



The evolution of costing during the period 1985-2015: Progress or inactivity?

Evdokia I. Tsifora¹, Prodromos D. Chatzoglou²

¹Department of Accounting and Finance, Technological Educational Institute (T.E.I.) of Thessaly,
PhD Candidate, Democritus University of Thrace, Department of Production and Management Engineering,
tsifora@teilar.gr

²Democritus University of Thrace, Faculty of Engineering, Department of Production and Management Engineering,
pchatzog@pme.duth.gr

Abstract

Purpose - This paper examines the evolution of costing process during the past thirty years. More specifically, the technological developments that have affected industrial firms are analysed, focusing on the type of production and the innovations that have been developed and affected costing related issues. Additionally, the creation of a new framework is examined, focusing on costing information that could be useful for making business decisions.

Design/methodology/approach - A field survey was conducted on a sample of Greek manufacturing firms. A structured questionnaire was used as a research instrument for collecting primary data. It was constructed incorporating questions used by similar surveys reported in the relevant literature.

Findings - The use of cost information for short-term decisions is prevailed over long-term (strategic planning decisions, evaluation of alternative options for the design or production of goods, product mix determination, introduction of new products), while the examination of the cost structure showed that the proportion of fixed cost covers almost 50 per cent of the total cost (fixed and variable) for most of half firms. Additionally, the proportion between direct and indirect production costs revealed that 76.8 per cent of the firms estimate that their direct costs would be up 80% of their total cost.

Research limitations/implications - The omission of other important factors and the relation between specific factors such as firm's size, industry sector and decision making process should be considered as well as the differentiation of the results according to the industry sector, or due to different costing purposes.

Originality/value - This is one of the few studies exploring the costing practice implemented by Greek industrial firms. The analysis of the findings shows that despite the technological developments that affected the costing area and the criticisms concerning the limitations of the traditional costing approaches, they are still predominant.

Key words: cost structure, manufacture, costing methods, theoretical gap

JEL classification codes: M11, M41

1. Introduction

Cost calculation process is globally considered as one of the most serious and complex accounting issues, concerning all type of organizations. Costing information is used as the basis for many different business decisions while, in recent years, after the revelation of a gap between the theory and practice on management accounting, there is an increased interest about costing practice (Bright et al., 1992; Tales and Drury, 1994). In recent decades, there is a growing interest in exploring the effects of technological developments in the production function that resulted in a new framework, created for modern enterprises. According to this framework, costing information is often being used for business decisions, but the technological changes created different requirements regarding the provision of cost information (Gupta, 2001).

Literature suggests that, decisions based on costing data require changes to the calculation and use of cost

accounting information (Kee, 2008). This fact was partially confirmed by experts who stress that the traditional approach of accounting could not support these changes (Scapens, 2006). Moreover, executives use a mixture of financial and non-financial data for improved decision making, thus making unavoidable the need for modifications regarding the estimation of the production cost (Bright et al., 1992). Relative studies revealed the existence of three main factors that have guided the evolution of costing systems namely, the presence of a gap between theory and practice, the changes in the business environment and a general criticism on the implementation of costing, in practice (Brierley et al., 2001).

The purpose of this study is to explore the costing evolution in Greece, during the past thirty years, based on the following main lines; a) the technological progress made b) the changes brought about by technological progress in the production function and the cost accounting systems and c) the changes in the

provision of cost accounting information and the decision-making process. In particular, modifications on the structure of production cost are addressed. Moreover, differences relevant to the diversification of the purposes for which companies are using the cost information are also examined. The time period of thirty years (1985-2015) was selected since, as Lukka and Granlund (1996, pp.1-2) assert, *"the 1980s witnessed, after a long silence, a renaissance of cost accounting issues. During the last decade both academics and practitioner started increasingly to question prevailing cost accounting thinking"*.

The paper is organized as follows. The changes in technology and production methods are discussed in the first section. Then the changes in the provision of cost accounting information, as well as changes in the decision making process, are also discussed. The second section discusses issues related to the research methodology adopted and describes the questionnaire used to collect the relevant data. The empirical results are presented in the third section, while in the fourth section, a discussion of the costing approaches for Greek firms is provide. The main conclusions, the limitations of the study as well as specific suggestions for further research are presented at the end.

2. Research Background

2.1 Changes in technology and production methods

During the last decades, significant changes have been introduced in the production function resulting from the technological advances. Fullerton and McWatters (2004) research on the impact of technological innovations in the area of pricing provides a significant and useful insight into this area. As they comment, based on the work of Holzer and Norreklit (1991) and Howell and Soucy (1987, p. 88), traditional cost accounting systems were designed for different environments. Additionally, Cobb (1992), as cited in Fullerton and McWatters (2004), states that, if those people involved in management accounting do not respond to the technological advanced environment and to the demands for information, then, in the future, they will be probably limited solely into a role of historical recording. Consequently, a new situation has emerged for firms, where it is necessary to collect internal information so as to ensure that better and informed business decisions are being taken. To achieve such an objective, changes are necessary to be made in various activities and business processes, as far as the calculation of cost and the use of cost information is concerned.

In addition, changes in consumers' habits have created the need for a different approach of managing enterprise resources. New costing approaches are introduced and recommended as a consequence of the various changes that resulted in the overheads' cost reduction. The automation of the production process inevitably brought changes to the allocation methods. The most noticeable change in the allocation process includes the shift from volume criteria to batch or product related criteria. A typical example that is related to the automation of the production process is

the Advanced Factory Management System (A.F.M.S.). However, the aforementioned changes had an impact, not only on the production process, but also on a wider spectrum of business functions, such as the justification and the evaluation of investments (Chen, 1996).

The continuous technological progress has introduced innovations in the production philosophy which significantly impact the production's general organizational framework. New philosophies, such as Lean Manufacturing or Lean Production, are primarily associated with the removal of everything considered as "unnecessary" from the production. The term "unnecessary" is related to inventories, waiting times, mistakes, failures as well as to the production activities that do not add value to a product. Hence, a need for broader changes emerges. One of the main causes for the introduction of innovative philosophies is the end of mass production. Nowadays, consumers demand a wide variety of high quality products which are produced in small portions while producers are mainly competing with a customer-oriented philosophy, developing products with strong innovative elements (Gamal et al., 2001, p. 2). In addition, the reduction of overheads facilitated the creation of Total Quality Management (T.Q.M.) which intends to minimize the rates of defective units. Moreover, it was a prerequisite for the implementation of Just In Time (J.I.T.) systems. The immediate effect of those two changes was the reduction of the intermediate safety stock which, in former organizational production's schemes, protected the firm from problems originated from defective units.

In the production process, one of the most important changes includes the developments in inventory management systems. An inventory management system is related to technological innovations that have occurred in recent decades. For example, the introduction of J.I.T. systems aimed at the satisfaction of a need for high production volume with minimum stock levels. The J.I.T. is a management method for the production and reserves that has, as a basic requirement the minimization of a machine's setup times for the production of different products. In this way, firms enhance their ability to produce in small portions, with minimum intermediate inventories between work centres. Consequently, firms are able to flexibly respond to changing market conditions and, at the same time minimize the levels of capital committed in inventories (raw materials and finished products). As a prerequisite for the implementation of J.I.T., the harmonization of production rates between labour centres (balancing production lines) is considered necessary. In this way, bottlenecks are eliminated and the need for intermediate inventories is reduced. Finally, this method satisfactorily co-operates with a "pull" system, where nothing is produced until needed.

An inventory control system is based on two basic models, the "Push" and "Pull model. In a "Push" system, the production orders are "pushed" from a central planning office to the plant, while, in a Pull system, nothing is produced until it is needed or requested by the next stage. In a J.I.T production system, a very small portion of the total production is

“pulled” during the different phases of production, using a Kanban card. In its essence, a Kanban is a part of the system that determines the supply or production, based on actual customer demand. Such a system is related to flexible production and J.I.T., while its main utility is to respond quickly to changes in the demand. In this way, each work centre produces only what is needed by the next centre, as it is determined from the actual demand. In other words, it represents a technique of J.I.T., in a repetitive production system. In such a system, a narrow range of standardized products are produced, while the demand is characterized by small fluctuations, creating conditions for smooth and uniform flow of production. These cards contain data (e.g. type and number) concerning the parts of a product expected to be required from each work centre during the production process and until its completion (Hilton, 2002, pp. 226-227). An alternative to J.I.T. system is the Manufacture Resource Planning II (MRPII) system that efficiently achieves to minimize intermediate inventory levels and shorten transit times for the production.

The term “Kaizen” is a Japanese word meaning the effort for continuous improvement. Such an effort is related to a horizontal organization chart, which fits well with the changing needs. Additionally, it works positively with modern business philosophies. The key element of a horizontal organization chart is the presence of fewer management levels and employees who cooperate in a horizontal structure. According to Hilton (2002, pp. 247-249) and concerning the production and costing process, such an attempt focuses on the cost reduction of an existing product. This reduction is achieved through small changes in activities rather than large and drastic changes. Finally, in the search for an effective method of performing a task, an additional feature of the new production’s philosophy is the promotion of continuous improvement, an effort that is supported by Benchmarking.

Of course, it should be understood that the determination of an inventory’s optimal level is not an easy task. In one hand, the lack of inventory could result to additional costs, due to interruptions in the production process, losing suppliers’ discounts that are provided over an order level, or losing a customer’s confidence, if the firm fails to deliver customers’ orders on time and, additional transportation costs incurred to the company (Garrison and Noreen, 2006). Despite the fact that all the aforementioned costs, except for the shipping and transportation, should not be recorded in the accounts, since they are characterized as opportunity costs, they undoubtedly affect company decisions. On the other hand, when a firm maintains high stock levels, whether or not they include raw materials or finished goods, it creates more maintenance and storage costs, insurance and transportation costs while the hazard of physical obsolescence is enhanced. Also, one should not forget the relative capital commitment and costs that are related to employee salaries. The production system is closely related to the costing process and Tatsiopoulos

et al. (2010, pp. 4-6) define a production system as “the combination of natural resources that cooperate to produce goods, services or works”. Natural resources or inputs can be grouped into three main categories: a) materials, b) capital equipment and c) human resources. The importance of each one of these three categories of resource affects and determines, to a significant degree, the organization of a production system.

Additionally, an issue that concerns both production organization and costing is production capacity. It includes the level of production that can be performed by the equipment and the organization (Martin, n.d). The level of capacity is an important issue for costing, since it is often used as a denominator for determining the percentage of indirect overheads, which is known as activity cost driver. Usually, for the accurate calculation of costs, the use of long-term productive capacity is proposed. In this way, it is possible to segregate the relevant cost elements between those caused by the used and unused capacity. The inclusion of unused production capacity in the denominator results in products over-pricing.

Finally, an advanced model for organizing production includes Cellular Manufacturing. In such a production process, autonomous production lines exist, which are organized by product in order to simplify the spatial structure and the material flow. Flexible workers with multiple skills are assisting such a model. As reported by Shim and Siegel (2002), a cell is comprised of machines controlled by a computer and an automated material handling equipment (such as a Flexible Manufacturing System-F.M.S). In practice, each cell produces a family of integrated products using robots, while the entire system is controlled via a computer. Although the initial cost of installing such a system is high, production cost for each unit is low and products are characterized by high flexibility and quality.

2.2 Changes in the provision of cost accounting information

Technological developments that were incorporated into the production, as well as different production philosophies, could not leave unaffected the structure of production costs. According to Tsai (1996), these developments led the direct labour cost to a proportional decrease, while increasing the indirect overhead in total production cost.

In a similar vein, Lowder (2006) claims that the significant changes that have occurred in the industrial business environment affected the administrative costs. The main modification includes the increase of indirect industrial costs, along with the reduction in the direct labour cost. To a large extent, the basic reason for the substantial restructuring of the product cost structure was the reduction of direct labour cost as a consequence of the introduction of modern technologies in the production process. However, the impact of this change was significant and is reflected on the need that alternative cost allocation methods or techniques should be developed.

The need for alternative methods of cost allocation plus the weaknesses of the traditional costing systems

are the two basic changes that are recorded in various research efforts. In particular, Lee (2003) records developments that signalled the research on cost systems after 1990. He argues that, during the 1990s, there was a widespread impression that there is a real need for a great change regarding cost systems. In particular, he cites the study of Gupta's (1993), who commented on the distortions caused by costs' calculation, claiming that, to a degree, this was generated by an erroneous process used for the allocation and accumulation of various cost items. In the same article, he also referred to Boer & Jetter (1993), who studied the changes in the cost structure that resulted in reductions of labour costs, while the importance of overhead is increased. In addition, a reference to the study of Dopuch and Gupta (1994, p. 48) is made relatively to the changes in production processes and their impact on direct and indirect overhead. Additionally, the need for constant changes on the business tactics in the production and marketing process is examined. Such changes increased the costs for setup (restarting the machines after reconfigurations) to a greater extent than the reduction of the direct labour cost and raw materials. This situation highlights the fact that changes in the cost structure played a significant role in the evolution of costing.

The changes made in the production process resulted in similar adjustments in Management Accounting. According to Kee (2008), in modern environments labour costs are almost 12% of the total cost, thus questioning the allocation methods which use criteria based on direct labour hours. On the other hand, the support of variable costing is favoured because it is not affected by changes in the production volume and the only true factor that affects profits is sales' fluctuation, as opposed to absorbing costing where profits are a function of both sales and production volume. In addition, the fictitious variation of earnings due to seasonal stocks' fluctuations should not be ignored.

On the same issue, Drucker (1990), as shown by Lere (2001), notes that traditional production costing systems have limitations arising from the technological changes that have occurred in the production process. More specifically, he states that the percentage of direct labour in the overall production costs has decreased considerably. Then, a justifiable question is raised, relatively to the problems a firm would face if it continues to associate the direct labour cost with the allocation of common or indirect overheads. Furthermore, the exclusion of "non-productive activities" from the calculation of production costs may contribute to the isolation of the production process from the whole organization, since a holistic approach of the firm has many advantages.

Another noticeable issue includes the complexity and variety of products available to consumers. The changes in consumer preferences created the need for a large number of more complex products, produced in small volumes and with different product characteristics (product diversity). This means that

different products could absorb different proportions of overhead and such a differentiation could have important implications. Additionally, working hours could also vary greatly, as well as the amount of material used and the machine operating hours (Tsai, 1996).

The disclosure of the erroneous allocation that exists in most traditional cost accounting methods created favourable conditions for the supporters of Activity Based Costing (A.B.C.) to consider how this "new" approach could provide the solution for the problems identified. However, in practice, it was proved that its implementation and operation was, in many cases, expensive and rather complex. Therefore, the process of finding alternative allocation methods continued. Such an alternative method is analysed by Lere (2001), according to which the implementation process requires some changes on the accounting system. These changes are necessary for calculating the allocation percentages, based on the average rates derived when the cost of overhead is divided based on the activity performed.

However, the introduction of these changes required the avoidance of using direct labour hours, as a measure for the calculation of the predetermined overhead rate (as a denominator). Although, this measure was widely used since, it is immediately available in any business (whether in time or in monetary units), the automation of the production process reduced its proportion in total product cost. Hence, Lere (2001) suggests an alternative allocation method by collecting overhead costs in many cost pools, so as to estimate the duration that each job requires, in different production's departments or phases. Finally, he argues that it is possible to extend the calculation of overhead rates, by introducing measurements that are not based on the unit level. In this way, it is applicable for traditional methods to include, during the process of common costs allocation, differences in the calculation of production costs deriving from fluctuations in production volume. Also, an approach that is based on measuring the cost of activities would make possible the inclusion of costs, that are related to additional activities carried out on behalf of a particular customer, during the negotiation process with the customer, in order for the firm to determine a price.

The introduction of changes in the allocation process is based mostly on shifting from unit level to other criteria, such as batch or product level, in order to calculate cost per unit, as a result of overheads' reduction caused by the automation of production. The allocation process inevitably is affected from technological developments, while the most salient change concerns overhead costs (Chen, 1996).

To sum up, based on the relevant literature, alternative ways of cost allocation require changes in the accounting system adopted by firms including: a) changes in the determination of the percentage for the allocation of overhead hours based on direct labour, a type of information that is easily accessible for all firms, b) the avoidance of using a "common" rate (blanket overhead rate) for allocating the sum of indirect

overhead. Instead, a separation of costing data into multiple cost pools, based on the rate of absorption in each section, is proposed as more preferable, and c) introducing other methods to measure overhead rates which are not related only to the unit level (such as attempts to make and ABC), in accordance with Lere (2001).

The established inadequacy of traditional cost systems led Chen (1996) to propose the creation of a new accounting system as an alternative solution. This system, as a part of the production system, is based on the simulation (Simulation Based Manufacturing Accounting) and supports the measurement of various costs in real time, based on different (alternative) scenarios. Moreover, he states that when companies implement Total Quality Management (T.Q.M.) programs, a change is introduced through the development of the Activity Based Costing (A.B.C), where the activities performed, during the production process, are the reason for the cost creation. Such an approach is being considered as the most appropriate and this is justified on the basis that, when activities are analysed and recorded in detail, then managers are encouraged to measure the value created for their customers, based on these activities. Indeed, this fact might provide a possible explanation for the observed shift to a more "customer centric" type of organization which, in recent years, is adopted by many firms. This shift is observed not only in the production process, but also includes all business functions, where the main concern is the immediate satisfaction of customer needs.

2.3 Changes in the decision making process

The knowledge derived from cost data could be used for different objectives including cost control, pricing, raw materials supply and the design of new processes. Bright et al. (1992) found that just a small percentage (11%) of the firms estimate the effects of alternative production methods on product's cost, while 43% of them retain more than one inventory valuation system so as to meet different costing objectives. According to the same research, the benefits that a firm expects to gain from the introduction of new costing accounting methods include enhanced profitability, cost reductions, timely and accurate information for the management team, reduced inventories' level, shorter delivery and waiting times and a less complex costing management system.

Using cost information in taking strategic decisions triggered the revelation of problems arising from "traditional methods". Consequently, the necessary conditions for the development of new costing methods are closely related to accurate cost calculations. If the costing process physically diverges from its basic objective, the calculation of production costs for tax purposes, and is used as a tool to determine profitability, growth and even the probability of a firm's survival, then the accuracy of cost information is crucial. Therefore, when incorrect costing data are used for decision making, such as the determination of the selling price, the gains and losses of customers, or even the line removal of profitable products, then conditions

that could threaten a firm's viability can be created. Most of the observed changes are closely related to the difficulty of allocating individual costs accurately. Consequently, the discovery of such a process is one of the key issues of cost accounting as noted by several researchers, like Lere (2001), who suggested alternative ways of allocation.

Finally, there is strong criticism of the traditional costing methods and their insufficiency to operate in high-tech environments. As reported by Fullerton & McWatters (2004), one of the main issues for every firm during the decision process of adopting or not advanced technologies, is closely related to satisfy its need to successfully implement the long-term strategy, rather short-term. They also considered whether contemporary production systems which are based on advanced technology environments, lead in the adoption of different costing practices in order to meet different information needs. The basic belief behind this view is that traditional methods have completely different goals compared to a firm's strategic objectives. Strategic objectives address the on-going improvement and waste elimination, through modern production methods, thus minimizing activities that do not add value to the final product.

The primary objective that a firm sets for costing determines its subsequent choices. A typical example of the impact of the cost' objective on costing choices represents the need for financial reporting of a firm's creditors, in the German-speaking countries in Europe. This need leads to the development of a new costing approach, or of a different methodology, the Flexible Margin Costing, as the term "Grenzplankostenrechnung - GPK" is translated from the German language according to Lowder (2006, p. 9). The development of a different approach stems from the need to calculate cost accurately and correctly, an objective that, for the German speaking countries, has a particular importance. More specifically, as the profit margins are directly dependent on the cost, while profit margins' are limited globally for most firms, then an important factor, contrary to what is proclaimed by the accounting principles, is to take under consideration the total costs that are arising during all stages of a product's life cycle, until it reaches the end consumer (Lowder, 2006).

Additionally, Lowder (2006) notes that, a trend that takes into account production costs as well as costs that are not directly related to the production process, is observed. However, the introduction of such an innovative methodology is not without problems, particularly in relation to the attempt to include in the decision-making process costs that are recorded in the general ledger. More specifically, starting with absorption costing, which is considered as a traditional approach, one should not overlook the fact that it is mandatory under the legislation and accounting policies in many countries. However, based on its limitations, the proponents of the A.B.C. introduced it as an alternative for the allocation of indirect costs, thus aiming to fill the gap that was described. Despite the critics of A.B.C., its central point is the opportunity

provided to the firm to focus on the cost based on the premise that the cost objects are consuming activities. Additionally, the cost calculation process may include other types of costs incurred such as marketing or transportation costs. Also, an important change is the fact that it takes into account the actual level of capacity for the allocation process, so as to eliminate cost transfer due to different production volume, which is reported as a common problem of allocation.

Finally, there is a predominant view, as reflected by Bright et al (1992, p. 202), who claims that the traditional accounting approach could not support such changes. Therefore, improvements should be done that would provide improved cost control. Additionally, there is accumulated evidence suggesting that executives need a mixture of both financial and non-financial data to improve decision-making (Johnson & Kaplan, 1987; Drucker, 1990; Eccles, 1991). Bright et al. (1992) referred to a search conducted in 1990, on a large sample of industries in the United Kingdom, where the production and accounting techniques applied were studied. A lack of a uniform terminology for the advanced costing is observed (Eccles, 1991) while the concept of change is difficult to be determined since it concerns a situation including subjective criteria.

3. Research Methodology

3.1 Sample

A field survey was conducted on a sample of Greek manufacturing firms, with sales turnover of more than 500.000 €, during the fiscal year. The sample consists of 598 manufacturing firms, with a response rate of 45% taking into account the number of the firms that had initially agreed to participate in the survey (a 16% of the total population). Table 1, presents the general characteristics of the firms included in the sample. These firms are mainly medium sized firms (mean 111 employees) although there is a good representation of large firms (31.9% of them with sales of more than 20 M euros) as well. Food and Drinks industry is the sector with the higher representation (39%) in the sample.

As far as the characteristics of the respondents are concerned, a brief overview of the results shows that 77% the respondents are men, mainly aged between 36-45 years-old (39.3%) or older (34.8%), holding a higher education degree (71.3%), or even a master or PhD diploma (10.5%). Most of the respondents are currently working as accountants (56.9%) and supervise their department (31.2%), or they are head managers (42.4%), while the 22% of them are Chief Executive Officers (CEO's), indicating that costing departments are often staffed by senior executives. Finally, the average working experience (in years), for the position currently held is 11.30 years (approximately 18 years of total average working experience) indicating that, probably not only employees but the firms (employers) as well, are looking for a stable working environment. Such a situation is likely to imply, in generally, the significance of costing issues for the firms, where the frequent change of executives is considered as undesirable.

Table 1: Sample general characteristics

General firms' characteristics	Results
Average number of employees	Administration department: 33 Production department: 78
Average annual sales turnover (in .000 €)	2013: 28,934.51 2012: 32,382.25
Sales distribution (2013)	Up to 1 million: 14.1% 1-5 million: 27.4% 5-20 million: 26.7% 20-50 million: 15.8% More than 50 million: 16.1%
Average market share of the main activity	29.11 %
Number of the main products	Up to 10: 34.6% 11-50: 26.7% 51-300: 23.3% More than 300: 15.4%
Industry sector (including sectors with more than 4% in the sample)	Food and drinks: 39.0% Rubber: 10.0% Metal: 8.1% Concrete and blocks: 6.6% Chemicals: 5.0% Furniture: 4.8% Paper: 4.3% Other: 22.2%

3.2 Questionnaire Design

A structured questionnaire was used as a research instrument for collecting primary data while the questions included were mostly based on the relevant literature and used in similar surveys. Therefore, every possible effort was taken to ensure the validity of the present survey. The questionnaire was sent via e-mail, after achieving a telephone agreement from the person in charge of the accounting department.

Respondents were asked to point out if they were familiar with the sixteen (16) costing approaches that were included in the questionnaire, or if they had ever used any of them. Then, they were asked to answer: a) which, from these approaches they were using in the time that the survey was conducted, b) which of them was considered to be the most appropriate, in serving firm's main goals and c) which of them they believed could provide more accurate product cost calculations. Finally, the main reason for using them and the application areas of cost information, i.e. for what decisions a firm uses the cost information, are also examined. The hierarchy of ten different factors (reasons) was measured using a five-point scale (Likert type), where "1" represented the least important reason (purpose) of cost accounting information collection, while "5" indicated the most important reason (or area).

The questionnaire was tested (pre-test) before it was released, to assess the degree of its content validity (Saunders et al., 2009, p. 592). Such a test is used to check if the objectives of the research are correctly measured or captured. Moreover, in the field of costing, the lack of a well-defined terminology is a reality, which has

been noted by several researchers (Brierley et al., 2001; Bright et al., 1992), making the formulation and understanding of the factors examined, even more difficult. For the above mentioned reasons, it was chosen to send the questionnaire for a pre-test to two academic, two senior business executives employed as cost accountants and to one chartered accountant. The main aim of this process was to realize whether the respondents perceived the terminology, in a similar way (Dimitriadi, 1999, p. 95).

4. Results

Products' cost structure is consisted of three basic cost elements namely, the direct materials, the direct labour and the manufacturing overheads while their proportion in total cost is also significant. Moreover, it is considered as an important factor that affects the

choice of a costing method (Brierley et al., 2001). This sample, according to the calculated mean figures, direct materials cover 61 per cent of total cost, while the proportion of direct labour and manufacturing overhead are almost equal (20% and 19% respectively). According to the relative theory, manufacturing overhead is a cost that could complicate the cost calculation process, especially if a significant proportion of the manufacturing overheads is considered as an indirect cost, that it is not easily traceable and measured. However, as previously stated, cost calculation process is additionally affected by the proportion of fixed and variable cost. In table 2, the results of corporate cost structure are presented, along with the proportions of the fixed and variable costs in total cost, as well the reported direct and indirect costs.

Table 2: Cost proportion and cost structure

Variables	Variable values	Percentage (%)	Cumulative Percentage %	Mean
Proportion of fixed cost	0-10%	7.9%	7.9%	48,11
	10-20%	10.4%	18.3%	
	21-30%	20.9%	39.2%	
	31-40%	8.7%	47.9%	
	41-50%	9.2%	57.1%	
	51-70%	21.2%	78.3%	
	71-80%	12.5%	90.8%	
	81-100%	9.2%	100%	
Proportion of variable cost	0-10%	6.3%	6.3%	49,32
	10-20%	17.5%	23.8%	
	21-30%	12.2%	36.0%	
	31-40%	10.0%	46.0%	
	41-50%	7.1%	53.1%	
	51-70%	23.9%	77.0%	
	71-80%	11.7%	88.7%	
	81-100%	11.3%	100%	
Proportion of direct cost	0-20%	4.8%	4.8%	68,10
	20-40%	8.8%	13.6%	
	41-50%	6.6%	20.2%	
	51-60%	10.9%	31.1%	
	61-70%	22.0%	53.1%	
	71-80%	23.7%	76.8%	
	81-90%	14.0%	90.8%	
	91-100%	9.2%	100%	
Proportion of indirect cost	0-10%	18.0%	18.0%	29,35
	11-20%	25.4%	43.4%	
	21-30%	25.0%	68.4%	
	31-40%	12.7%	81.1%	
	41-50%	7.5%	88.6%	
	More than 50%	11.4%	100%	
Proportion of direct materials cost	0-20%	4.3%	4.3%	60,45
	20-40%	14.3%	18.6%	
	41-50%	14.0%	32.6%	
	51-60%	19.0%	51.6%	
	61-70%	20.1%	71.7%	
	71-80%	14.7%	86.4%	
	81-90%	10.5%	96.9%	

	91-100%	3.1%	100%	
	0-5%	12.0%	12.0%	
	6-10%	24.3%	36.3%	
	11-15%	10.8%	47.1%	
Proportion of direct labour cost	16-20%	19.3%	66.4%	19,41
	21-25%	8.1%	74.5%	
	26-30%	12.4%	86.9%	
	31-70%	13.1%	100%	
	0-5%	10.5%	10.5%	
	6-10%	22.8%	33.3%	
	11-15%	15.5%	48.8%	
Proportion of overhead cost	16-20%	21.0%	69.8%	19,12
	21-25%	7.3%	77.1%	
	26-30%	8.9%	86.0%	
	31-70%	14.0%	100%	

According to the results presented in table 2, the proportion of fixed cost covers almost 50 per cent of the total cost (fixed and variable) for the 57.1% of the firms, while for 21.2 per cent of the firms fixed costs reaches 51-70 per cent of their total cost. The proportion of variable cost is quite similar, where almost half of the firms (53.1%) report variable costs higher than 50 per cent of their total cost, while for 23.9% of the firms variable cost covers 51-70 per cent of their total cost (which is one of the highest proportion recorded).

The analysis of the results concerning to the proportion between direct and indirect production costs revealed that the 76.8 per cent of the firms estimate that their direct costs would be up 80% of their total cost (direct and indirect), implying that indirect cost covers the remaining 20 per cent. However, the main problem with the indirect cost is related to its difficulty to be directly detected in each cost object during the allocation process and therefore, firms should find fair methods to complete this process.

It is also noteworthy that, almost 30 per cent of the firms' reported that their manufacturing overhead rates range between 21-50 per cent. Generally, a large proportion of this type of cost might affect the convenience and accuracy of the product's cost estimation especially, if the firm uses traditional costing approaches, which is the case, as it is found that the costing approaches that are well known and currently used by Greek firms are Actual Costing (53.4%) and Normal Costing (42.3%) (table 3).

Table 3: Costing approaches that have been used in past

Description of costing approach	(%) of cases
1. Actual Costing - A.C.	53.4%
2. Normal Costing - N.C.	42.3%
3. Job-Order Costing - J.O.C.	25.8%
4. Activity Based Costing - A.B.C.	25.1%
5. Standard Costing - S.C.	23.7%

Table 3a: Costing approach currently used

Description of costing approach	Rate (%)
1. Actual Costing - A.C.	33.5%
2. Normal Costing - N.C.	24.2%

3. Job-Order Costing - J.O.C.	11.0%
4. Activity Based Costing - A.B.C.	8.9%
5. Standard Costing - S.C.	8.5%

Table 3b: Most appropriate costing approach

Description of costing approach	(%) of cases
1. Actual Costing - A.C.	33.2%
2. Normal Costing - N.C.	15.2%
3. Standard Costing - S.C.	12.4%
4. Job-Order Costing - J.O.C.	11.1%
5. Activity Based Costing - A.B.C.	10.1%

Table 3c: Most precise costing approach

Description of costing approach	(%) of cases
1. Actual Costing - A.C.	38.4%
2. Normal Costing - N.C.	13.4%
3. Job-Order Costing - J.O.C.	13.0%
4. Activity Based Costing - A.B.C.	12.0%

Although, in the questionnaire was also included and other, more contemporary, costing approaches such as: a) Backflush Costing, b) Target Costing, c) Throughput Costing, d) Grenzplankostenrechnung (or Flexible Margin Costing), e) Resource Consumption Accounting (R.C.A.), these costing approaches appear to be used only by less than 5 per of the firms. The results in table 3a show that, almost one third (1/3) of the Greek firms are currently using the Actual costing approach while, one fourth (1/4) of these are using the Normal costing approach, namely that more than half of the firms use the "well-known" or traditional costing approaches. Moreover, the J.O.C. approach is highly correlated to the type and method of production and, therefore, such a choice is considered as "compulsory" for the firms that choose it.

Additionally, the results concerning the costing approach which is considered as more appropriate in achieving firms' objectives and more precisely identify the production cost are accordingly presented in table 3b and 3c. Again the superiority of Actual Costing is observed in both tables, followed by Normal Costing.

Turning now our attention to the purposes for which product costing information is currently being used (measurement scale ranging from "1": less

significant cause to “5”: most significant cause), the results (table 4) revealed that the most common cause for every single firm i.e. the preparation of Profit and Loss Statement for external reporting, was rated in fifth place, while the use of cost information for short-term decisions is prevailed over long-term (strategic planning decisions, evaluation of alternative options for the design or production of goods, product mix determination, introduction of new products).

Table 4: Firms’ decisions that are based on cost accounting information

Causes of cost accounting information collection	Mean
1. Cost control	4,60
2. Determination of pricing policy	4,33
3. Operations control	4,00
4. Measurement of effectiveness	3,96
5. Drawing up of financial statements	3,91
6. Efficiency measurement and segment profit analysis	3,88
7. Strategic planning decisions	3,83
8. Evaluating alternative options for the design or production of goods	3,48
9. Product mix determination	3,26
10. Introduction of new products	3,22

5. Discussion and Conclusions

This study aims to explore the evolution of costing process in Greece, studying a sample of 598 Greek manufacturing firms. The evolution is examined according to the relative theory, based on the changes that have been occurred during the past three decades. More specifically, the technological developments for industrial firms are analysed, focusing on the type of production and the innovations that have been developed, thus affected the costing area.

Literature suggests that traditional costing approaches have various limitations and may be problematic, during the cost calculation process especially, since cost accounting information is currently used for many different, short and long-term, decisions (Afonso et al., 2008; Chen, 1996; Lere, 2001; Tsai, 1996). In addition, executives seem to use a mixture of financial and non-financial data to improve the decision making process (Bright et al., 1992; Fullerton and McWatters, 2004). Finally, many studies revealed that there is a gap between management accounting theory and practice meaning that in every day practice firms might follow different methods and techniques (Brierley et al., 2001; Bright et al., 1992; Tales and Drury, 1994; Scapens, 2006).

This study examined the cost structure of Greek firms, the cost accounting approaches used and the decision-making process that is based on cost accounting information. The results indicate that Greek firms are mainly relying to rather traditional costing approaches (Actual and Normal Costing). Kohen and Kaymenaki (2005) assert that when the proportion of direct cost is high, then this could be resulted in choosing more traditional costing approaches, which

fits well to our results. The cost structure is a rather a difficult issue to be assessed and compared since, it could vary significantly across industry sectors and is affected from different degrees of automation, in the production process (Lamminmaki & Drury, 2001). It seems that when the results concerning Greek firms with other European firms are compared, a convergence between them and those located in Belgium, Sweden, Denmark and Finland, do exist (Abernethy et al., 2001; Brierley et al., 2001; Lukka and Granlund, 1996). Even though most of the results are referring to surveys, or case studies, conducted during the 90’s, however, the main issue is that, for the Greek firms, direct materials are still the main bulk of the cost structure, while direct labour and manufacturing overheads vary between 10-20%, for each cost type. Finally, the assessment and comparison of the cost structure for firms facing different economic conditions, technological levels and different size of market (according to population) is not an easy target. Our results were mostly compared to those referred in Bright et al. (2001), Drury and Tales (1992) and Lukka and Granlund (1996, pp. 8). In addition, Greek firms use cost information for many different purposes, other than taxation, however, according to their significance, the short-term decisions seem to prevail over long-term. Our results suggest that Greek firms are still using costing information mainly for short-term purposes, while they use more conventional approaches when collecting necessary costing information (Abernethy et al. 2001, pp.2; Byrne et al., pp.2-3; Chenhall and Langfield-Smith, 1998, pp.250; Pierce and O’Dea 2003, pp. 261)

However, there are some limitations that are worth noting, like the omission of other important factors, as well as the relation between specific factors such as firm’s size, industry sector and decision making process. Additionally, the results could vary according to the industry sector, or to costing purposes.

Future research should therefore include other important factors such as advanced production methods currently used, to examine whether they could result in significant differences on cost structure. Additionally, it would be interesting to explore the differences of costing practice stemming from differences in the number and types of the products (uniformed or customized, innovative or traditional). Finally, the exploration of the costing process in practice and the causes behind the unwillingness of Greek firms, to adopt innovative costing approaches, would be an area that needs further investigation. Useful comparisons could be made between organizations operating in a particular sector, as to determine whether or not, significant differences respecting the cost structure data, do exist.

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