity of labor possible.

For a key metric of this process is considered *operational profit (NOPAT)*. The rate of profit is influenced by the volume of product sales depending on customers and their willingness to buy, which is influenced by customers' satisfaction (ensuring desired outcomes, desired properties, and elimination of undesired outcomes as it is depicted in Table 1). Selling price as a result of negotiation between a product provider and a subject interested in the product is included among factors influencing customer's satisfaction. It is also the rate of operational profit influenced by the rate of variable and fixed costs. Metrics cover the basic criteria: costs, price and quantity. By control of casual links at all-firm level (because of the scope of the article the link is not presented), connections between metrics of the chosen process and metrics at the all-firm level (liquidity and cash-flow) are obvious: within the process the evaluation of performance at all-firm level is aimed at the utilization of production capacity and productivity of labor increasing.

## CASUAL LINKS AMONG KEY PERFORMANCE METRICS

Quality metric makes it possible to get to the very roots of the problem, to the basic causes, and to integrate the established facts into the information system so that the managers could use the information to the improvement of the process. If metrics' resulting values in the system of management are to be used usefully, it is necessary to determine their mutual links. Ensuring mutual interconnection so that improving (or worsening) the re-

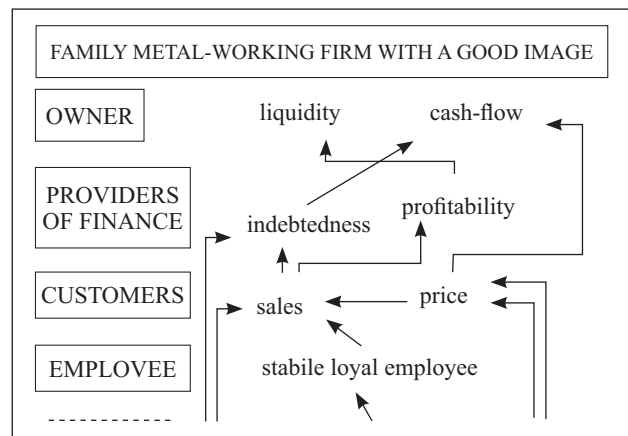


Figure 2 Example of causal links among key metrics of the success

sult of one metric will not be evaluated in isolation but as a cause or consequence of follow-up metrics' results is a precondition of their usefulness. The choice of key metrics and ensuring their mutual links will depend not only on the field of business of the firm but also in which phase of its development it occurs.

In the previous part mentioned small family firm operating in metal-working industry determined 'cash flow' and 'liquidity' as the basic top metrics of the success. The reason of the choice was the fact that it is a family firm in which the owner is at the same time its manager, the firm is at the beginning of its activities and it is relatively indebted. Part of the key metrics of the mentioned firm has been chosen for the following figure (Figure 2) to demonstrate causal links. The firm has a vision 'to build up a family firm with a good image'.

A cash flow and liquidity were identified as top metrics. Development of liquidity is influenced by indebtedness and profitability. These are influenced by the share of profitable loyal customers (sales volume). Sales volume is in the first place influenced by selling price (price policy) and the volume of production (stable loyal employee with a high productivity of labor) that is influenced by employee's productivity of labor with the utilization of production capacity.

In looking for the way of maintaining the position on the market (an actual goal in the current economic situation) the manager (the owner) decided on cutting the selling prices in average by 10 % (Table 2). The result was gratifying - the sales increased almost by 20 %. By the increased sales the indebtedness was decreased (by 24 %) and profitability (return on assets-ROA) was increased. Thanks to the decrease in indebtedness and the increase in ROA an available liquidity was enhanced (by 14 %). Decrease in indebtedness influenced not only the increase in liquidity but also the increase in a cash flow even by 26 %.

For comparison a case of increase in sales price by 10 % in average was simulated. It was intended that the increase in a sales price would result in sales drop by 10 % in average. Results of 'telling story' were interesting. Sales price increased by 10 % led to further indebtedness (by 7 %). Increase in indebtedness together with the aris-

en loss as a result of economy decreased a prompt liquidity. The drop was very small (by 3 %) so the liquidity still remained at a very good level as well as a higher volume of cash flow for the owner (by 4 %) thanks to the increased prices. Yet it would be desirable to carry out a detailed analysis to find out whether a liquidity crisis is not starting, which might together with the alarming state in the area of profitability seriously threaten the existence of the analyzed metal-working firm.

Table 2 Example of causal links

	price -10 %	price + 10 %
liquidity	+ 14 %	- 3 %
cash-flow	+ 26 %	- 4 %
indebtedness	- 24 %	+ 7 %
profitability	+ 15 %	- 8 %
sales	+ 20 %	- 10 %

## DISCUSSION

Risks associated with the formation of the metrics system (selected from the summary):

### *Variety of definitions of the same metrics*

When the same or similar metrics are used, different results often occur. It is important for the definition of a particular metric to be the same for all involved, they should know it and consistently observe it [1]. This uniformity of metrics' definition should be ensured by publishing written principles for metrics.

### *Averaging*

To decrease metrics' variability the calculation of average value is often used. The longer the period is the more the resulting value of the metric will seem to be depreciated by the calculation of the average [1-3]. But the longer the period is the longer the time needed for finding out the trends will be.

### *Using of too complicated metrics*

There is always a danger that too complicated metrics will be used with the aim to transform them into 'better' metrics of customers' satisfaction.

### *Control limits and variability of processes*

Part of metric's working definition should be the determination of desired limits [4]. The need of interference should be signalized only when the change of metric's value is statistically significant, as a majority of processes cannot show a zero number of drawbacks (undesired results) because of their inherent variability. It is obvious that metrics are an indispensable instrument of efficiency and performance, mainly with the focus on company's goals, critical factors of success, processes and sources efficiency [5-6]. Metric is a complicated phenomenon that can be searched from various angles. With changing conditions of the environment the metrics themselves will be developed so it is really not possible to give a detailed survey of metrics' analysis standpoints and their classification [7-9]. There are a number of views of a quality metrics. In a simplified way it can be said that quality metrics are as follows: they are in harmony with company's strategic priorities

and customers' priorities, they are appropriately chosen for company's operation as well as for work of individuals, it is easy to develop and adjust them, they can be quickly implemented, they are easily understandable, they lead to the improvement, they are not an inviolable thing, they are not left to exist forever [10].

## CONCLUSION

Metrics can be generally divided into two big groups. The first act as *external* metrics visible also for the surrounding area, and they are a motivation for its behavior, the others act as *internal* and serve to internal control and improvement and they remain hidden for the surrounding area. Whatever field is taken into consideration and choose a type of metric (combined, of the result, of efficiency, financial etc.) it can be concluded that the obtained result is either meant or directly accessible for company's subjects around and it influences their decision-making or it is solely meant (or mostly) for internal decision-making, and for the subjects around is 'kept in secret' most probably from the strategic standpoint (then, of course, it would also influence their decision-making) or it is of no importance for these subjects.

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**Note:** The responsible translator for English language is K. Kashi, Ostrava (independent tutor).