

Management Accounting Software and Accounting Practices: Empirical Study on SME Enterprises

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Abstract: There appears to be a paradox between the methods of product valuation considered theoretically most suitable and those effectively used by enterprises according to empirical studies already made. This research strives to clarify which factors explain enterprises continued use of theoretically inadequate methods. The study aims to identify the methods used by Portuguese small and medium size enterprises to value products and to analyze if the management accounting software influences the methods used. Accounting managers from 58 enterprises in 11 Portuguese districts were interviewed. The interviewees stated that the management accounting software influences the method of indirect cost distribution, and the association of these two variables is statistically significant. However, the individual analysis of the interviews led to the detection of a third variable, namely the way in which the product valuation was conceived, and this influences the previous two variables simultaneously. This evidence suggests that the conditioning that accounting managers believed was exerted by the management accounting software on indirect cost distribution was in fact the result of the direct influence of a third variable on the first two, namely the way in which the method was conceived.

Key-words: management, accounting, software, SME, Portugal

1 Introduction

This work aims to contribute to knowledge of the influence of the management accounting software on the valuation of the products in Portuguese small and medium industrial enterprises (SME'S). More specifically, this study identifies how enterprises distribute indirect costs by product, and analyze if the management accounting software influences the methods used.

Researchers continue to demonstrate interest in whether enterprises use the methods of product valuation which theory considers most suitable [1] [2] [3] [4] [5] [6]. Empirical studies have shown that this is not the rule and that many enterprises prefer simpler methods to those that are theoretically more appropriate [7] [8] [9] [10]. The combination of these two aspects justifies research that clarifies factors for this apparent paradox between theory and practice. Several researchers suggest that this may be explained by the conditioning exerted by the management accounting software used [10] [11] [12] [13] [14] [15] [16] [17] [18] [19] [20] [21] [22] [23] [24] [25] [26] [27] [28].

The universe under study was restricted to SME's due to their great importance in the

Portuguese business fabric. Enterprises classified as excellence-industries were therefore chosen because are a group of enterprises classified both for financial and economic performances and management, their goals are therefore convergent with those of this study [29]. Only enterprises that received the excellence classification in the last two years of the award were included in our study. The universe under analysis comprises 163 enterprises consistently classified as excellence-industry SME's. The data was collected by interviewing accounting managers as they are in command of the relevant information. Interviews were conducted in 58 enterprises in 11 Portuguese districts with a 36% response rate. Treatment of the non-response revealed no statistically significant differences between responding and non-responding enterprises.

2 Theoretical framework

The easiest way to distribute indirect costs to the products is by using overhead rates related to direct consumption [30], in particular direct material, direct labor and machine hours. Several reviews have targeted this method of product valuation [31] because all of these rates are influenced by the amount of each product produced, which determines over-valuation of the products manufactured in large quantities and the under-valuation of the products made in small quantities [31]. However, a number of empirical studies report the use of these methods in several countries [22] [7] [8]. All of these studies conclude that enterprises continue to value products using the overhead rates of indirect costs considered theoretically inadequate as they are influenced by production volume.

Some authors give clear preference to Activity Based Costing to determine the cost to each product [8] [22] [7] [3] [4] [5] [10]. In this method, costs are treated in relation to factors like the number of the production orders or the number of products as opposed to production volume. Nevertheless, most empirical studies report use rates equal to or less than 20% [32] [33] [9].

Empirical research is required to analyze the possible causes for this apparent paradox, namely that enterprises continue to use product valuation methods that theory considers inadequate. Recent studies suggest [21] [22] [23] [24] [25] [26] [27] [28] that the management accounting software used by the enterprise might be one the factors that leads to the indirect cost distribution method and the consequent product valuation.

3 Research method

On determining the most appropriate paradigm for accounting research, [34] considered that the different paradigms deal with different kinds of problem, or perhaps the same problem but with a different perspective about its nature. Accordingly, they do not identify one research paradigm as better than the others; they defend paradigmatic pluralism to improve the understanding of the multiple roles played by accounting management in organizations and societies. Chua [35] analyzes the results obtained by positivist, interpretive and critical research and concludes that the three paradigms present advantages and disadvantages, which are not quantifiable and can not be rationally evaluated.

Following an analysis of the accounting research paradigms, the positivist research paradigm

was selected, as the type of information sought is compatible with an objective conception of reality. Based on the positivist paradigm and literature review, the following study questions were generated:

Research question A – Are the methods used by the Portuguese industrial SME's to allocate indirect costs influenced by the production volume?

Research question B – Do the accounting managers consider that the use of these methods is conditioned by the software used?

The research questions defined above limited the data collection method to two alternatives, namely surveys or interviews, as enterprises do not publicly report the information required. It was necessary to define which was the most suitable. Although [36] defend that there is no ideal research method and that all have advantages and disadvantages, they say that finding the right method to collect evidence about the defined research questions is the key issue.

The main advantage of interviews for this study is that the data required is about information that is not standardized in Portugal which could lead to different terminology being used in the various enterprises. Interviews allow the concepts to be explained to the interviewee thus making their answers more reliable [37]. Surveys are suitable for collecting information about standard concepts that are accepted and shared by all those involved and should therefore not be used for this work [36]. The results of the research could be prejudiced by the fact that the respondents do not have the opportunity to clarify any interpretive doubts.

It was decided to use semi-structured interviews as the research method. Only accounting managers were interviewed as they were understood to have the necessary information at their fingertips and, given the size of the enterprises, a global vision of their own.

The universe includes 163 consecutive benchmark industrial SME's in the current century. After three contacts, meetings were arranged with the accounting manager in fifty-eight enterprises from eleven districts of the initial universe (fourteen) were analyzed and this is considered a good geographical coverage of the universe under study.

Nevertheless, non-responses may cause a bias in the results, notably if the enterprises that did not agree to participate have uniform characteristics and are not dispersed and therefore define a category with specific characteristics [38]. The latter authors consider this problem to be more related to the fact that the enterprises that answered are different from

those which did not than to the actual response rate. In this study, no indications were found of a non-response bias following the analysis of three factors: 1) the geographical coverage of the Portuguese territory; as there were enterprises from 79% of the districts in the universe, and the three not covered had only one enterprise each, geographical representation is not considered to bias results; 2) the activity segments of both responding and non-responding enterprises were very diverse which also indicates a lack of bias; 3) the dimension of the enterprises, which according to [38] may be measured by number of employees. A comparison of the respondents and non-respondents in terms of size, measured as the average number of employees, was performed and revealed no significant difference in average size between groups (t-student test=1.165; p-value=0.246).

4 Results and discussion

4.1 Allocation method of indirect costs

In relation to the industrial indirect costs, a variable was built that reflects the method used by its allocation and its non-existence; this was named industrial indirect costs and presents four categories of answers shown in Table 1. The results reveal that 24% of the enterprises do not allocate industrial indirect costs to products, in 48% of the enterprises use a single allocation base, in 28% of the enterprises use multiple allocation bases. All the allocation bases used are influenced by the production volume and are therefore considered theoretically inadequate. The most used are machine hours and the direct labor hours. None of the enterprises uses the Activity Based Costing.

Table 1 – Industrial indirect costs

Industrial indirect costs	Frequencies	Percentages
Indirect costs not allocated	14	24%
A single allocation base influenced by volume	28	48%
Multiple allocation bases influenced by volume	16	28%
Activity Based Costing	0	0%
Total	58	100%

4.2 Influence of management accounting software

Three procedures are required to analyze if the management accounting software conditions the allocation methods of the indirect costs. First, a variable must be built that presents the types of software used by the enterprises. Second, another variable must be defined which represents the information given by the interviewees on the conditioning, or not, from the software used on the management accounting with regard the methods used to allocate the indirect costs by the products. Third, these two variables must be connected.

In relation to the first variable, management accounting software used in the forty-four

enterprises that allocate indirect costs, three categories were found and are presented in Table 2. In 41% of the enterprises, product costs are determined using spreadsheets. In 29.5% of the enterprises, there are integrated computer systems for the whole enterprise which do the financial accounting and management accounting using the same software. In the remaining enterprises (29.5%), the product valuation is integrated in the management production software and the financial accounting is done in an other software.

Table 2 – Management accounting software

Management accounting software	Frequencies	Percentages
Spreadsheets	18	41%
Integrated system with production management	13	29.5%
Integrated system for the whole enterprise	13	29.5%
Total	44	100%

In relation to the second variable, the conditioning variable with two answer categories (see Table 3) expresses the managers' opinions about the influence, or not, of the management accounting software on the method of allocating indirect costs. A significant number (41%) of

managers claim that the management accounting software determines the method used to allocate the indirect costs. It is now interesting to determine whether or not this conditioning is associated to the type of management accounting software.

Table 3 – Conditioning

Conditioning	Frequencies	Percentages
The management accounting software does not determine the indirect cost allocation method	26	59%
The management accounting software determines the indirect cost allocation method	18	41%
Total	44	100%

When the answer categories of these two variables are crossed, (see Table 4) it find some heterogeneity in the distribution of frequencies across the various answer categories. In the enterprises that use integrated software for the whole enterprise, most managers (69%) consider that it conditions the product valuation. In the

enterprises that use an integrated system with production management, 62% of managers also believe conditioning occurs. In the enterprises that use spreadsheets, 94% of the managers felt their management accounting software did not condition the product valuation.

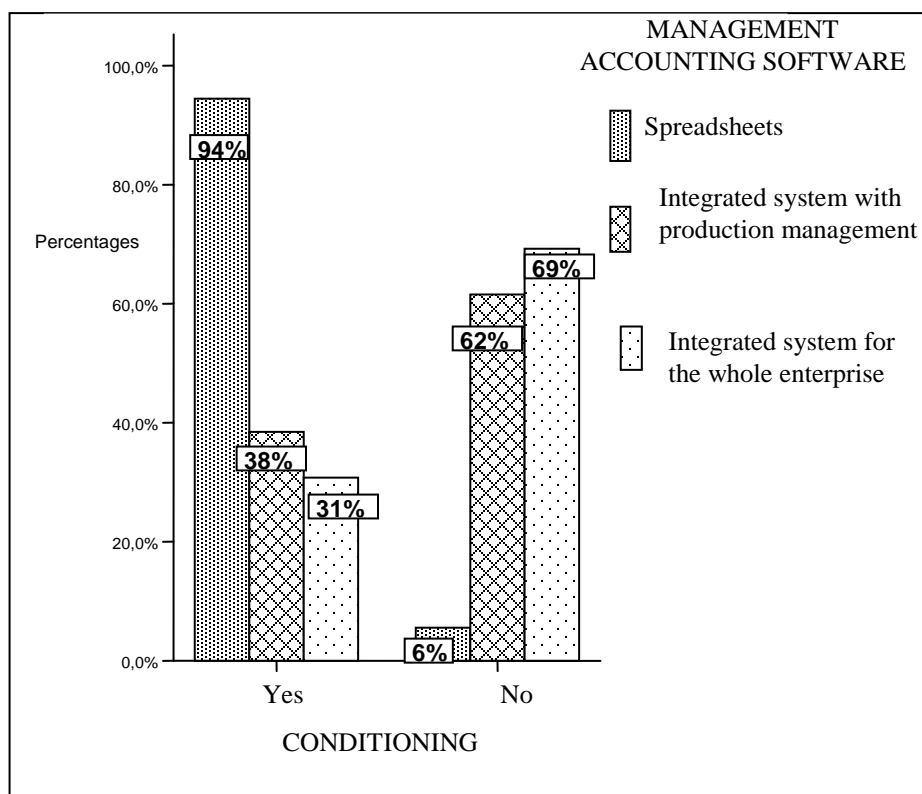
Table 4 – Conditioning and management accounting software

		Management accounting software			Total
		Spreadsheets	Integrated system with production management	Integrated system for the whole enterprise	
Conditioning	No	17	5	4	26
	Yes	1	8	9	18
Total		18	13	13	44

There appears to be a relationship between the conditioning variable and the use of integrated systems. Being the aim to analyze the possible relationship between the behavior of two nominal variables with more than two response categories, the applicable membership test is the test of independence of the chi-square or the Pearson Chi-square test [39]. The application of the Pearson Chi-Square test to the relationship between the two variables results in the value of 15.909 for two degrees of freedom, with a p-value less than 0.001; the null hypothesis of independence can therefore be rejected and the alternative hypothesis of the existence of a relationship between the two variables is accepted. Nevertheless, some interesting questions are raised when the two variables are crossed (Figure 1) and suggest that there are additional factors, thus justifying a more detailed analysis of the interviews.

The conditioning phenomenon is more common in the enterprises with integrated systems. However, not all, enterprises that used these systems felt conditioned, namely in five using integrated systems with production management and in four enterprises with global integrated systems. The analysis of their interviews revealed that all these enterprises had a common factor: they were distinct from the others because they did not have a standard integrated systems, but developed a system internally and in line with the management demands. Moreover, the relationship between the conditioning and management accounting software variables may be indirect and caused by a third variable i.e. the way the indirect cost allocation method was designed which influences both simultaneously. This is analyzed below.

Figure 1 – Conditioning and management accounting software



4.3 New conditioning perspective

Although no empirical studies were found on the relationship between the person responsible for the design process and the product valuation methods used by the enterprises, two articles make partial references to this question [40] [41] but reach conflicting results. Both studies analyze the influence of the external consultants in the diffusion of the Activity Based Costing, even though [41] concludes there is no statistically significant relationship between the use of external consultants and the use of this method in Greek enterprises. Bjornenak [40] notes that all Norwegian enterprises analyzed that use or are implementing the Activity Based Costing acquire the services of external consultants.

Three procedures were required in our analysis of the possible influence of the design process on the methods used in Portuguese industrial SME's. Firstly, a variable was built to characterize the way in which the methods were conceived. Secondly, this new variable was linked with the information obtained in the interviews on whether or not there was conditioning. Lastly, we checked to see if this new variable also conditioned the management accounting software variable. If the new variable influences the management accounting software and conditioning variables simultaneously, the relationship between the latter two variables is indirect due to the influence of a new variable.

A new variable called design process was built for which the categories of answers presented in Table 5 were found.

Table 5 – Design process of the indirect cost allocation method

Design process	Frequencies	Percentages
Internal resources	27	61%
Management Consultant	4	9%
IT Consultant	13	30%
Total	44	100%

The majority of the enterprises (61%) conceived the method for indirect cost allocation

internally. Some enterprises (30%) requested an IT consultant that recommended management software

that would, among other things, allow the products to be valued. Only 9% requested management consultants to design the indirect cost allocation method. All cases in which management and IT consultants were called in were aggregated in the same category named external consultant.

It is now interesting to confirm whether there is a relationship between the design process and the conditioning variables. The answer categories of these two variables are crossed in Table 6.

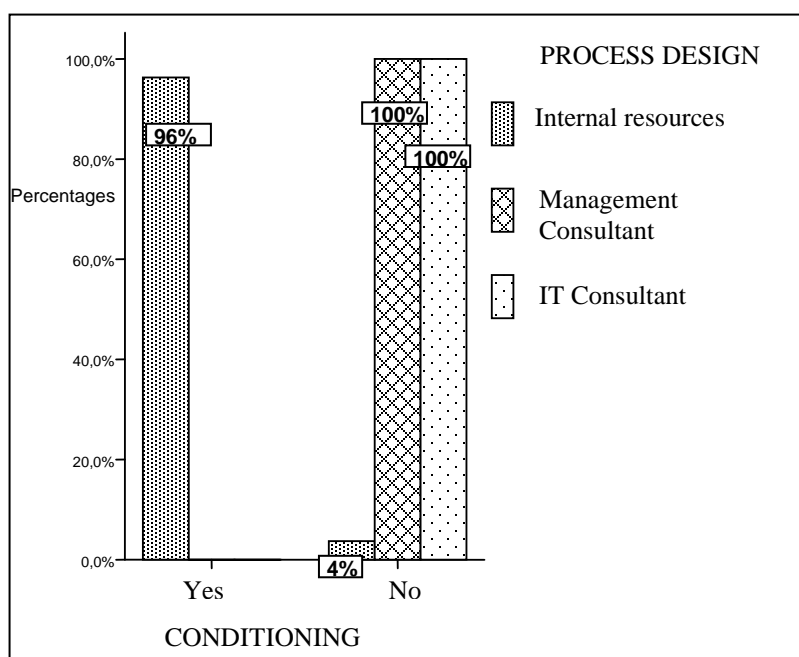
Table 6 – Conditioning and design process

		Design process		Total
		Internal resources	External consultant	
Conditioning	No	26	0	26
	Yes	1	17	18
Total		27	17	44

The managers of the enterprises in which the method was designed by external consultants all consider that indirect cost allocation method is being conditioned (Figure 2). Only 4% of the

managers of enterprises where the indirect cost allocation method was designed internally consider the existence of the conditioning phenomenon.

Figure 2 – Conditioning and design process



The value obtained by the Pearson Chi-Square test is 40.016, with one degree of freedom, with a p-value of less than 0.001; this allows us to reject the null hypothesis and accept the existence of a relationship between the design process of the indirect cost allocation method and the conditioning phenomenon. To measure the intensity of this relationship, Cramer’s coefficient was applied with the value of 0.954, with a p-value of less than 0.001; this allows us to reject the null hypothesis of independence between the variables and consider

the existence of a strong association between them. It is then advisable to validate the direction of this association using the Lambda Asymmetric. The Lambda value is 0.944 when the conditioning variable is considered dependent and has a p-value of less than 0.001. It can therefore be concluded that knowledge of the design process variable allows a 94.4% reduction in the prediction error about the conditioning variable category; in other words if it is known who designed the method, we can easily predict if the manager considers it is conditioned.

As each of the variables presents only two answer categories, Relative Risk can be used to confirm the results obtained. The value of the Relative Risk of eighteen means that accounting managers in enterprises that design the product valuation system internally are eighteen times more likely not to feel conditioned.

The evidence collected reveals that the conditioning phenomenon felt by the accounting managers is influenced by the fact that the indirect cost allocation method is designed by external

consultants. An analysis must now be made to determine if there is a relationship between the design process and the management accounting software used in product valuation.

When the two variables analyzed separately above - management accounting software used and the design process - are crossed (see Table 7), it is found that the enterprises that brought in external consultants all adopted integrated computerized solutions.

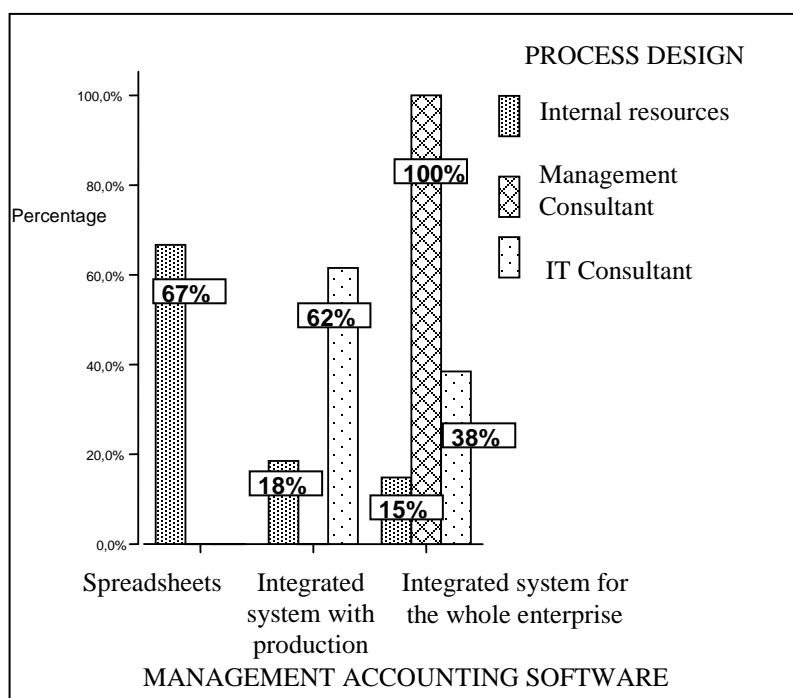
Table 7 – Management accounting software and design process

		Design process		Total
		Internal resources	External consultant	
Management accounting software	Spreadsheets	18	0	18
	Integrated system with production management	5	8	13
	Integrated system for the whole enterprise	4	9	13
Total		27	17	44

Enterprises that designed indirect cost allocation methods internally mainly use spreadsheets (67%) to support management accounting. However, a detailed analysis of each interview is required as nine of these enterprises

have integrated systems (Figure 3). This resulted in the same conclusion as those presented in Table 4. They are the enterprises in which the indirect cost allocation method is not conditioned.

Figure 3 – Management accounting software and design process



The Pearson Chi-Square test result from this association presents a value of 19.342, for two degrees of freedom, with a p-value of less than 0.001; the null hypothesis is therefore rejected and the alternative hypothesis that there is a relationship between the design process and management accounting software variables is accepted. The value of Cramer's coefficient is 0.663, with a p-value of less than 0.001 thus leading to the rejection of the null hypothesis of the variables' independence; their association is considered moderate though it is weaker than the association between the conditioning and design process variables. Lambda Asymmetric is used to validate the direction of the association. The Lambda Value is 0.346, when the management accounting software variable is considered to be dependent. Knowledge of the design process variable allows a 34.6% reduction in the prediction error for the management accounting software variable. The results are statistically significant given that the p-value is 0.001 and confirms the direction of the relationship, i.e. the design process variable influences the IT solution used in the management accounting.

5 Conclusions

As there appears to be a paradox between the methods of product valuation considered theoretically more suitable and those effectively used by enterprises according to empirical studies already made, research clarifying the explanatory factors for this is justified. The first goal was to identify the methods used by Portuguese industrial SME's to value products. In line with empirical studies made in other countries, it is possible to conclude that enterprises continue to use methods that are theoretically unsuitable. About a quarter of the enterprises analyzed do not allocate indirect costs to products; allocation in the remaining enterprises is influenced by production volume. The use of these allocation bases may not reflect the real consumption of organizational resources required by each product. As a result, those items produced in large scale may be over-valued while products made in small quantities may be under-valued. If the resulting product costs are used for any managerial decision, e.g. to determine the sales' price or to perform a profitability analysis, there may be important strategic implications as managers may use the resources for products manufactured in smaller quantities incorrectly.

This paradox between the methods defended by theory and those used by the companies requires further study. The reviewed literature suggests that

management accounting software may condition the methods used to value the products. Results confirm a statistically significant relationship between two variables: the conditioning felt by the accounting managers and the management accounting software. Managers of the enterprises using integrated software in the management accounting feel most conditioned. However, the individual analysis of the interviews led to the detection of a third variable, namely the way the indirect cost allocation method was designed, which simultaneously exerted an influence on the previous two variables. A statistically significant relationship was found between two variables: design process of the indirect cost allocation method and the phenomenon of conditioning felt by the accounting managers. The accounting managers of enterprises where the method was designed by external consultants all felt the phenomenon of conditioning. A statistically significant relationship was also found between the design process variable and the management accounting software used. The methods designed by external consultants use only integrated IT systems. This evidence suggests that the conditioning of the management accounting software on the indirect cost allocation method identified by accounting managers is, in fact, the result of a third variable, namely the way the method was designed, and this has a direct influence on the first two.

The number of enterprises that agreed to participate in this study, and how the conditioning variable was measured, and the potential influence of the data collection method i.e. interviews, on the results are recognized shortcomings of this study. However, this study makes two contributions to knowledge of accounting management. Firstly, the results do not suggest a causal relation between the management accounting software and the methods used for product valuation. Secondly, this study finds a new conditioning factor for product valuation methods used by industrial enterprises: the way the indirect cost allocation method was designed, this fills a gap in our understanding of the relation between accounting software choices and determining the value of products. Further empirical research is required to detect other explanations for enterprises' continued use of product valuation methods considered theoretically unsuitable. I still suggest replication of this study in large companies, with the aim of examining the possibility of generalization of these results.

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