

HISTORICAL DEVELOPMENT OF COST AND MANAGEMENT ACCOUNTING IN EUROPE AND US

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Cost accounting has been employed to determine the price of products and assist decision-making process throughout the history. Although it has evolved as production technology was improved, some of the early practices (e.g. in the 15th century) of cost accounting may be stated to be quite similar to those that are in use in the 20th century. The aim of this paper is to describe the historical development of cost and management accounting, from the early fourteenth century to date. Insights into modern cost and management accounting systems that are referred to as 'traditional' systems can better be described and understood if they are linked to the past. This paper examines the evolution of the traditional systems by describing cost allocation methods, cost drivers and their use in decision-making process in the traditional context, application of which for some industries are now criticised by academics. It also seeks to establish the links between modern and old practices.

Introduction

In the last decade some researchers (for example, Johnson and Kaplan, 1987:19) stated that management accounting first appeared in the US in single activity businesses such as textile-making, iron and steel manufacturing, and railroading in the 19th century. Although this may be the fact for the US manufacturers, rudimentary forms of cost accounting and the use of cost information for decision-making purposes were employed in Europe from the early fourteenth century.

The aim of this paper is to describe the historical development of cost and management accounting, from the early fourteenth century to date. Insights into modern cost and management accounting systems that are referred to as 'traditional' systems can better be described and understood if they are linked to the past; because, there is a close relationship between the systems that are employed now and the ones being used in the past.

This paper examines the evolution of the traditional systems by describing cost allocation methods, cost drivers and their use in decision-making process in the traditional context, application of which for some industries are now criticised by

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academics. It seeks to establish the links between modern and old practices. For this purpose, it is divided into three main sections.

In the first section, the medieval era prior to the seventeenth century is addressed to show the formation of `industrial accounting`, which is considered by the historians as the predecessor of cost accounting. In addition, the simplistic forms of costing applications used prior to the 1600s are described. The seventeenth and the eighteenth century developments of industrial accounting that led to the development of modern cost accounting are then described.

The second section is devoted to the nineteenth century, when a number of researchers believe that the important developments in cost accounting took place; and the first seeds of management accounting appeared due to the industrial revolution. In the 19th century, establishment and mass production of large factories in the US, UK and the rest of Europe required that systematic product costing methods be implemented.

The third section is related to the 20th century. It is divided into two periods, which are the periods before and after 1950. These periods, especially the latter, are important in that an enormous change in manufacturing environments have taken place. These changes, according to some researchers, have led to most product cost systems adopted by the multi-product companies becoming obsolete since the technological developments have changed the product cost structure a great deal by increasing the overhead and decreasing most direct costs such as labour.

1. The Roots of Cost Accounting

Cost accounting is probably one of the oldest managerial tools, which may go far back to ancient times, used in the determination of the amount of taxes that were taken by kings; or used in pricing the products that trading people of antiquity were selling. The trading people of ancient times such as the Chinese, Egyptians and Arabs had accountants in the service of the royal courts, some of whom were experts in the determination of costs (Perren, 1944:1059). Perren states that:

"In Egypt, 3,000 years before Christ, accountants had to present to the Pharaohs each year a detailed report on the net cost of harvest, so that just taxes on wheat could be levied. The ancient Code of Manu made obligatory

the periodical auditing of trading profits by court auditors. In Books VII and VIII of these sacred Laws we find the following two passages: 'Merchandising experts will establish the sales price of goods, so that the king may levy 1/20 of the profit thereon' ... 'the sales price of merchandise shall be evaluated according to the distance it has travelled, the time it is kept in storage, the expenses connected with it, the time it has to travel to reach its final destination, and the profit that can be anticipated'."

As is stated in this quotation, the purpose of calculating the cost of the products in ancient times was to determine the amount of taxes; and this duty was always performed by the court officials. Government auditing, budgetary accounts, expenditure control and periodic reporting, which were in existence in China since 1100 BC. (Lin, 1992:105), are other examples of costing techniques adopted for governmental needs in ancient civilisations. However, according to some accounting historians such as F. DeRoover (1968), S.P. Garner (1988), Edwards and Newell (1990), the first simplistic forms of product costing applications date from the medieval era. Therefore, the discussion in this paper regarding historical development of cost and management accounting begins with the medieval era.

Cost accounting is generally believed to be a product of the nineteenth century when large business enterprises such as textile mills, iron and steel works etc., appeared with an extensive use of machinery in industrial production (Littleton, 1966:320; Wilson & Chua, 1993:4). While this belief is partly true for the systematic recording technique of cost accounting that was developed in the nineteenth century and greatly extended in recent decades, some elements of cost accounting are much older in the form of industrial bookkeeping practices and techniques (DeRoover, 1968:50; Garner, 1988:2).

DeRoover (1968:50) states that some medieval business records that exist in the twentieth century show that industrial accounts, early and simple forms of cost accounting, were used as early as the beginning of the fourteenth century. DeRoover is not the only researcher who claims this. Edwards and Newell (1990:41) state too that the use of product costing is not a product of the nineteenth century. The authors exemplify a number of cost accounts from business records of iron making in Wealden covering the period 1330 to 1773.

In the following section, starting from the fourteenth century, early use of 'industrial accounting' will be described. These early costing techniques practised in the

medieval era, apart from their simple structures, were very similar to many of the techniques employed in cost accounting in the twentieth century, e.g., evaluation of by-products.

1.1. The Fore-runners of Cost Accounting in the Medieval Era: Some Examples of Industrial Accounting Before the Seventeenth Century

It is a generally accepted belief among accounting historians that double-entry bookkeeping started with the first textbook on accounting, *Summa*, by an Italian monk Lucas Paciolo in 1494. However, this system had been explained and practised by the Venetian merchants and others in northern Italy approximately 200 years before the publication of *Summa* (Haydn, 1985:3). Due to an extensive trade of Italian merchants with Arabs living in the Middle East, North Africa and Spain (DeRoover, 1956:86), Arabic numerals were introduced around the early thirteenth century (Croix, 1956:65-66; Durham, 1992:39). Moreover, bookkeeping practices in commercial activities appeared after the Crusades (Peragallo, 1956:215) that began at the end of the 11th century. As the businesses grew, accounts were used in costing products, but in a very simple way. Garner (1988:15-19) explains some of these early users of industrial accounts in his book *Evolution of Cost Accounting*. Since the aim of this paper is to shed light on the insights of cost accounting developments, some of these early practices of industrial accounting will be described in detail. For instance, practices of *Del Bene firm*, and *Datini of Prato* may be described as follows.

a. **The Del Bene Firm Accounts:** (Garner, 1988) The Del Bene firm, which was established in Florence, Italy, was converting raw wool into a useful and saleable product. The firm's accounting records date back to 1318. Thus, they represent some of the earliest examples of cost bookkeeping, although the system is crude when compared with the later developments. In 1350 only prime costs were derived, however, a great amount of additional information was provided to owners and managers. Accountants of the firm established two types of book, one of which was for *the results of trading or mercantile activity* and the other for *the central workshop data*. By 1368, other books called *the book of raw wool purchased*, *the labourers wage book* and *the dyers wage book* were also established and used. These three books were used to record every transaction of purchasing wool; the labour expenses necessary to manufacture a certain quality and quantity of woollen

cloth; and cost of dyers by opening an account for each individual dyer. These three books were summarised at certain intervals and the totals of which were carried to a ledger book that had many of the characteristics of a modern ledger. At the end of each manufacturing period, a `Bilancio` was prepared to evaluate profit or loss of the period, the lengths of which depended on the production of a certain quantity of woollen cloth. The periods were distinguished from each other by an alphabetical letter. By subtracting liabilities, capital and deferred sales from the total assets, a profit or loss was determined which was further allocated to the partners using a predetermined ratio.

b. The Accounts of Datini and Niccolo of Prato: (Garner, 1988) The first workshop produced cloth was established by Francesco di Marco in Prato, Italy, in 1382. A ledger, in which single entry was used, shows that the shop began in March 1384 and the wages were paid to the workers for the 20-30 processes through which the wool was put. Other costs were also evaluated, entered in a `day book` and then posted to the ledger.

One of the day books dated 1395 has a resume of the different costs incurred in production of two pieces of cloth, each of which was 32.6 meters long and 8.1 meters wide. This resume contains a list of the costs incurred. By-products (filling and warp yarn) of this production were deducted from the total to get a `net` cost of the two pieces of cloth. This list may show that the `cost of production` in modern cost accounting had been known by accountants one hundred years before Paciolo wrote his famous book *Summa*. Therefore, as early as the fourteenth century, applications of some costing techniques and even single entry recording technique were well ahead of the theory, which appeared in the late fifteenth century (Haydn, 1985; Garner, 1988).

Some other early application examples of cost accounting explained by Garner (1988) include `Bracci` and `accounts of Mints at Ragusa`. The records, which belong to the early fifteenth century, contained many of the elements of a modern cost accounting system such as control of the cost factors used in production and in the different processes.

DeRoover (1968:51-61) states that the simple forms of cost finding were commonly adopted in industries such as mining and textiles in the sixteenth century. The

author also describes the books and the accounts, which belonged to Christopher Plantin—a Frenchman by birth—who established a printing business in Antwerp in 1555, as follows.

c. Plantin's Accounts: Christopher Plantin kept several subsidiary account books. He kept a form of journal, called *journal des affaires*, in which transactions such as purchases of equipment and paper, sales etc., were recorded; a form of ledger, called *grand livre des affaires*, in which the same information entered in the journal was recorded in a concentrated form. Other books that Plantin had were a wage book containing records of wages paid to compositors, artists, scholars, etc.; the *livre de libraires*, containing current accounts of the book dealers; a retail sales book, recording cash sales; and a `Journal of C. Plantin`, in which the inventory at the beginning of the partnership and some miscellaneous accounts were recorded. He also had a plant ledger and a book that contained accounts of bookbinders both of which have, unfortunately, been lost. Some of the accounts were used to calculate the cost of book printed. This account contains the cost of paper, a direct material used in printing (debited £21.88); wages (£8.98); and for a supposed error in price of the paper, £2.10 is added. The total of these direct costs, £32.97, represents the cost of publication. This total amount does not include the charges for ink, glue, thread, and the depreciation. This account was, then, cancelled by a debit to `Books in Stock`. When the publications were sold, they were credited to Sales Account.

Plantin or his accountants also prepared a `trial balance` on April 26, 1565, one year after the formation of partnership. Solomons (1968:6) states that the method that Plantin applied was really a cost finding system of extraordinary maturity. Another example is given by DeRoover (1941) in his study on a cloth manufacturer called Medici, as follows:

d. The Medici Accounts: The Medici family who lived in the early sixteenth century, had a cloth manufacturing business. Records of the books kept were in double entry form, and, from 1513, eight books were used: a waste book, a journal, a ledger, a cash book, a wage ledger, a book of dyers and workers, a book of weavers, and a book of spinners. The system that Medici applied was adequate for the needs of the management of the organisation in controlling the flow of materials and funds. The account books show that the Medicis had approximate but enough information for

their needs about the cost of the products which were produced (De Roover, 1941). This cost information was used in pricing decisions. De Roover (1941:28) states that “it was not yet a cost finding system, but it came very close to being one”.

As with the Plantin's books, the Meidicis kept subsidiary account books, showing that the application of some advanced techniques were practised in the medieval era. Since there is no evidence that any of the textbooks on accounting published in those centuries contained any information on industrial accounting, or the use of subsidiary books, many accounting historians, such as the De Roover (1968) and Garner (1988), state that the practical applications of industrial accounting were well ahead of the theory.

1.2. Industrial Accounting in the Seventeenth and Eighteenth Centuries

There are very few references on the developments of industrial accounting in the seventeenth century in comparison to either the medieval era or the eighteenth century. Nevertheless, there are some examples about the use of costing in businesses in the seventeenth century. For instance, Garner (1988:21-32) states that one of the most interesting examples of seventeenth century cost calculations belongs to the members of the Worshipful Company of Bakers in 1620. This company prepared a cost statement to show that the selling price of baked bread in 1620 was not adequate to cover the cost of baking.

Another example is given by Edwards and Newell (1990:42) about a copper production mine near Keswick in 1615. They state that Hechstetter, owner of the copper mine, evaluated the relative cost of producing rough copper in detail. This indicates that comprehensive accounts of all aspects of production were kept. Weekly cost of labour, various materials, carriage, horses, etc. are listed and multiplied by 52 (i.e., the number of weeks in a year). The cost of copper ore, charcoal and other smelting materials, as well as miscellaneous items such as rent and interest are added to this amount which gives an annual total cost of production. Hechstetter was using these calculations for cost related decision making, from the late 16th century. For example, he calculated the effect on profit of selling copper in a different geographical area; and also the effects on cost of changing the level of production.

On the other hand, Edwards (1937a:226-227) discusses a book 'The Accountant or The Method of Bookkeeping' published by James Dodson in England in 1750. Dodson suggested and demonstrated how to evaluate the cost of making shoes. In the book, he demonstrated what is now called 'batch costing' (according to Solomons, 1968:5-6) and recommended that separate books be used such as a workman's ledger, a cash sales book, and so on, for different types of transactions. However, this type of segregation of different transactions was not a general characteristics of the accounting systems of his time. When Dodson's shoe-maker cut leather and the other necessary materials in making a pair of shoe into pieces for different sizes, Dodson was attaching a different value for each so that the total value of parts cut exactly matched the cost of leather used up. Unfortunately, how he did his evaluations is not known.

Edwards (1937a:229) gives a detailed example of the eighteenth century accounts for 'thread hosiery production' set out by Wardhaugh Thompson, in his book *The Accountants' Oracle* published in 1777. He states that "the accounts are worthy of note because they show the materials moving process to process [and] acquiring costs as they move". This shows that process costing system was in use in the 18th century.

As another example of eighteenth century cost applications, Fleischman and Parker (1990:212-220) explain the system of the Carron Company, which began operations as a pioneer iron foundry in Scotland in 1759. It is stated that the company utilised superior cost management during the industrial revolution. Its records reveal many examples of cost management, mostly between the years 1759 and 1786. For instance, company policy was to attribute the responsibility of cost management to individual managers and departments as early as the 1760s. For two of the products produced, anchors and anvils, separate accounts were established to determine the cost of production accurately. According to the authors, a pronouncement of the General Court (neither definition nor function was given) required that overheads be applied to all products produced, and in 1763 for example, an overhead cost of £2,000 was allocated to departments in predetermined proportions, the bases of which were not unfortunately disclosed, nor any explanation was given by the authors concerning the pronouncement of the General Court.

Interestingly, costs were often compiled for a wide range of managerial needs including product line decisions at the Carron Company. For example, the company stopped anchor production and trade since the cost of anchors could not be recovered by the sales price (product dropping decision). Also in the same year (1769) managers evaluated the cost of per tonne of charcoal iron made in the company as £16 and 50^p, and suggested that Russian iron could be purchased at a cost of £14 and 50^p per tonne (make or buy decision). Evidence was also found of operation cost analysis of managers based on their output costs; subcontracting; improving steam engine efficiency to reduce the running costs; development of production standards and some other applications. These practices demonstrate that the Carron Company used costs extensively for decision-making.

Besides the use of cost information by a number of manufacturers, some authors studied the issue during this period. For instance, Hamilton, an eighteenth century author and a lecturer at Marischal College in Aberdeen, wrote a textbook, *An Introduction to Merchandise*, that introduced some important practical costing techniques and an early description of process costing system for the linen industry (Mephram, 1988:55,68). In his book, Hamilton also discussed industrial costing using an approach which concentrated on the managerial uses of costing. He was a precursor of management accounting with his emphasis on the need for accounts to be relevant for decision making (Mephram, 1983:51,54).

2. Nineteenth Century: Developments of Cost/ Accounting and Cost Management

The 19th century is considered by most authors as the beginning of cost and management accounting because of the emergence of large business enterprises. This was the period of the industrial revolution, during which large cotton textile factories appeared in England and the US that used cost accounts to ascertain the direct labour and overhead costs of converting raw material into finished yarn and fabric (Johnson, 1981:511). Iron and steel works and railroading also contributed to the advancement of cost and management accounting, particularly in the US (Johnson and Kaplan, 1987). This section is devoted to the developments of cost accounting and cost management in industries such as cotton and textile, iron, steel and metal working and railroading in the UK and the US.

2.1. The Cotton and Textile Industries

Surviving documents from the 19th century mechanised cotton and textile mills show that costing practices in UK companies were ahead of costing practices of their US counterparts (Stone, 1973:78). Charlton Mills of Manchester for example, as described by Stone, had a complete cost accounting system that was first used as early as 1810. The cost system of the mill was integrated with a double entry system that produced a trial balance on a bi-monthly basis. There were fourteen cost centres in which prime costs for labour and materials were collected and, by using predetermined rates, general expenses were allocated to them.

Cost accounts of the Charlton mill were designed to reflect the cost flow of the manufacturing process. Raw cotton costs (because of purchasing from different countries with different prices) were charged to warehouse trading account at purchase price plus freight-in. After charging wages to the warehouse account for the cleaning process, the cotton was then transferred at prime costs to the five carding rooms, each of which was treated as a cost centre. Direct labour expended for each carding room was charged separately and general expenses were allocated to each. Output from these five carding rooms was transferred to eight spinning rooms, each of which was also a cost centre. The waste of the carding rooms was transferred to the warehouse. Credit was given to the carding rooms for the waste transfer. Direct labour cost and general expenses were charged to each spinning room; and the finished products were transferred back to the warehouse at an intra-company price. As soon as the product was sold to customers, the warehouse trading account was credited at sale price. The exact basis for the intra-company price, which differed by grade, is not known. However, it was not market price since the warehouse profits were relatively high when compared with the profits of the cost centres; nor was it cost plus price because individual carding or spinning room accounts showed losses from time to time.

The general expenses were allocated to the cost centres by using arbitrary amounts that differed for each cost centre. However, they were charged at a constant amount for each cost centre for a period of one or two years. More importantly, the general account was charged with depreciation twice a year at an annual rate of 5%. There was also a tendency to charge larger amounts of depreciation during profitable years. This is revealing because depreciation as loss of value was widely

understood in the British textile industry in the 1830s, whereas it was not used by the US textile or cotton mills at that time (Tyson, 1992:14). Tyson also states that Montgomery, whose book was published in 1832, discussed 7.5% of machinery for 'tear and wear' in calculating profit and loss per fortnight for a Scottish textile operation.

Cost accounts, in which remarkably sophisticated cost systems were used, survived from integrated multi-process cotton textile mills operating in the US in the first half of the nineteenth century (Johnson and Kaplan, 1991:24). The purpose of cost accounting in those mills was to co-ordinate, control and increase the efficiency of conversion process, material and labour utilisation. In the Merrimack Manufacturing Company, as briefly described by Tyson (1992), detailed cost per unit calculations were performed for 13 different styles of products in 1826. The cost of each type of product was built up by adding the unit cost of four operations (bleaching, printing, dipping, making up) and the allocation of general expenses. However, Tyson does not explain the contents and allocation basis of those general expenses. The company kept detailed accounts, which also included general expenses, for total and the unit costs of various operations and preparing cost reports every six month.

Another cotton textile mill, the Lyman Mills Corporation, is regarded as having had one of the most sophisticated cost accounting systems of the 1850s (Johnson, 1972:468). There were accounts, in which cost of material (cotton), labour, and overhead were incurred on semi-annually basis. However depreciation, as with its contemporary mills in the US, was not included in accounts as a cost item. These accounts enabled managers to calculate cost of production, including the unit cost of each different cloth style which it manufactured. It was, therefore, easy to determine the cost of cotton that was accounted for on a cost per pound basis. However, the average labour and overhead costs, which were allocated to various styles every six months, were calculated per hank of yarn (one hank equals 840 yards of yarn). Then, average cost was multiplied by the number of hanks per pound in each style to get an estimate of labour and overhead per pound. In this way, the company was able to estimate total cost per pound for each style produced.

Johnson (1972) concluded that Lyman Mills did not use cost accounting to evaluate production decisions. Managers of the mill focused their attention inside the shop

and used their elaborate cost system to facilitate control of plant operation. Nevertheless, its system has been regarded by accounting historians as one of the earliest examples of a completely integrated double-entry cost accounting approach.

2.2. The Iron, Steel and Metal Working Industries and Railroads

The Iron, Steel and Metal Working Industry was among the large scale mass production environments in which complex production processes and reliable cost data were required in the nineteenth century. In the 1820s and 1830s, British mining and smelting industries were using elements of cost, —material, labour and overhead cost— (Haydn, 1985:106-7) that resembled the cost elements which are now being used in the last decade of the twentieth century. Accountants of these mining and smelting companies charged overhead costs to departments and products using the prime cost and the direct labour hour methods. By the first method, overhead costs were allocated to departments or products using a percentage of direct materials and direct expenses, as well as direct labour; and by the second method, overhead was allocated as a percentage of the labour costs that could be clearly identified with a specific department and/or product (Edwards and Newell, 1990:50). The prime cost method was the most common way in allocating overhead in the 1870s and remained so up until the end of the 19th century. The evidence found in the British mining and smelting industry by Haydn (1985) opposes Clark's assertion (Clark, 1923:9) that the importance of overhead was first realised after railroads had been constructed in the US. Overhead cost had been in use in the British mining industry long before the railroads were ready for transport in the US.

In the last quarter of the nineteenth century, one steel and iron working company in the US, managed by Andrew Carnegie, is of particular interest. Carnegie's managing strategy is now regarded by some authors (see, for example, Johnson and Kaplan, 1987) as being one of the earliest utilisation of cost information for management needs in the US. Carnegie used cost information to manage his giant steel manufacturing company for 30 years. His system was concerned primarily with continuously gathering data on all direct costs in every process of the manufacturing activity, from the blast furnace to the rolling mill (Johnson and Kaplan, 1987:32). One of his executives introduced `the voucher system of accounting` which, while it

had long been in use by the railroads, was not in general use in manufacturing (Chandler, 1977:267). By using this method, each department manager in the factory listed the amount and cost of materials and labour used on each order as it passed through the units within the department. This cost information was sent to Carnegie monthly, weekly and even daily if he asked. These cost reports were not only Carnegie's main instrument in controlling plant activities, but also his obsession. One of his favourite dicta was: Watch the costs and the profits will take care of themselves. As a strategy, he always attempted to keep his direct costs lower than his competitors so that he could apply lower prices which created enough demand to run his factory at full capacity (Johnson, 1981:515). Consequently, this practice resulted in the effect of fixed costs on the cost of each unit produced being minimised. He charged cost of repairs and maintenance to the operating account but did not use depreciation systematically (Boyce, 1992:44). His success, however, depended upon good accounting information about direct operating costs rather than fixed ones.

The railroads, like manufacturers, devised cost accounting systems to evaluate and control the internal processes by which they provide a transportation service (Johnson and Kaplan, 1987:36). The ton-mile was used as the basic unit of output, and complex internal accounting procedures were created to calculate the cost per ton-mile. This unit of output, which was created by a railroad executive —Albert Fink— to determine the cost of freight in the late 1860s, was also used to control and evaluate the work of managers (Chandler, 1977:117). *Fink divided costs into four categories, which were maintenance and overhead that did not vary with the volume of traffic; station personnel expenses that varied only with volume of freight; fuel and other operating expenses which varied with the number of train miles run; and finally fixed charges for interest. He evaluated operating expenses of each sub-unit by using cost per ton-mile. With the formulae he worked out to convert costs in each category to a ton-mile basis, he monitored costs per ton-mile for the entire railroad and determined the reasons for cost differences among the sub-units (Johnson and Kaplan, 1987:36).

*Fink treated and categorised the costs in a way that may be regarded similar to that of ABC in the 1860s. Each category varies with only certain service activities such as volume of freight and the number of train miles run.

The nineteenth century is regarded by accounting historians as the 'costing renaissance' (Parker, 1969:19) during which important developments in cost and management accounting took place and most of the methods that are in use today appeared in manufacturing companies. Costing practices such as standard costing (Johnson and Kaplan, 1991:49), process costing, overhead utilisation as a cost element and its allocation to products or departments by using machine/labour hours or prime cost methods, etc., were all used in the industries discussed above. These techniques, however, were greatly improved in the first quarter of the twentieth century.

3. Twentieth Century Cost and Management Accounting

Developments in cost and management accounting in the 20th century may be divided into two sections, in which the developments before and after 1950 may be described as follows.

3.1. Developments in Cost and Management Accounting Prior to 1950

In the late 19th and early 20th century, engineering-managers such as F. Taylor and Emerson devised new cost accounting procedures primarily to assess and control financial and physical efficiency of processes (Johnson and Kaplan, 1991:51-2).

Their aim was not to evaluate the overall profitability of the company, but to assess the efficiency of processes. By 1910, existing cost systems provided information relevant to a wide range of decisions concerning efficiency and product differentiation. These systems were designed to assign costs to products and product lines. These practices came from the engineers, who were working in factories, rather than accountants or academics. This could explain why those new cost accounting and control techniques were rapidly adopted by organisations.

Nevertheless according to Kaplan and Atkinson (1989:5), these practices disappeared after 1910, perhaps as a result of the collection of cost information becoming very difficult and expensive for a widening range of products making it harder to justify its benefits. In its place, there appeared various costing procedures that 20th century accountants adopted to evaluate cost of inventories for financial reports. However, while this kind of cost information was reliable for evaluating cost

of inventories and financial reporting, it was irrelevant and even misleading for decision-making needs, particularly for strategic product decisions.

Edwards states (1937b:344) that after the first decade of the 20th century, cost accountants did not add much to the advancement of the theory of cost accounting. Edwards is not the only researcher who claims this. One of the researchers who shares this idea is Kaplan (1984a:390). He says that little innovation in the design and implementation of cost accounting and management control systems occurred until the 1980s. Kaplan and Atkinson (1989:8) believed that the exact reasons for the slowdown in developing new cost accounting systems were still unclear, however, part of the reason appeared to lie in the demand for product cost information for only financial reporting.

However, there were some contributions to the improvement of accounting information for decision making needs in the 1910s and 1920s. For example, Parker (1984:56) discusses two Scottish chartered accountants, John Mann and Harold Judd. He states that Mann helped to develop the break-even chart, and Judd, in his article published in 1914, gave an example that stressed the importance of direct and indirect costs (including fixed and semi-variable indirect costs) in strategic product pricing decisions.

In 1923, an economist, J. Maurice Clark, published his book, *Studies in the Economics of Overhead Costs*, in which he discussed fixed and variable costs; joint, sunk, differential and residual costs; short and long run fluctuations; and a number of other issues from the economist's point of view. He also advocated that different costs should be used for different purposes, i.e., the cost information used for decision-making should be different from that of financial requirements. This book is considered by most of the researchers and historians (for example, Parker, 1984; Kaplan, 1984a) as a major contribution to cost accounting literature in the 1920s. However, Clark's study was widely unknown and did not have a significant impact among accountants until the 1950s.

3.2. Developments in Cost and management Accounting After 1950

Cost accounting had a close approximation to management accounting in 1940s' business curricula. Nevertheless textbooks, which had almost the same terminology

as is used today, emphasised the mechanics of cost accounting such as journals and journal entries, requisitions, time cards, vouchers, purchase orders, etc., (Anthony, 1989:1). There was no textbook devoted to management accounting in the 1930s and 1940s. Existing books dealt only with numbers and the aim was to determine the true cost of manufacturing. However, management accounting should deal with making decisions and the behavioural factors that affect managers who use those numbers, not just with the numbers themselves. On the other hand, different costs are employed for different purposes in management accounting, whereas cost accounting focuses on measuring full costs. With these general distinctions, the first management accounting textbook by Bill Vatter, following the tradition of J.M. Clark (1923) who strongly advocated “different costs for different purposes”, appeared in 1950 (Johnson and Kaplan, 1991).

In 1961 Shillinglaw and in 1962 Horngren published the first modern cost accounting textbooks with managerial emphasis (Anthony, 1989). Horngren (1989:22-3) states that, among cost accounting textbooks, the emphasis on cost control and management decision-making shifted from 27% of the total chapters in 1945-50 to 54% in 1961-70. During the same periods, however, inventory valuation that comprised 73% of the textbook chapters in 1945-50 declined to 46%. This shows a growing interest of using cost accounting information in decision-making, rather than simply for inventory valuation and financial reporting.

Academics in the cost accounting discipline conducted some research during the 1950s and 1960s, focusing on relevant costs for decision-making (Horngren, 1989). Cost concepts in association with capital budgeting, inventory, and cost-volume-profit decision models, which were relevant for decisions made by an individual manager, were analysed during this period. Later, this single-manager information economics approach was replaced by agency theory research (Kaplan, 1984a; Horngren, 1989), in which accounting information is viewed as the basis of contracting between economic agents, who have different ownership rights, different information, different prior beliefs (Kaplan, 1984a).

In the 1980s some researchers began to complain about the current state of cost and management accounting. Kaplan wrote several articles (see, for example, 1984a, 1984b, 1986b; Cooper and Kaplan, 1987) and criticised traditional cost accounting systems. He claimed that those systems distorted cost information since

they were outmoded and could not capture the requirements of the new production environments. In the mid 1980s, Johnson and Kaplan (1987) published a book, *Relevance Lost: The Rise and Fall of Management Accounting*, in which they articulated their ideas about obsolescence of existing cost and management accounting systems.

Two other researchers, J.G. Miller and T.E. Vollmann, published an article, *The Hidden Factory* (1985), in which they stated that overhead costs grew in percentage (more than 1,000%) as a result of automation in the electronics and mechanical equipment industries. They also said that transactions, which took place in a factory, were the real cause of a large proportion of the overhead cost accumulated. Therefore, they stated, if overhead costs were accumulated as a result of transactions, the key to managing overheads was to control the transactions that drove them. They then introduced “transaction based costing”, in which the major transactions that may occur in a factory in electronic industry are divided into four groups as follows (Miller and Vollmann, 1985:145-146).

Logistical transactions include ordering, executing, and confirming material movements from one location to another efficiently.

Balancing transactions ensure materials and labour supplies are equal to demand, and are ready when needed.

Quality transactions ensure product quality meets market requirements, and other transactions are performed efficiently.

Change transactions involve updating manufacturing information and changing product designs, production schedules and routings, material specifications and standards.

The authors believed that these transactions were responsible for the occurrence of most overhead cost, and stated that to control manufacturing overhead, related transactions should be managed efficiently.

The article “Hidden Factory”, and a number of case studies performed in real manufacturing environments led Robin Cooper and R.S. Kaplan, to introduce a new product costing system, which they referred to as “Activity Based Costing”. In their article *Measure costs Right: Make the Right Decisions*, Cooper and Kaplan (1988b) explained the system, and later, Cooper (1990a:4-14) refined and organised the system by adding new concepts such as hierarchy of activities.

These developments and new challenges to the traditional cost systems lead managerial accounting to a critical stage, in which its development and some of its conceptual foundations are being scrutinised as never has been done before (Shillinglaw, 1989:45). These latest developments also make the researchers optimistic about the future of modern cost and management accounting. Horngren (1989), for example, expected the coming years to be fruitful in research and teaching of management accounting, and Johnson (1990a:144) stated that the appearance of new articles and cases may signal that cost management, which has been lost since the beginning of this century, was returning to the manufacturing firms.

Summary and Conclusion

As stated by most accounting historians, the roots of the cost accounting go back to the thirteenth century in the form of what was then called industrial accounting. From the evidence that has survived, they have found a number of companies in which some forms of cost accounting -- sometimes in rudimentary form, and sometimes resembling twentieth century systems -- were used. These systems were not devised by academics. They were invented by accountants or owners depending on the needs of every individual company. Practices of those companies, as stated by historians, were always ahead of contemporary accounting textbooks of the medieval era.

Cost information was employed for decision making long before the 19th century. It was used for decision-making requirements such as product pricing, make or buy, dropping products, development of production standards, and attributing departmental responsibilities to managers and performance evaluation. These concepts, which necessitated extensive use of cost information, were in use in some companies, some of which were in British mining and iron working industries, as early as the fourteenth century.

Early forms of process costing, standard costing, transfer pricing and, as stated by Edwards and Newell (1990:54), many of the tools of modern management accounting were in use by 1850. The origins of cost and management accounting were linked by some researchers (Kaplan, Littleton) with the emergence of multi-product textile and steel mills and railroads in the US. However, cost accounting

practices of UK companies were, in some aspects, ahead of their US counterparts. For example, they were involved in using most of the modern cost concepts, such as depreciation, overhead and its allocation by predetermined basis, process costing, etc., earlier than their US counterparts.

In the first half of the 20th century, the development of cost and management accounting was slow despite the fact that there was a fast change in the manufacturing environments. During this period, cost information was used for inventory valuation and financial reporting rather than decision making. However, this practice changed after the 1950s. New books that emphasised the decision making role of cost information and accounting were published. Academics conducted research that concerned relevant cost concepts and other decision relevant approaches. After the 1970s however, the developments in production and computer technologies resulted in traditional cost systems becoming inadequate for the requirements of some manufacturing industries, such as electronics and machine parts.

The use of the traditional costing systems, the roots of which can be traced to the fourteenth century, were severely criticised by some researchers in the mid 1980s. Instead, they recommended new and advanced techniques that, they considered, would be more appropriate to the technologically advanced, multi-product companies, in which a number of highly diversified products are being manufactured.

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