Cost Management and Cost Behavior in Manufacturing Enterprises – Preliminary Research

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***Abstract*—** This paper presents results regarding a pre-test of the quantitative research within the project focused on cost variability and cost management systems. The main goal is to analyse and then introduce principal findings resulting from searching for the level of cost management as well as for understanding various types of cost behavior in manufacturing enterprises in the Czech Republic.

The first part of the paper analyses present theories regarding approaches to cost management with the emphasis on overhead cost management, general and asymmetric cost behavior.

In the second part, procedure as well as methodology of research is presented. The hypotheses that are the base for the analysis of particular areas within the cost management are also presented in this part.

The third part presents research results themselves that were also verified by a statistical check-up of dependence relations. Rather significant drawbacks and reserves of manufacturing enterprises in their overhead cost management mainly were found out. These results are then discussed in the final part of the paper.

***Keywords*—** cost variability, cost behavior, asymmetric cost behavior, overhead cost management.

I. Introduction

The changes in business environment in the second half of the 20th century had the significant impact on the structure of the company costs and due to this, we can observe a continuously growing importance of cost management systems. The ability to analyse company costs is one of the most important prerequisites of the effective cost management and it is one of the most important area of company performance. The most important feature of the cost analysis is cost classification when costs are classified into defined categories according to the particular characteristics. Another important area is the analysis of the cost behavior.

Due to a growing competition on globalized markets, companies need more detailed and precise information about the cost efficiency and profitability of their products, projects or customers. All these problems are connected with a higher need for understanding the consumed costs and other areas where the costs play an important role.

Knowing how costs change as activity output changes is an essential part of planning, controlling, and decision making [1]. Ways to proceed with the assessment of costs and their analysis are numerous. In traditional models of cost behavior which appears in literature, costs are described as fixed or variable with respect to changes in volume production. In this model, variable costs change proportionately with changes in the volume of production [1], [2], [3], [4], implying that the magnitude of a change in costs depends only on the extent of a change in the level of production, not on the direction of the change. But some allege costs rise more with increases in activity volume than they fall with decreases [5], [6], [7], [8], [9]. In fact, not knowing and understanding cost behavior can lead to poor and even disastrous decisions. And this is the reason why we constantly talk about the variability of costs and how they translate into costing systems and hence the price of the product.

The main goal of this paper is to present results of the pre-test of the quantitative research done within the research project called "Variability of cost groups and its projection in the costing system in manufacturing enterprises". **The partial goal** is to analyse current situation regarding cost management in practice within manufacturing enterprises in the Czech Republic. **The attention is paid** to particular results of the questionnaire survey with the emphasis on overhead cost management in manufacturing enterprises as well as perception of potential asymmetric cost behavior. The analysis of management approaches regarding overhead costs mainly, and their dependence on particular factors will be made.

II. Literature review

Financial and management accounting in different countries usually offers different approaches to cost classification. Financial accounting uses the cost classification on financial

Acknowledgements this paper is one of the research outputs of the project GA 14-21654P/P403 "Variability of Cost Groups and Its Projection in the Costing System in Manufacturing Enterprises" registered at Czech Science Foundation.

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statements [10]. This classification assorts natural types of costs based on a type of the consumed input.

E.g. Drury states the main division into direct and indirect costs [4, p. 24-25]. Among the direct costs then classified primarily direct materials and direct labor as represent those which could be easily and accurately identified with a particular cost object. Indirect costs then cannot be identified specifically and exclusively with a given cost object. [4, p. 25], [11, p. 33].

Another division is according to the cost behavior to the variable costs, fixed costs, semi-variable or semi-fixed costs. e.g. [1]–[4], [12], [13], etc. In connection with this issue Hansen adds, that then cost assignment is one of the key processes of the cost accounting system [1]. **And just the correct identification of variability in each cost groups due to production is the key to the exact allocation**. It is necessary to realize that costs need to be split to variable (links to load capacity) and fixed (independent to load capacity). How Popesko says, in practice it is really necessary to distinguish these sets of costs. We can distinguish for example costs united with dose and its level, which are going to be change in addiction at quantity of doses, but stays fixed in link to individually produced units or products. [14] Next possibility is to distinguish costs related to group of products or services. These costs are independent of made products quantity of certain type, but they have tend to grow in case of product type number produced by company grows. We could continue in this enumeration of variability, for example through costs, theirs formation is induced by specific customers and individual attitude to them (e.g. in marketing, support of customers etc.)

Many authors have stressed the need for exploring the cost behavior, depending on various factors in this current turbulent period of economic fluctuations and instability of production.

For example Weiss has examined the effect of sticky cost behavior in estimating analysts' earnings forecast and how the earnings forecast can affect the market responses in any surprise earnings announcements [15]. Similar research performed also Banker and Byzalov when examined the sticky cost behavior by using a global Compustat data from 20 countries, to see whether the sticky cost is a global phenomenon or it is more pronounced in the US only. They have tested 5 hypotheses to analyze the cost behavior of firms along with managers' optimism and pessimism about the future economic outcomes. [16]

From earlier performed (and published) researches then went out Shust and Weiss when examined the sticky costs behavior between reported operating expenses in the annual report versus the operating expenses paid in cash by analyzing three models given by Banker and Byzalov [17], [16]: according to Anderson, Banker a Janakiraman specification (ABJ) [18], the liner ABJ model given by Balakrishnan et al. and Weiss firm specific nature of stickiness [19], [15]. They argue that, financial reporting choices of operating costs induces stickiness, more than the costs paid in cash, which is noted as economic costs.

Cost stickiness becomes a phenomenon of present time. Yasukata and Kajiwara found out from their researches, that, the difference in cost stickiness even larger when managers are more optimistic about the future sales even when sales decline, hence keeping the slack resources for future uses. When analyzing the individual stickiness between selling, general, and administrative (hereafter, SG&A) costs and cost of goods sold (hereafter, COGS), they find that, SG&A costs are stickier than the COGS costs. In this case, managers are reluctant to cut the administrative costs or any downsizing costs of selling personnel with an expectation that they need to higher again the selling personnel when sales restore. [20]

In connection with this issue Chen etc. found out, that SG&A costs increased by 0.80% if sales increased by 1%, whereas SG&A costs decreased by 0.74% per 1% decrease in sales where the manger is less confident and further decrease by 0.61% where the manager is overconfident. Thus, the result is showing that, overconfident manager is less willing to cute resources when sales reduce due to his perceives believe that sales will increase in the near future. They differentiated the sticky cost behavior beyond the managerial agency theory and economic behavior of the cost accounting. Authors argue that, in an agency theory, stickiness cost behavior arises due to opportunity seeking behavior of the managers. However, overconfident manger is not looking for any personal benefits, however he is driven by his self-stream about the positive future outcome, and that is why he is keeping the unutilized resources to increase the value of the firm in future. [21], [22]

All these (and many other) studies clearly demonstrate the need for such exploration, comparison and verification of this issue also in terms of manufacturing firms in the Czech Republic.

III. Methodology

In accordance with the goals of this paper, the partial research results are also presented. This quantitative research was done as a pre-test of the complex quantitative research focused on the issue of cost management in manufacturing enterprises. This is done from their variability cost perspective as well as taking into account costs in particular cost and calculating systems within the enterprises.

The questionnaire was divided into 4 basic areas that fulfil the goals and hypotheses of this research project. These are following:

- General information about the enterprise – the emphasis on the size of it, ownership and type of production
- General information about the costs – structure of the costs according to their classification, the attention paid to the costs (frequency of their monitoring and evaluation, what types of costs are monitored in more detail, etc.)
- Costs and calculations (the emphasis on overhead costs) – what types of calculations are made, how the overhead costs are reflected in calculation formulas, how the overhead costs

are matched with an expense item, and so on.

• The area of cost variability – whether the enterprises have knowledge and consider the fact that costs do not have to be dependent on production capacity only, how they work with overhead costs in relation to various factors (number of customers, production batches, orders, etc.), the approach to semi-fix or semi-variable cost management

• Additional information – information environment, methods regarding cost processing, and so on.

For this quantitative research, the firm´s range of exploration was bounded in the manufacturing industry – NACE from 10.10 to 33.20. 200 randomly chosen companies were addressed. It managed to find 57 respondents out of these companies, which is a 30% return rate. The results obtained from the questionnaires were evaluated by relative frequency and the hypotheses were tested using $\chi 2$ Tests (Goodness of Fit Tests and Contingency Tables) for determination dependence between categorical variables. The null hypothesis is that the actual distribution can in fact be represented by the theoretical distribution, and that the discrepancies between them are due to chance.

We compute test statistic [23]

$$\chi^2 = \sum_{i=1}^{k} \frac{(n_i \pi n)_{0,i}^{\ 2}}{n\pi_{0,i}} \qquad (1)$$

where n_i are observed sample frequencies and $n\pi_{0,i}$ are theoretical (expected) frequencies in the ith group. $\chi 2$ has (if n is large enough) a $\chi 2$ distribution with $(k - 1)$ degrees of freedom (df).

Decision rule: we reject the null hypothesis if

$$\chi^2 \geq \chi^2_{1-\alpha}(k-1) \qquad (2)$$

otherwise we do not reject it. The measure of dependence is the Pearson´s contingency coefficient:

$$P=\sqrt{\frac{\chi^2}{\chi^2+n}};\quad P \in \langle 0;1) \qquad (3)$$

The level of infallibility was defined on 0.05, which means that the hypothesis of independence of two variables can be rejected if the calculated p-value will be lower than this level defined. In such case, it is possible to consider the statistical dependence of two variables. Despite the total number of respondents, which is not too high and the results can be rather distorted for this reason, it is possible to make certain conclusion regarding this pre-test. This pre-test based on questionnaires also verified the relevance of questions in connection with the companies studied. Having the test corrected shall enable us to do a standard research when 150 respondents are expected to take part in. This sample should be sufficient enough to generalize particular findings.

Based on the project goals, the following hypotheses were stated regarding this part of result evaluation:

H1: There is a statistically significant dependence between the company size and the attention that is paid to manage its fixed costs.

H2: There is a statistically significant dependence between the company size and considering the cost variability evaluation according to other quantity than production capacity.

H3: Medium and large enterprises concentrate more on the development of overhead costs than small enterprises.

H4: In fact, there are certain groups of costs that are increasing when the production capacity is getting higher. However, when the capacity is getting lower, these are to stay on the same level. Such costs do not decrease again. This does not depend on the company size, type of production or the ownership structure.

IV. Results

In this part, some of the research results will be introduced. First, regarding the goals and hypotheses, it was essential to evaluate enterprises from the following perspectives – their size, ownership structure and type of production.

Table I: The company size (number of employees)

Number of employees	Absolut freq.	Relative freq. in %
10 - 49	21	37 %
50 - 99	6	10 %
100 - 249	17	30 %
250 - 499	5	9 %
500+	8	14 %

Source: own

Table I illustrates the structure of respondents regarding their size[1]. Here as the most important criterion was the number of employees. From the table above, it is evident that the highest number (about 77 % of companies) belong to small and medium enterprises with 0 – 249 employees. About one third of the companies can be classified as small enterprises with 0 – 49 employees. About 23 % of companies are large enterprises with over 250 employees.

The aspect of company ownership was also studied as there are other various dependences that can occur. The aspect whether the companies are owned by a domestic or foreign proprietor is rather important. Regarding this aspect, three quarters of respondents were owned by a domestic proprietor, 19 % of companies were owned by a foreign proprietor, and in case of 5 % of companies, there was a joint ownership of both domestic as well as foreign proprietors.

The type of production is also essential for the purpose of further conclusions and research. It is possible to search for connection between cost behavior and particular types of products. The table below shows this feature.

[1] Commission Regulation (ES) no. 800/2008

Table II: Type of production

Type of production	Absolute freq.	Weighted average percentages of production
Piece production	32	24.86%
Project production	20	16.61%
Small batch production	31	20.61%
Large batch production	23	25.37%
Mass production	11	13.51%

Source: own

Note: Number of cases in which at least 1% of the respective type of production was indicated.

The respondents were to choose more possibilities when also mentioning the percentage of these types of production. Therefore, the evaluation had to be based on weighted average. Table II shows that numbers of particular types of production are rather balanced. We can state that no type of production considerably predominates.

For the purpose of cost management, it is necessary to find out a structure of costs from the perspective of their classification. The table below shows the portion of overhead and fixed costs.

Table III: Overhead (fixed) cost portion.

	Portion on total cost		Portion on total cost
Unit cost	62 %	Variable cost	65 %
Overhead cost	**38 %**	Fixed cost	**35 %**

Source: own

Table III illustrates that average portion of overhead costs is about 38 % whereas regarding fixed costs it is only 35 %. There we can also identify a small disproportion between overhead and fixed cost portions. This is caused by the fact that it possible to include a part of overhead costs within production into variable costs. It is positive that companies understand the differences in costs. From other questions and answers to these, it is evident that companies do not pay special attention to overhead costs. The respondents mentioned (almost 55 % of cases) that they pay as much attention to overhead cost management as to variable cost management. 28 % of respondents mentioned that they focus on variable (unit) costs mainly. Only 7 % of respondents specified that they concentrate directly on fixed cost management. Then, 22 % of respondents specified that they tend to focus on cost division in detail after having them divided into particular categories. This means that they also pay attention to overhead cost management. To sum up, **only about 30 % of respondents focus on overhead cost management in detail.**

To have an overall view on the issue of cost management, it is interesting to mention that about 10 % of respondents do not use calculations for their cost management. In other cases, the companies (more than half of the cases – 54 %) make use of full absorption costing. To compare these findings with previous studies, it is also interesting to mention the use of a modern method called Activity-based costing, which was used in 7 % of the cases only. This confirms its low usage, which also emerged in previous studies that were already published by the author. [24] As the proof of these findings, we can state that there is **the least possible cost management based on other cost drivers than production capacity.** This was confirmed also by other respondents´ answers when only 20% of these mentioned that they are aware of the fact that cost variability can also be considered in relation to other quantities than in relation to production capacity only. On the contrary, 75 % respondents stated that they are aware of the above mentioned but they do not make usage of such knowledge for the cost management itself. 5 % of respondents mentioned that they have never heard of this issue. This confirmed also other findings when majority of the companies (up to 60 %) mentioned that they do not distinguish semi-fixed or semi-variable costs. About 27 % of respondents have never heard of these issues. This means that only 13 % of respondents distinguish the categories of semi-fixed and semi-variable costs. This was again confirmed by the answers to the last question from this category when 72 % of respondents do not see the possibility of having other groups within the company that are increasing in relation to a growing production capacity. However, when the production capacity is getting lower these will stay on the same level and do not decrease again.

Based on the above mentioned facts, a more thorough research was carried out in order to find out potential connections among various areas of companies. Firstly, we assume that there is a strong dependence between overhead cost management and the company size. Logically, a larger company is to have a more complex system of costs and will have to pay more attention to overhead cost management mainly as in this area, there are possibilities how to save costs almost in any company.

Table IV: Dependence between the company size and the attention paid to management of particular cost groups.

	Mainly variable cost management	Mainly fixed cost management	Variable and fixed cost management
Small enterprises	33%	19%	38.10%
Medium and large enterprises	21%	25%	54%
χ^2	2.119		
p-value	0.55		

Source: own

Based on the calculated feature of $\chi 2$ (p-value = 0.55), it is evident that the hypothesis of independence is not possible to be rejected. This means that the research carried out **did not confirm statistically important dependence** between the company size and the attention paid to management of particular cost groups. It cannot be assumed that in connection with a higher company size there is a greater emphasis on the attention paid to, for example fixed (overhead) costs contrary to variable costs. Nevertheless, this does not mean that the companies do not pay any attention at all to overhead cost management. This fact was also confirmed by other hypothesis (*H2*), which has to be rejected as well for the reason of being tested on statistical dependence with the result of having

p-value on the level of 0.71, which is a higher value than the critical one of 0.05. **The hypothesis** of two variables independence cannot be falsified and therefore, the statistically significant dependence between the company size and the cost variability assessment done by other cost drivers than production capacity **was not confirmed.**

Although there was no proof of dependence between the company size and paying a special attention to certain cost groups, majority of companies (up to 85 %) monitor structure and development of overhead costs. The statistical dependence between the company size and detailed study of overhead costs was confirmed (*H3*). In this case, p-value was lower than 0.05 (0.016), which enable us to reject the null hypothesis regarding the independence of these two variables. It is possible to state that **medium and large enterprises statistically monitor in detail their overhead cost structure more often than small enterprises.**

The final hypothesis made (*H4*) describes *the fact regarding asymmetric cost behavior. These are costs that are increasing when the production capacity is getting higher. However, when the production is getting lower these are to stay on the same level and do not decrease again. This does not depend on the company size, type of production or the ownership structure.* This hypothesis **was found valid** due to three partial conclusions of statistical check-ups. The first conclusion made was based on study regarding dependence between the company size and understanding the fact of having asymmetric costs. In this case, relative frequencies did not show significant differences between small and larger enterprises. Consequently, the statistical test did not confirm the differences as p-value on the level of 0.726691 did not enable to reject the null hypothesis regarding the independence of two variables. In a similar way, it is possible to evaluate dependence between perception of asymmetric cost behavior and type of production. Even relative frequencies show that for example companies with a project type of production or a small-quantity production see the disproportionality of some of the costs more clearly than other companies perceive them. Still, these differences were not found to be statistically significant. The p-value of 0.649411 does not enable to reject the null hypothesis regarding the independence of two variables. This was also confirmed by the third conclusion regarding the study of dependence on property structure. The most significant relative differences were visible between the companies owned by a domestic proprietor and the companies of a joint ownership. The statistical testing confirmed that there is no dependence between the company ownership and perception of the costs (p-value of 0.559).

V. Discussion and Conclusion

This survey together with the previous ones carried out show that in many manufacturing enterprises, **the share of overhead (fixed) costs increased** up to about 40 % of total costs (38% in the year 2014, 39.5 % in the year 2009, 40.7 % in the year 2007[2]). The positive aspect of the findings is that companies are aware of the importance and significance of cost management as well as detailed monitoring and overhead cost management. This was stated by 85 % of the companies studied. Still, we cannot declare that companies pay a greater attention to analyses and overhead cost management than to variable cost management.

Then, it is necessary to state that there is no sign of application of detailed cost analyses that would monitor the cost behavior within the companies from other perspectives than production capacity only. This is confirmed by survey thanks to which we can declare that up to 75 % of respondents concentrate on studying the relation to a quantitative factor, i.e. production capacity or total of sales. To find out the reasons for the above mentioned, the research project is to focus on carrying out a qualitative research. However, one reason can be mentioned at this very moment. The research has proved that there is only a minimum awareness regarding asymmetric cost behavior. Almost three quarters of respondents (senior executives of the companies studied were addressed) are not aware of the fact regarding asymmetric cost behavior or the influence of other factors than production capacity only. Concerning this fact, no connection was proved in relation to the company size or a type of production, which again draws attention to drawbacks in the area of cost management within many companies.

In general, out of 4 hypotheses, there were 2 of them rejected and 2 of them confirmed. We consider mainly the result of hypothesis *H1* rather surprising. In this case, it will be essential to do further research regarding this hypothesis, and this should be done on a larger sample of respondents. These findings will also be verified in the future by a qualitative research within companies selected.

In conclusion, although many authors have discussed the issue of cost management, there is still a great need of reactions and attitudes towards changing economic situation. It is important to provide companies with possibilities regarding problem solving in the area of planning and cost prediction thanks to which they can reach higher economic efficiency. As shown by the research, there are still reserves regarding cost management in companies, and majority of companies still follow the practice of historically rooted models of cost management. Since there is a growth in overhead cost portions, it is vital to pay a greater attention to these, to make detailed analyses, and search for various possibilities of savings. It is essential that monitoring as well as overhead cost evaluation are then reflected in calculation methods, which are to offer a better view on allocation of these costs on the basis of relevant relational quantities.

[2] Result of research investigations that were conducted by the research team of Popesko and Novák in the years 2004 – 2009. The surveys were conducted as quantitative surveys of a random sample of manufacturing firms belonging to the manufacturing sector in the Czech Republic.

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