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Control systems: an historical perspective

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Contents

1. Introduction

This thesis addresses the topic of management control: what it is, why it is important, but mostly, it focuses on how and when management control has developed as a practice, historically.
Most of the management control literature and frameworks in use are quite recent, mainly descending from the Harvard school[1]. This makes it seem that management control is a rather contemporary practice, which developed with the development of modern capitalism and the expansion of firms in our contemporary society. But what about before? Forms of business organization have always existed, even complex forms: were forms of management control not in use before its codification as a discipline by the Harvard school and subsequent developments?
Indeed, some accounting history research has explored management control practices in the past.
The objective of this thesis it to review these contributions and shed light on the roots of management control practices historically, before their codification into a disciplinary field.
In order to pursue this target, the methodology applied is a literature review of selected accounting history research contributions focusing on management control. In particular, careful attention has been paid to those articles focused on the practice, in which through primary resources, it has been possible to extrapolate the method of control as it was practiced.
The thesis is structured as follows: firstly, a conceptual background of the management control systems is discussed, underlining its main aspects within the organizational framework. In particular, it is underlined the basic definition and main principles of management together with the importance of control for the business survival and the key role played by accounting practice as method to provide, gather and manage information.
Then, a brief explanation of the definition of accounting history and its main exponents, together with an exposition of the methodology employed to draft the elaborate.
Subsequently, starting from the consultation of secondary sources, represented in the table review in the next chapter, it has been made an historical reconstruction of the management control systems practice from the ancient society that lived 3500 years BC until the present day. An important key in the evolution of this practice has been the social and economic context of the period investigated; at any society, in terms of culture and economic systems adopted, corresponds specific accounting practice and method of recordkeeping.
It is therefore interesting to note how accounting is linked to society and that, as it evolves, the accounting practice also evolves.
In the end, after having examined national framework of management control practice through the use of accounting as tool for decision making and control systems, it is provided a final discussion on the global standard setter's entity. In particular, it is stressed the worldwide importance attributed to accounting which, starting from the second half of twentieth century, has become a debated subject by academics and experts. The purpose of these debating is to elevate this practice from a national framework towards an international context, able to guarantee harmonization and comparability among different nation practices.

[1] Mio C., Fasan M., Luisiani M., Fondamenti di programmazione e controllo negli insegnamenti della scuola cafoscarina, Il contributo delle discipline economiche e aziendali nelle dinamiche storico-evolutive di Ca' Foscari, p. 12-13

2. Conceptual Background: Management Control Systems

The word control has numerous meanings and different connotations, many of which are not applicable to the field of management. Within this scope, the term management control has been defined it as all the devices or systems managers use to ensure that the behaviors and decisions of their employees are consistent with the organization's objectives and strategies.[2] The systems themselves are commonly referred to as the management control systems.

Management control failures can lead to large financial losses, reputation damage, and possibly even to organizational failure.

Management control literature also coincides in pointing out that the management control system furnishes information intended to be useful to the managers for carrying out their work and helping the organizations to develop and maintain viable behaviour patterns. Moreover, any valuation of the role played by this information requires taking into account the use which managers give to this information. However, it should be mentioned that control may be applied to different levels of an organisation and that, as a result, the requirements for this control to be effective may differ from some organisational levels to others.

Therefore, the term control is used in the sense of assuring the strategy's putting into practice. The function of management control includes carrying out the plans necessary for ensuring that the strategies are fulfilled as envisaged. Although planning and control are at times described as separate procedures, both contribute to the management control function.[3]

An organisation's control system is the fundamental means it has for inculcating its members to pursue its objectives.

For this process to be satisfactorily conducted, the management control system has to consider the following aspects, both at the level of the organisation as a whole and at that of the different units comprising it:

- Objectives and goals that reflect those set for the organisation as a whole as a result of the planning carried out, which is equivalent to establishing what has to be done, when and how;
- An internal structure of the unit, including the line of authority and responsibility, which refers to allocating the responsibilities of managerial action;
- A measuring system consistent with the objectives and the structure of responsibility, which includes fundamentally the budgetary system and the information system for control;
- A system of material or non-material rewards or penalties, which leads the different people to act in a direction coherent with the organisation's objectives. This includes the system of appreciation for performance, and compensation or incentives to motivate the person in charge, linking his personal objectives with those of the company. [4]

Control is perceived as a common and inevitable trait in all human organisations making the control function one of the most basic and indispensable in business management. Even if it is only one of the elements that an organisation may avail of as a management system, it appears to be the most influential in improving organisational performances.

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[2] Kenneth A. M., Wim A. Van der Stede, Management control systems: performance measurement, evaluation, incentives, Prentice Hall, Edinburgh, 2007, p.22

3 Ivi, p. 25

4 J. Careyns, Management control systems: an historical perspective, International Journal of Economy, Management and social science, Vol (I), No (I), December 2012, pp. 1-18

As a matter of fact, measuring these performances involves translating the organisation's strategy into results, and thus for the organisation to know their trajectory.
One of the main reasons for implementing control systems is the difficulty in coordinating the activities of the organisation's members when the organizations grow in size, and the individuals in charge do not obtain information on everything that takes place in the company.
Therefore, all organisations require the designing of an information system in order to perform control functions, since the control system must be the tool through which the organisation strives to ensure that its strategies are carried out.
The growing awareness of companies towards the need to implement information systems for management purposes is related to their own need to coexist in a permanently changing environment, not only physically but also technologically, socially and financially.[5]
In view of this new context, organisation managers have had to adapt the structure of their companies to these changes and to plan, control and handle different types of decisions.
The accounting information system is the information system par excellence, since it can be designed to obtain objective and quantifiable information at all organisational levels.
In a nutshell, the majority of control systems (budgets, information management systems and accounting and financial systems) are management systems that compile information on specific aspects of the organisation's performance and release them to the organisation members, although, in order to do this, attention has to be paid to which systems each organisation has to use and how it has to do so. Out of all the accounting control systems, management control research has progressively focused on budgeting as the key system and because it is the most regularly used for organisational management control. The management control system makes it possible to adapt to changes in the environment, provides feedback in the performances, makes it possible to evaluate the profit of the products and clients, and counsels in capital investment decisions. Likewise, its adoption intends to reduce internal tensions and conflicts, as well as to facilitate reports to external groups.
Management accounting and management control have long been viewed as practically synonymous concepts, since accounting provides a language capable of including all areas of organisation and it has always been attributed with a considerable decision-making orientation, which is especially true in the case of management accounting.
This is particularly so if we consider that the objectives of an organisation's accounting system are centered on the following three aspects:

- To produce periodic internal reports for the management, so as to facilitate information and influence people's behaviour, with regard to cost management, planning and the operations control;
- To provide non-periodic or special information for strategic or tactical decisions in matters such as price policies, product selection, investments in equipment, the formulation of overall company policies and long-term planning;
- To release information outside the company through financial statements aimed at investors, financial authorities and other people and institutions

Restricting to the first two aims, those having to do more specifically with management, and in contrast to the rather financial purpose of the third aim, it is verifiable that the first two tally with the company's purpose of management control. On the one hand, the periodic information referred to in the first point would constitute the basis for the periodic evaluation of the company's regular activities, which corresponds to the more intuitive notion of control, understood as the process that makes it possible to check that the organisation's normal routine is as it should be: in other words, that it is operating in

[5] Ibidem

accordance with the plans outlined by the organisation. On the other hand, special information for strategic decisions would constitute the basis for what today tends to be called strategic control, which would have to do with much more isolated decisions, related to the formulation or revision of the strategy.

Accounting is a system designed to measure, aggregate, and transmit financial data for a variety of managerial purposes. In most organizations, the accounting system is an integral part of the overall core control system because of its measurement capability and the need for measures to facilitate control. In addition to the role that accounting plays in the overall core control system, certain managerial accounting systems, i.e., budgetary systems, may function as if they were control systems per se. When an accounting system functions as though it were a control system, it may be termed as accounting control system.

An accounting control system may be defined as a set of accounting mechanisms, both techniques and processes, designed to increase the probability that people will behave in says that lead to attainment of organizational objectives. The accounting system has the same ultimate purpose as the overall organizational control system, but it uses different methods. [6]

In summary, the most important features of management control as: the behavioral constraints, the production of information for both internal and external purposes and the objectives and strategies setting have been important not only in the last century, with the formation of its literature by US Business School but also far well before.

As a matter of fact, the activity embedded in the definition of management accounting has been enacted since the Ancient Civilization.

The methods and practice used in the past could be deemed useless for the contemporary management cases. However, it is very important understand how they took place in relations with the social and economic context because it provides an important insight on the importance given to this issue by the human being. Management control method adopted in the Ancient Civilization, or simply, before the advent of the Early Modern Period, are very useful to determine how a particular society were structured and what was their accounting needs, in terms of activities to monitor, behaviors to drive and strategy to enact.

Therefore, through the examination of accounting articles, it is obtainable an historical reconstruction which provides the control methods and the social and economic reason behind those particular methods and may, in certain aspects, be useful for the resolution of current issues.

[6] Ibidem

3. Methodology

3.1 Accounting History

Before starting the management control techniques reconstruction based on the practice, it is useful for the sake of the elaborate to illustrate the concept of accounting history.
Accounting history is much more than describing the content of crumbling ledgers, the scrutiny of faded balance sheets and charting impenetrable methods for recording transactions in the past.
Accounting has been implicated in key transitional events such as the emergence of capitalism and the industrial revolution. Further, those who practice accounting and the organizations that employ, regulate and represent them have amassed considerable power and significance in the modern age.
Accounting history is understood as a sub-field of accounting which draws inspiration from other discipline. It embraces various specialisms based on configurations relating to subject areas, theoretical approaches, interdisciplinary influences, methodologies and use of sources, and sectoral, spatial and temporal foci.
The practitioner of accounting history operates in diverse national and cultural contexts and are socialized in various traditions of accounting and historical research. Compare, for example, the position of the accounting historian in the US with his counterpart in Italy. The former operates in an academic environment where capital markets research dominates and career building rests heavily on the achievement of publication in the most prestigious generalist accounting journals. The latter, by contrast, benefits form an institutional context where the state explicitly recognizes accounting history as a legitimate specialism and where publication in its specialist journals contribute to career progression. [7]
Accounting historians operate in a divergent and potentially conflictual sub-discipline, especially when the purview extends beyond the local. At the same time accounting historians can display a capacity for commonality borne of the unifying effects of challenges to the legitimacy of their discipline in the modern business school, the unfairly low ranking of their specialist journals and the exclusion of their work from certain eminent accounting journals, a common concern for the advance of the discipline, and the quest for its greater recognition in the wider realm of history.
Given that accounting history is not institutionalized in academic and departments and research centers in the subject are few in number, organisations for practitioners beyond the university are of particular importance for sustaining communication and fostering collective identity. The development of disciplinary associations in accounting history is now considered.
The foremost international disciplinary association in accounting history is the Academy of Accounting Historians, formed in 1973. The association states forcibly that:
"Historical research is a continuing and necessary element in the overall research effort of scholars in an academic discipline. Accounting is at once professional and academic, and its history is no less relevant than medical history is to medicine, legal history is to law, economic history is to economics, and architectural history is to architecture!". (American Accounting Association 1970).[8]

[7] Walker S.P., Structures, territories and tribes, in Edwards J.R., Walker S. P., *The Routledge Companion of Accounting History*, Routledge, London, 2020, p.15
[8] Ivi, p.17

The Academy of Accounting Historians considered that the objects of accounting history research were to understand the development of accounting thought, practice and institutions, and argued that such knowledge would assist the formulation of solutions to modern day accounting problems.
As a result of this improvement in the discipline body, the 1990s recorded an increase in the volume of publications on accounting history.
There are three Anglophone specialist journals in accounting history: Accounting Historians Journal, Accounting History Review and Accounting History.
Their common policy was to boost "the development of accounting thought and practice, including but not limited to research that provides an historical perspective on contemporary accounting issues".
Within this theoretical framework, it may be helpful to separate historical accounting research into two strands. The first is called "history of accounting", in which the researcher's objective is to understand accounting as a set of procedures or practices. In this context, questions and answers are posed as to why accounting took the form that it did, why individuals and organisations adopted particular methods and rejected others, and why accounting ideas emerged and changed at particular points in time. The important point is that accounting is the "dependent variable" in such studies – accounting is explained in terms of other variables or factors.
The other strand is "socio-historical accounting research", where the researcher is primarily concerned with how accounting impacts on specific individuals and organisations, and more broadly on society. This means that accounting plays deep and complex roles in modern society that need to be excavated and revealed in order to gain an adequate understanding of how individuals are controlled, restricted and in enabled through the use of records and calculations.
The two strands of historical accounting research should be mutually supportive: accounting is shaped by its environment but also feeds back into shaping the world in which it operates. For example, the development of standard costing in the years around 1900 may be documented by reference to contemporary writings by accountants and engineers or explained as a specific case of the rational pursuit of profit by businesspeople.
In this regard, a relevant point of view on accounting history is provided by Micheal Foucalt.
Foucalt appealed to some accounting historians because he saw what appeared to be technical practices, such as accounting, as fundamentally based in "discourse" – in language as practiced at a social level. Accounting is not just about measuring phenomena such as "income" or "cost" or keeping track of resources. Accounting is used to construct categories or concepts, such as the "standard cost" and the "efficient worker", which themselves are mobilized in organisation and societies. Foucalt stressed the intimate association between power and knowledge: those who have power are able to define what counts as knowledge, for example, what is measured, recorded and reported, while the knowledge thus produced can be used not just for blatant coercion.[9]
The Foucauldian research program in socio-historical accounting research has been of the central aspects of the accounting history. It has concentrated on how accounting makes "visible" various activities of human life and behaviour, using concepts such as the "calculable man" to interpret accounting methods such as standard costing as helping to construct the worker as a "governable person".
Foucault's concept of "governmentality", which he defined as "*the ensemble formed by institutions, procedures, analyses and reflections, calculations, and tactics that allow the*

[9]Cristopher J. Napier, Historiography, in Edwards J.R., Walker S. P., The Routledge Companion of Accounting History, Routledge, London, 2020, p. 34

exercise of… power that has the population as its target" (Foucault 2007, p. 40) has been a central element of critical accounting history.

Historical accounting research, therefore, has developed to address many new themes, going well beyond the traditional subject matter of the development of systematic record-keeping of economic transactions by businesses. The strand identified as "history of accounting" has explored accounting ideas, practices, and methods in broader settings, while the strand identified as "socio-historical accounting research" has investigated how accounting affected society in the distant recent past, helping us to understand how accounting changes and itself may act as an engine of social, economic and political change.[10]

[10] Ibidem

3.2 Paper Selection

In order to provide a detailed examination of the management control practices throughout the history, I have conducted an analysis starting from the secondary sources, in order to extrapolate from already done research the insight related to the control practice, in particular the accounting method and its entailed aspects and opportunities.
In pursuing this research, particularly important has been the Routledge Companion to Accounting History of Stephen P. Walker and John Edwards. After a preliminary reading of the relevant chapters, in the framework of the research object, it was possible to map out the most important sources, as journals, workshop, management websites, and key words to extrapolate the information needed.
In particular, three international journals have represented the fundamentals for this research:

- Accounting History
- Accounting History Review
- The Accounting Historians Journal

Subsequently, from this first researching activities, other journals and paper websites emerged, as: Accounting And Business Research; Accounting Business And Financial History; Accounting, Auditing & Accountability Journal; Accounting, Organization And Society; Business History; Critical Perspective On Accounting; European Accounting Review; European Journal Of Humanity And Social Science; International Business & Economics Research Journal; International Journal of Economy, Management And Social Science; Journal For Business Economics And Management; Journal of Accounting And Public Policy; Management Accounting Research; Procedia Economics And Finance; Research Journal of Finance And Accounting. While the other references other than journals are: EIASM workshop, IE working paper and Research Gate.
Within these websites the key words most used to find out the more appropriate articles have been management control, management accounting, historical accounting, control projects, accounting in projects, management accounting system, control system, cost accounting.
The research has gone in depth until the 4000 BC, because before that period there is lack in primary resources, which made a potential study impossible.
After a preliminary investigation aimed to extrapolate a first sample of papers, the analysis continued digging the paper reference.
Once the database was complete enough in each historical period – Ancient, Middle Ages, Pre Modern, Modern – a meticulous examination of the social-economic context together with the related management practice have been underpinned, in order to acquire a deep understanding of the why and how those choices have been taken.

3.3 Paper Classification

In Table 1 is presented the database containing all the thirty-eight articles investigated to perform the research. The table is structured to display at first sight the period investigated, and the country took into analysis, comprehensive of the authors and source. As a matter of fact, the main columns are:

- Source
- Title
- Author
- Historical period
- Historical setting

Table 1, Paper Selection, Source: Personal Elaboration

Critical perspective on Accounting	Double-Entry bookkeeping and the birth of capitalism: accounting for the commercial revolution in medieval northern italy	R.A. Bayer	1300-1500	Italy
JSTOR	New perspective on the evolution of double entry bookkeeping	John L. Williams	1200-1500	Italy
Critical perspective on Accounting	Accounting, control and accountability: preliminary evidence from ancient egypt	Mahmoud Ezzamel	Ancient	Egypt
JSTOR	Commercial record keeping in Ancient Mesopotamia	Orville R. Keister	Ancient	Mesopotamia
JSTOR	Some glosses on Greek and Roman Accounting	Richard H. Macve	Ancient	Greek and Roman
EIASM	Retheorizing Accounting, Writing And Money With Evidence From Mesoporamia And Ancient Egypt	Mahmoud Ezzamel and Keith Hoskin	Ancient	Egypt
Management Accounting Research	The emergence of the “accountant” in the institution of Ancient Egypt.	Ezzamel, M.	Ancient	Egypt
International Business & Economics Research Journal	A Modern Look at the Banco De Medici	Marco Fazzini, Luigi Fici, Alessandro Montrone, Simone Terzani	1300-1400	Italy

International Journal of Economy, Management and Social Science	Management control system: an historical perspective	J. Carenys	None	None
Accounting History	The perseverance of Pacioli's goods inventory accounting system	Greg Stoner	1400	Italy
The Routledge companion of accounting history	Structures, territories and tribes	Stephen P. Walker		
Accounting Business and Financial History	Organizational change and accounting: the gunpowder monopoly in the New Spain, 1757-87	Miriam Nunez	1757-87	Spain
Research journal of finance and accounting	Luca Pacioli double entry system of accounting: a critique	Adum Smith Ovunda	1500	Italy
Journal of Accounting and Public Policy	Cost accounting in early regulated markets: the case of the Royal Soap Factory of Seville (1525-1692)	S. Carmona R. Donoso	1525-1692	Spain
Accounting Business and Financial History	Controlling expenditure, or the Slow emergence of costing at the Venice Arsenal (1586-1633)	Stefano Zambon, Luca Zan	1586-1633	Italy
JSTOR	Early cost accounting for internal management control: Lyman Mills in the 1850's	H. Thomas Johnson	1850's	UK
JSTOR	Accounting for rationality: double-entry bookkeeping and the rhetoric of Economic rationality	Bruce G. Carruthers and Wendy Nelson Espeland	Middle Age - 1900's	Italy and UK
Accounting and Business Research	Accounting and management discourse in proto-industrial setting: The Venice Arsenal in the turn of the 16th century	Luca Zan	1500-1600	Italy
JSTOR	The Evolution of Management Accounting	Robert S.Lakan	1850-1915	UK and US

JSTOR	Influence of Nineteenth and Early Twentieth Century Railroad Accounting on the Development of Modern Accounting Theory	Boockholdt, J.L.	1800-1900	US
Management Accounting Research	Industrial organization and accounting innovation: charcoal ironmaking in England 1690-1783	John Richard Edwards	1690-1783	UK
JSTOR	Financial reporting and stewardship accounting in sixteenth-century Spain	Patti A. Mills	1500's	Spain
JSTOR	Probative capacity of accountants in early-modern Spain	Patti A. Mills	1500's	Spain
Business History	The development of industrial cost and management accounting before 1850: a survey of the evidence	Edwards, J.R. and Newell, E.	<1850	UK
The Routledge Companion of Accounting History	Historiography	Christopher J.Napier	None	None
The Routledge Companion of Accounting History	Ancient Accounting	Salvador Carmona and Mahmoud Ezzamel	None	None
The Routledge Companion of Accounting History	Bookkeeping	Alisdair Dobie and David Oldroyd	None	None
JSTOR	Capitalism and industrial development: some lessons from Britain's experience	Kaldor N.	1800's	UK
Il contributo delle discipline economiche e aziendali delle dinamiche storico-evolutive di Ca' Foscari	Fondamenti di programmazione e controllo negli insegnamenti della scuola cafoscarina	Mio C., Fasan M., Luisiani M.	1850-1950	Italy and UK
Prentice Hall	Management control system: performance measurement, evaluation, incentives	Kenneth A.M., Wim A. Van der Stede	None	None

Enterprise and Secular Change	Medieval and Modern Commercial Enterprise	Sombart, Werner	Mediaval and Modern	UK
Krieger Pub Co	A History of Accounting Thought	Chatfield A.	None	None
Taylor and Francis	Accounting Evolution to 1900	Littleton A.C.	Till 1900	UK
Accountig Review	Illustrations of the Early Treatment of Depreciation	Mason P	1900	UK
Studies in the History of Accounting	Aspects of railway accounting before 1868	Pollins H	1868	UK
Gale, Making of Modern Law	The Interstate Commerce Commission: its history, activities and organization	Bernhardt J	1800-1900	UK
Business History Review	Management Accounting in Early Integrated Industrial: E.I. duPont de Nemours Powder Company	Johnson H. T.	1903-1913	None
Business History Review	Management Accounting in an Early Multidivisional Organization: General Motors in the 1920s	Johnson H. T.	1920	UK

4. Findings: Historical Reconstruction

The sample table presented in the previous chapter provided a first insight on the length and deepness of the research. It covers a timespan of five thousand years, from 3500 BC, with the ancient civilization of Egypt and Mesopotamia, to 1900 AC, with the advent of the Second Industrial Revolution and the borne of management accounting and control literature.

The articles in the database mainly focus on three perspectives: case practice of management control, as the use of accounting instrument; the literature of management control; the social-economic framework according to the period investigated.

The most in-depth aspect in the database is the case practice. However, the secondary resources available for both the historical interval and location are very different.

When discussing the ancient civilization, due to the lack of surviving evidence, it is difficult to gather information and provided a complete analysis based on various case practices and different viewpoints by authors.

Instead, when the research has approached the end of Middle Ages, with the beginning of the Renaissance, the amount of publication has greatly increase, especially in the Italian context. As a matter of fact, in those years the Italian framework has been largely studied by authors thanks to both important figure, such as Luca Pacioli, and organizations, as De Medici Family or the Venice Arsenal. In this case, unlike the previous situation, there are plenty positions and debating on both the practices employed and social framework, motivated with smaller and bigger case study.

During the Pre-Modern and Modern Period, the amount of publication is even larger, focused mainly on the Anglo-Saxon social-economic context.

In fact, the technological development has increased the production techniques making possible the Industrial Revolution. Jointly, the management control and accounting practices have advanced in order to handle this amount of capital and information; and this is especially true for the two countries which foremost have been impacted by this situation: England and United States.

After this brief review of the sample and its main temporal and geographical phases, in the following chapters is provided a detailed historical reconstruction for each timespan and geographical region considered.

In particular, the elaborate begin chronologically with two important civilizations of that period: Babylonians and Ancient Egyptians. They were the first societies known to use tokens in order to record their transaction and control their production process, posing the basis for the employment of writing in the development of accounting.

Then, it is analysed the Greek and Roman society, which was based mainly on the agricultural activity, with the use of control systems to monitor both the production and behavior of workers. Nevertheless, there is no sign of employment of control systems aimed at verifying the economic results of this business.

At the end of the Middle Ages, the fall of the Roman Empire left as legacy the perfect condition to the development of mercantile activities in the Northern Italy. This condition made it possible the invention of the double entry bookkeeping, which is the method employ until the current days. This method goes throughout the centuries spreading all over the Europe, as testify by the Venice Arsenal in the sixteenth century or the Royal Factories in Spain during the seventeenth century. With the advent of the Industrial Revolution double entry system assume modern features due to the change in the organizations activities, which made mandatory the monitor of manufacturing process and the consequent economic results.

4.1 Ancient Civilization

Since the view of accounting adopted is that of an assemblage of socially and historically embedded technologies of calculation, and reporting demands an appreciation of ancient socio-political and economic contexts, the study of ancient accounting is highly challenging. As a matter of fact, there are considerable gaps in the ancient material that has survived, creating a problem of discontinuity that bedevils any attempt to forge an account of ancient history.

A significant number of the texts containing accounting entries from Mesopotamia and Ancient Egypt have been transliterated and then translated into modern European languages. This entails the daunting problem of translating a text from the remote past into the present, finding suitable equivalent contemporary terms to those the ancients have used. To what extent, for example, can be described 'exchange of goods for a price' as equivalent to 'market exchange'; or representing the ancient economy as a means of describing the creation, accumulation and distribution of wealth; or legitimately speak of government in the ancient era.

On the concept of economy, the distance between Ancient Egyptian and modern European economics is so wide that it is useful to stress and perhaps even overstress it in order to avoid a too modern conception of economic life in Ancient Egypt.

Similarly, Finley argues at some length that the ancients did not have a concept similar to the notion of what we now understand as 'the economy':

The ancients in fact lacked the concept of an 'economy', they lacked the conceptual elements which together constitute what we call 'the economy'. Of course, they farmed, traded, manufactured, mined, taxed, coined, deposited and loaned money, made profits or failed in their enterprises. And they discussed these activities in their talk and their writing. What they did not do, however, was to combine these particular activities conceptually into a unit, in parsonian terms into 'a differentiated sub-system'. [11]

Reasonable apprehension, however, should not hamper efforts to study ancient economic and social practices, even though they may not correspond to conceptual categories that are currently employ.

[11] Carmona S., Ezzamel M., Ancient Accounting, in Edwards J.R., Walker S. P., The Routledge Companion of Accounting History, Routledge, London, 2020, p. 82

4.1.1 Ancient Mesopotamia

In the Mesopotamian Valley, between the Tigris and the Euphrates Rivers, the Assyrian, Chaldaean-Babylonian, and Sumerian civilizations flourished from at least as far back as 4500 B.C. to approximately 500 B.C.
The Tigris-Euphrates River Valley was extremely fertile area due to periodic floodings, and the farmers had bountiful harvest every year.
The products of both the farms and the businesses were traded back and forth within the empires, and much was traded with civilizations quite some distance away. The language used by the Babylonians became the language of the immediate commercial and political world and the religious temples owned and accounted for land, buildings, and herds.
It would be preposterous to suppose that this extensive scale of trading operations and temple activities could have been carried on without a rather elaborate accompanying record-keeping system.
The ancient Mesopotamian record-keeping system was a very simple system based mostly upon receipts, expenditures, listings, and contracts. Receipts tablets had to be prepared whenever any money or goods were received in the temple, in the place, or in private businesses, even if it meant going to the expense of calling in a public scribe to record a single, small transaction.
The most numerous types of commercial record prepared by the Mesopotamians was the tokens (Figure 1). Thousands of clay tablets have been found on Babylonian land. The library of the temple of Bel, discovered in 1900, alone contained 23,000 tablets from the twenty-third century B.C. A record of this nature was prepared upon the receipt of practically anything – from a barge full of grain to a dead fowl. The latter item is not an exaggeration, as several tablets have been found recording the receipt of dead animals, and these tablets are one of the best indications available of the completeness and the meticulosity with which the record-keeping function was performed.

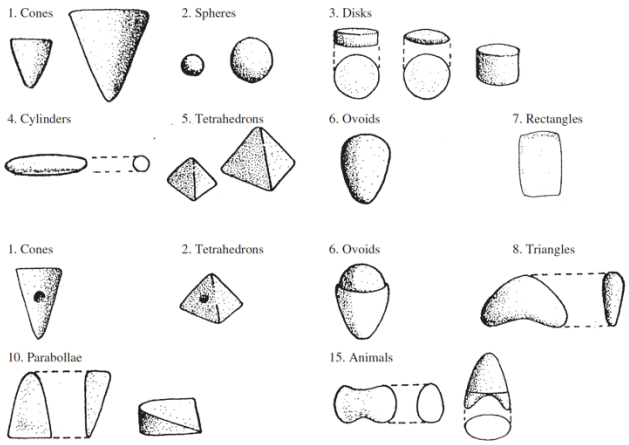

Figure 1. Tokens, Source: Retheorizing Accounting, Writing and Money with Evidence from Mesopotamia and Ancient Egypt – EIASM, p.33

Linguistically they stabilized separate visible designations for object sets, i.e., cones, spheres and ovoids, which could be circulated and identified across a group who shared the code. Numerically they embodied a principle of cardinality, i.e., "the final word of the series represented the number of the set".
For example, seven incised ovoids stood for seven jars of oil. This visible sign system was neither purely linguistic, writing, nor purely numerical, abstract counting, even though it was a system from which sign systems incorporating separate linguistic and numerical signs could be derived.

These sealed clays envelop ensured the recipient that their contents arrived as dispatched. This allowed forms of exchange and ownership to develop that were not contingent upon face-to-face contact between the parties involved.
Then, impressed and incised representations came to stand as signs in their own right, at which point the clay envelopes became clay tablets. However, from around 3300 BC, the impressed signs in some tablets began to function as purely numerical (abstract) signs; so, "while retaining their primary meaning, for example as grain or land measures and as animal count, they acquired a secondary meaning as numerals. By 3100 BC, incised signs were functioning as purely linguistic signs hence suggesting that writing developed as the result of abstract counting. It was this system which finally gave way to counting with a double shift; first in format, with the development of the clay tablets as an alternative to envelopes; and secondly in content, as the markings on the tablets "became a system of their own", adding to the earlier impressed markings a new set of incised ones with the impressed ones taking on the pure numerical role as a sign system deploying pictographs.[12]
The token system constitutes the earliest system of signs used for transmitting information. Hence, this accounting system was a symbolic sign system: each particular token-sign was differentiated in shape.
As linguistic-numerical signs, tokens promoted a new relation between knowledge and power. In a given context, tokens impose a new kind of stable value on objects, by apparently representing to those familiar with the code, a linguistic-numerical equivalence between signs and objects. Thus, even before writing, the token system constructed and imposed value upon a given number of objects. Moreover, accounting supplemented this simple valuing. On the one hand, it maintained a visible record of past transactions completed, and so conserved value from the past; on the other it offered a visible sign of the level of future obligations to be met, thus projecting value into the future.
In such ways it constructed a new organization of:

- time, in terms of continuing stewardship for obligations past, and future planning to meet obligations yet to come;
- space as delineated, since it required a secure and segregated storage-space for obligations rendered and some designation of the space from which each subject should produce the value demanded.

There is less of a standard schema evident in these Mesopotamian records, a number of different particulars in somewhat the same order are usually found in most of the tokens, except the very simplest. These information items are:

1. the amount and the nature of the commodity or the money loaned
2. the rate of interest
3. the name of the debtor
4. the name of the creditor
5. the time of repayment
6. specification regarding the method or return
7. witnesses
8. the date

One of the most interesting features of these tablet records is that sometimes they were negotiable, which is contrary to the popular theory that the concept of negotiability was introduced to commerce sometime after 1100 A.D.
Furthermore, no purchases were accomplished in Mesopotamia without the preparation of a purchase tablet. Most of these records contain the following information:

[12] Ezzamel M., Hoskin K., Retheorizing accounting, writing and money with evidence from Mesopotamian and ancient Egypt, Critical Perspective on Accounting (2002) 13, p.10

1. the description of the nature and the location of what was purchased
2. the purchaser
3. the seller
4. that which was given the payment
5. an agreement regarding the future claims concerning the purchased object
6. the witnesses
7. the date

Most of these tablets were rather detailed and lengthy as the rental records which appears to have included:

1. a rather complete description of what was being rented
2. the lessor and the lessee
3. the payment
4. other provisions, such as time limits, special payment methods, etc.
5. the witnesses
6. the date

It is worth to cite the expenditure tablets because most of them are simple listings of money or goods released from one's control for one reason or another. The terms "expenditure", in this case, does not carry with modern connotations of the word and it does not suggest that the Mesopotamians had an entirely crystallized concept of revenue, expense, and net income. Expenditure tablets were prepared often to summarize reductions in money, goods, or animals resulting from purchases, sacrifices, internal usage, loss, etc.

For example:

5 shekels of silver of the silver of the income for the wood of the house of Rab-bani;
2 ½ shekels for the doors of the weavers' house; Total, 7 ½ shekels of silver to Nabu-shum-lishir, the son of Nabu-makin-zer, and Gimilly, the son of Ardia is given.
1 ½ shekels, his good of the month Marchesvan, Zeria, the son of Ahe-sa,
½ shekel for 5/6 mina of lead to Liblut, the blacksmith, is given.
1 shekel to Balatsu, the son of Ardi-Nabu, and the soldiers, who with him to the presence of the administrator went, is given.
The 25th day of Marchesvan of Necuchadrezzar, king of Babylon.

Accurate records were also kept of incomes and of what was produced. The income tablets usually included the following information:

1. what was received as income
2. from whom it was received
3. the reason for its receipt
4. the date

Some of the most interesting records kept by the Mesopotamians are the account tablets – records reporting a beginning balance, additions to or subtractions from this balance, and the ending balance. [13]

Royal inspection:
2997 kor 3 Pi 5 seah and 7 qa of sesame were the initial amount.
1461 kor 3 Pi 3 seah and 9 qa of sesame were the transfer to the grain magazine.
The surplus balance is 1536 jor 1 sut and 8 qa of sesame.
Complete account for one year, (namely) the year Sin-iddinam king.

Token accounting enacted a first form of accountability from those whom it touched: not a detailed modern accountability for every aspect of human performance, but an accountability form subjects for the value to be delivered or conserved, which would be appraised in due season. The results of this valuing are manifest in the surviving artworks of the early Uruk kingdom, which depict time and again, lines of worshippers bringing to

[13] Keister O. R., Commercial Record-keeping in Ancient Mesopotamia, American Accounting Association

the temple the products of their fields and orchards; and which alternatively signal in the depiction of floggings of citizens "the administering of sanctions to Mesopotamian delinquents". [14]

It is important to stress the dual significance of these tokens, being both a set of individual assets in their detail and a representation of equity in their loyalty. This early accounting was capable of monitoring obligations and levies from stewards and taxpayers and recording actual payments in kind by debtors. Not only does every piece of commercial reality, such as a jar of oil, correspond to a specific token but also the relations, as the property rights, had proper correspondence through the location of certain tokens in a particular aggregate. Hence, an input-output relations were exhibited both in the actual transfer of commodities and also in their representations.

Mattessich applies this understanding to the Mesopotamian accounting evidence, arguing that 'since the ancient people of the Middle East exploited the transfer of clay tokens form one location to another to represent various economic transaction, there can be little doubt that an input-output structure dominated those early accounting system'.[15]

The historical material examined provides the possibility for assessing the management techniques adopted by the Babylonians. Their record keeping systems was simple, based mainly on receipts, expenditures, listing and contracts where the tokens was the tool in charge of transmit accounting information. Through this system, Mesopotamian were able to measure two management control features: space and time.

Time, in terms of continuing stewardship for obligations past, and future planning to meet obligations yet to come; space as delineated, since it required a secure and segregated storage-space for obligations rendered.

The management control literature, as conceptually described in the previous chapter, has among its main features the behavior consistency and an efficient information flows.

Babylonians thanks to the employment of the tokens practice enacted a management control method able to both maintain behavior consistent, through the stewardship function, and transmitting economic information, with the negotiability of clay tokens.

In conclusion, despite the technological backwardness of the Ancient Civilization it is possible through the examination of the practice to establish methods similar to the ones adopted by the current literature.

[14] Ezzamel M., Hoskin K., Retheorizing accounting, writing and money with evidence from Mesopotamian and ancient Egypt, Critical Perspective on Accounting (2002) 13, p.14

[15] Carmona S., Ezzamel M., Ancient Accounting, in Edwards J.R., Walker S. P., The Routledge Companion of Accounting History, Routledge, London, 2020, p.85

4.1.2 Ancient Egypt

The most detailed evidence available from ancient Egypt comes from the New Kingdom (1552-1069). This era witnessed a major expansion in administrative titles and practices, and also crucially in recordkeeping. Detailed daily attendance lists were kept for royal projects, including names, titles, days spent by each workman on project work, days of absence, days in transit, provision for allocations per day, tasks allocated to workmen converted into equivalent man-days, work completed and work remaining.
This evidence reveals a full system of ancient human accountability at work based on division of labour, allocation of predetermined work targets, and regular reporting on actual and completed work. In this emphasis, concern was focused upon ensuring that a particular task was completed, rather than being obsessed with meeting time targets.
In the following analysis there is no insistence on monetarization, commerce and profit making, or double entry. The emphasis, rather, is on the ability of accounting practices to quantify and value human activities, and in so doing to establish modes of reciprocity and to be available as a tool for adjudicating economic and social claims.
Accounting was called upon to facilitate the quantification, documentation and reporting of the performance of subordinates and to mediate semi-barter transactions. The preliminary analysis attempted indicates that accounting:

- had the ability to attend to these critical roles through the invention of a metric, and the development of a "money of account";
- facilitated the mediation of transactions by rendering exchange reciprocity calculable and hence visible;
- evolved a system of accountability that made the monitoring of performance possible;
- was capable, through its calculative practices, of conveying the appearance of conformity to established expectations.[16]

The material on which ancient Egyptian wrote their texts divided mainly into three types: the walls of the burial chambers and the monuments erected for ceremonial purposes and for the dead, papyrus and ostraca.
The scribe had at his disposal a wide array of terminology that was employed in a variety of accounts. For example, terms such as revenue, expenditure, interest, price and cost were used in abundance. Similarly, there was much of what might be termed account-related terminology such as sub-total, total, grand-total, balance due.
In recording private economic transactions, the scribes distinguished between three broad categories:

1. Category refers to transactions involving the exchange of goods in the marketplace once they have been value, using a money of account.
2. Transactions which involve paying craftsmen for specific objects, such as a bed or a coffin, they were commissioned to make.
3. Inventory lists detailing personal wealth of individuals. These tended to take the form of a straight list of various items typically in terms of quantity but at times also reflected in terms of value via a money of account.

Whether kept for private or state purposes, these accounting documents exhibited a remarkably high level of development in the technical sense. The accounting documents used covered a wide range of forms, including journals, ledgers, lists and tables with multiple columns. Dates of transactions or entries were very clearly stated including the day, month, season and year. Accounts were closed at the end of each period and balances were carried forward.

[16] Ezzamel M., Accounting, control and accountability: preliminary evidence from Ancient Egypt, Critical Perspective on Accounting (1997)

Drawing on a complete translation of original records dating back to the New Kingdom are provided some preliminary findings relating to the functioning of accounting as a means of monitoring the flow of inputs and outputs in a bakery which belonged to the Palace of Seti I (1303-1290 BC).
The accounting metric used in monitoring the conversion of inputs into outputs consisted of two parts, one dealing with counting and the other reflecting an adjustment for quality. The counting measure not only took account of matching the quantities of input with output, but also allowed for unavoidable loss and wastage arising from the technology of conversion. The unit of measurement reflecting lack of quality, used also interchangeably as cooking ratio, baking number, and baking value, was the psw (pesew), and its use applied only to grain. This measure indicated the number of loaves of bread or jugs of beer (brewed from grain) which were produced from one hekat (a capacity measure) of flour or grain.

$$psw = \frac{number\ of\ loaves\ or\ jugs}{number\ of\ hekats\ of\ grain}$$

Hence, the higher the psw the lower the quality of bread and the more diluted the beer.
A careful examination of these accounts shows that allowances were made for the natural loss of weight during baking. A rate of natural loss was determined which, in general, was of the order of 1/8 of the grain input, but the accounts examined here show some variations, within a narrow range, around this figure. It seems that the allowance of 1/8 for natural loss was therefore a guideline which permitted the derivation of more specific allowances for each day in the bakery, thereby making allowances more responsive to the everyday operating requirements. Once determined, these allowances were translated into a weight conversion rate which was used to convert the number of loaves of bread of a particular size into the equivalent weight in deben (approximately 91 grammes). In this way, the input and output of grain were brought into direct comparison. [17]
Subsequent accounts demonstrate that such an accounting practice, i.e., using a combination of weight measures and counting, was followed fairly consistently in order to match the input and output sides of the baking process.
In Figure 2 the account shows two types of non-permitted loss; one caused by the failure of the bakery to convert the emmer input into the correct number of loaves, the other by producing loaves of lighter weight than expected. In this account, the unit of finished output expected is a loaf of kyllestis bread weighing 3½ deben for every input of 4 deben of emmer, thereby giving a permitted wastage in baking of ½ a deben. The expected output and allowances for baking loss are made very clear to the baker right from the start.

1 ht day 5
Account of commands to the bakers with flour in order to make kyllestis bread Each one 4 deben
Finished $3\frac{1}{2}$ deben

This day
The baker D d Flour $3\frac{1}{2}$ (sacks)
Come kyllestis bread 602 *Remainder* 28
Remainder lost for cooking $78\frac{3}{4}$

Figure 2. Baking accounts during the reign of Seti I, Accounting, control and accountability: preliminary evidence from Ancient Egypt - Critical perspective on accounting. P. 17

[17] Ezzamel M. (1994), The emergence of the "accountant" in the institutions of Ancient Egypt, Management Accounting Research, p.15

This implies that after baking the scribe performed two functions:

- counting the number of loaves delivered and, after contrasting that against the number expected, entering the numbers of both actual delivery and missing loaves;
- weighing the actual loaves delivered and, after contrasting that with the expected weight, recording the loss in weight translated into an equivalent number of loaves.

Thus, through a combination of counting and weighing the bread baking process could be closely monitored.

Therefore, accounting was directly implicated in the organization and functioning of the redistributive system in ancient Egypt. The scribes accounted for both the inflow and outflow of commodities.

In accounting for the inflow of commodities, the scribes measured and recorded the crops at source and estimated the harvest tax. They then monitored transportation of the crops and their delivery to the state stores by checking and reporting the actual quantities/amounts available against those expected. In accounting for the outflow of commodities, a number of accounting-based documents were generated including orders for provisions, expenditure of valuable commodities, official reports and documents specifying amounts of goods received in the presence of witnesses and statements of account showing regular provisions, special deliveries, remainder, balance and surplus. Daily summary accounts were kept in tabular format and were divided into two parts, one for revenues and the other for disbursements. The tabular format of the account contained various columns, each earmarked for the entries of a specific commodity.[18]

The accounting practice was such that each delivery, or number of related deliveries, had an account which consisted of two parts:

- the first part indicated the types, numbers and weights of the produce (e.g., loaves) that were expected to be delivered;
- the second part detailed what was actually delivered.

The account in Figure 3 reflects two different ways of accounting for the same thing. The first part of the account details the number of sacks of emmer wheat (presumably sent from the granary to the bakery) and the expected output, both in terms of numbers of loaves and weights in deben. In contrast, the second part records the arrival of baked bread to the storehouse (presumably from the bakery), in terms of number of sacks of emmer wheat, and numbers and weights of loaves. Hence, in the two parts of the account there is a statement of output expected (first part) and actual output delivered (second part), given a particular amount of input.

$1601\frac{1}{4}$ 392325
Total Small breads 107893 Making 364371 deben
Small breads 6171 Large breads 1800 Making 21600 deben
Total 385971
Remainder 6354 deben

Total Emmer wheat $1601\frac{1}{4}$ sacks (A)* Making small bread 112090
Coming to the storehouse Small bread 114000+x (=114265) Making 385971 deben
Remainder Small bread 6335 deben Making small bread 1825.

---

*(A) signifies sacks, which for some reason is missing from the first line in the top part of the account.

Figure 3. Store accounts from the reign of Seti I. Accounting, control and accountability: preliminary evidence from Ancient Egypt - Critical perspective on accounting. P. 19

[18] Ivi, p. 17

In terms of accountability therefore it is important to differentiate clearly between the two parts of the account. The first part is purely concerned with output targets given a certain amount of input. Various equivalences between different types of output (two types of small loaf and one of large) were established, presumably to cater for possible changes in output mix depending on the needs and circumstances relating to a particular manufacturing run.
It is with the second part of the account, however, that statements about performance and accountability can be made. Here, the scribe is able to contrast and compare actual output, either in number of loaves or, more appropriately, in deben, against target (which is partly repeated in the first line). We are now able to establish that the amount of bread delivered to the storehouse (385,971 deben) was equivalent to the target stated in the first part of the account (385,971 deben, line 4, Figure 3), and also that actual remainder was almost identical to the target remainder in deben.
In summary, the monitoring of the baking process, Figure 4, involved the following steps:

- Deliveries of grain from the granaries to the bakery were reconciled with deliveries of bread from the bakery to the storehouse by matching numbers of loaves expected (using appropriate conversion ratios) against those delivered and corroborating this by reference to the total weight of bread in deben.
- Each part of the account was reckoned in terms of both input of emmer and equivalent output of bread (small and/or large loaves) thereby rendering input visible in terms of output equivalence
- Minor differences in the accounts were tolerated.

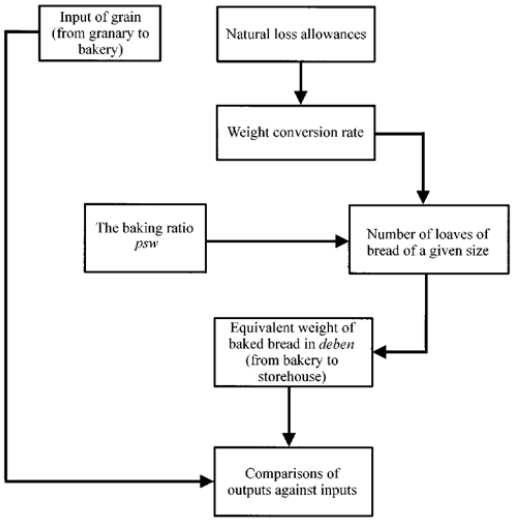

Figure 4. The control system in the bakery, Accounting, control and accountability: preliminary evidence from Ancient Egypt - Critical perspective on accounting. P.21

Hence, through the invention and systematic application of specific accounting practices the ancient Egyptian scribes were able to render the technology of the production process into a visible quantification that provided the potential for the careful monitoring of the activities of subordinates. The accounting techniques used included weighing, pure counting, a system of quantity equivalences, a quality adjustment, and permitted loss in production.
What is clear from examining the accounts of the bakery is that, technically, the accounting system developed at that time was capable of informing regular performance reporting and monitoring.
These accounting techniques, however, focused upon measures of physical quantities as distinct from measures expressed in terms of money. It is plausible to suggest that among the main reasons underlying the use of these quantity-based measures was the desire to monitor production activities and to minimize fraud; hence, despite the absence of direct money focus, quantity measures have at least indirect costing implications.

Clearly, the introduction of a "money of account" creates more scope for the use of accounting in recording and monitoring a wide range of transactions. However, what is of immediate concern here is to reflect on the possible reasons which may have given rise to such a detailed monitoring system in the bakery.

The need for such detailed accounting practices may have been particularly enhanced by two factors. First, the Reign of Seti I was characterized by a continuation of the use of severe sanctions in dealing with abuses, which were originally introduced by Horemheb four decades earlier. Both Pharaohs were concerned to re-establish the power of the Crown and to restore social order as a way of dealing with the conflicts in and weakening of Egypt's social structure that followed the Amarna revolution.

Although referred to frequently as the Abydos Foundation, the "bye-laws" contained in the decree were "operational far beyond the environs of Abydos" as they were in reality aimed at curbing corruption in the whole of Egypt. These punishments were more severe compared to those of the Old Kingdom, where similar offences typically resulted in the removal of the offender from office and the confiscation of his property.

Second, the desire to re-affirm central control, to minimize corruption and to restore social order promoted the invoking of supernatural powers in the decree when administrative controls were perceived to be ineffective.

Only the gods were deemed to have knowledge of, and hence able to punish, those citizens who would have known of an abuse without reporting it.

Given such strong emphasis on minimizing corruption and enhancing centralised control, it is hardly surprising that accounting practices, such as those used in the bakery, were aimed at uncovering and reporting abuse of resources. Indeed, it is plausible to suggest that the need to re-establish order, improve the efficiency of the administration, and secure regular supplies for the army in its extensive campaigns during the reign of Seti I provided the opportunity for elaborate systems of accountability to be used in state organisations. However, one of the missing links that remains unresolved is the extent to which accounting systems were used to monitor unintended, but avoidable, waste in terms of performance, and intended abuse as fraud.

The influence of the scribes, however, was not only restricted to the high esteem in which they were held socially, but also, and to a great extent, it extended to their virtual monopoly of both writing and the knowledge of accounting technology. For the accounting numbers that these scribes generated and inscribed had the potential to: render the technical attributes of production activities calculable and visible; and, as a consequence, make it possible for those individuals operating in such organisations to be held accountable for their actions.

By presenting itself as a system of calculation, accounting provided a basis for the seemingly unambiguous quantification of subordinates' contributions and inducements, thereby facilitating the adjudication of claims of performance against targets.

Further, the rules and procedures deployed by the bureaucracy were imbued with accounting calculation; in the case of the bakery the balancing of given quantities of inputs and outputs through the use of predetermined standards reflects expected numbers, weights, baking ratio, and normal loss. Again, a seemingly unambiguous exercise by the bureaucracy vested in legitimate authority was made possible, for through accounting knowledge superiors could:

- normalize practices which were deemed important to the bureaucracy and the state;
- differentiate the performance of individual subordinates, for example each individual baker, supervisor, and even the mayor;
- punish those individuals whose performance fell short of expectations.

In this context accounting can be seen to have legitimated the status and power of state officials.

The social and economic contexts of ancient Egypt reveal an extremely powerful bureaucracy at work, with the Pharaoh at its apex and an army of administrators and accountants, measuring, recording, and monitoring activities in considerable detail. Accounting developed a simple, yet extremely powerful, metric that made calculable and visible the activities of those individuals who inhabited state organisations. Focusing for illustrative purposes upon the accounts of a bakery, it is evident that accounting systems made it possible for the stewards to meticulously manage their subordinates through the judicious use of a combination of physical measures of quantity and quality. Targets of performance were established reflecting:

- loss permitted in the baking process
- the baking ratio (psw).[19]

In the management control framework, ancient Egyptians developed sophisticated techniques for the era. Thanks to the scribe, which were trained to accomplish the specific task of learn the linguistic sign, the Egyptians elaborate systems of monitoring and reporting activities to keep track of their available resources, as in the case of the Bakery in the Reign of Seti I. As a consequence of this advancement, it was possible for them to create indexes of quality to enrich their report, as the pesew, and subsequently to fill accounts for the expenditure and revenue generate from those products.

Even if they lack a modern concept of economy, since there was not an official currency, they still come up with rough notion of expenditure, income, interest, revenue and cost.

Furthermore, there was even the control exercised by Pharaoh: he establishes through "norms" apposite rewards/punishment system and appoint person with the task of, or control personally, the reporting and monitoring results of the activities.

In summary, during this time span of the ancient Egypt, there was an accurate control system enacted by the policy makers, similar in many aspects to the modern ones describe the current literature.

[19] Ezzamel M., The emergence of the "accountant" in the institutions of Ancient Egypt, Management Accounting Research (1994), p. 24

4.2 Greek and Romans

Greek and Roman civilization was at its height for several hundred years and embraced many different races and cultures; however, it has been observed remarkable consistency in bookkeeping practice over this period with little in the way of 'important general advances'. The most noteworthy technical advance of Greek and Roman bookkeeping compared to earlier civilizations, such as that of the Egyptians, lay in the adoption of coinage, which allowed the Greeks and Romans to employ a monetary unit of measurement. Typically, their books of account tracked receipts, payments, goods, debtors and creditors, even if, there was no distinction between capital, revenue, expenditure, and no evidence of double-entry.

The supposed lack of sophistication in Greek and Roman bookkeeping centres on the level of economic enterprise in society. Economic enterprise was allegedly impeded by the structure of society, in particular by the heavy reliance on slaves for economic activities allied to a reluctance to exploit fellow citizens.

Wealth was important in Graeco-Roman society because it reflected a citizen's status, but wealth was acquired first and foremost as a result of family and political connections, not through entrepreneurship. An example of this lack in entrepreneurial mindset is given by de Ste. Croix, who observed that it was hardly possible for a large Roman landowner who went in for different kinds of agricultural activity to establish which kinds yield the highest return, due to an inadequate accounting system which does not permit separate costing. The Roman agricultural writers never advice a potentially farm buyer to examine the vendor's accounts making impossible estimate in advance, or even calculate, the improvements. Historians have followed this accounting evidence to emphasize the lack of 'economic rationality' in farm investment and as an important factor in explaining the lack of technical progress in Roman farming.[20]

However, if the primitive nature of bookkeeping reflected the limited opportunities and choices that were generally available in antiquity, the work of Rathbone on the Appianus estate in Roman Egypt in the third century AD, reveals an interlocking and centrally controlled system of accounting over dispersed range of activities to encompass cost control and performance measurement.

Control of costs was identified as a key concern for estate owners: it included comparing the 'results attained' to the 'program of work' which the master 'had laid out' for the overseer on his last visit. Thus, the accounts were not solely a check on the overseer's honesty; estate accounts also served to hold the stewards accountable for production.

Other than in the private sector, bookkeeping was also deployed in the administration of the Roman Empire. Much public finance was conducted at a distance because of the dispersed locations of the provinces, and local officials were obliged to keep records of tax revenues and expenditures. This was a requirement of law and a necessary precaution against charges of corruption. Furthermore, tax assessments too required systematic information gathering procedures; provincial censuses of land, property and population formed the basis of direct taxation levies throughout the Roman Empire. Records were also kept to control payments to the troops and to monitor the flows of bullion and obsolete coin into the Roman Treasury.

The four hundred years following the collapse of Roman authority in the West in the fifth century are commonly referred as the "Dark Ages" because of the lack of surviving documentary evidence, including accounts. However, the lack of documentary evidence does not mean that records never existed and one of the most important documents to survive relates to bookkeeping practice. The *Capitulare de Villis* comprises a series of written instructions for the management of estates, inspired by the Frankish emperor

[20] Macve, R. H. (1985). Some glosses on 'Greek and Roman accounting'. History of political thought, 6(1/2), 233-264

Charlemagne towards the end of the eighth century. Essentially, two types of accounting can be distinguished:

- a charge and discharge account whereby the steward was held accountable for the difference between the income of his district and his payments in goods or money;
- a second one, which is evident in the requirement for the steward to submit an account of the estate's produce for the year. [21]

One approach in which knowledge about ancient accounting practice may be of significance to the ancient historian is illustrated by the following recent passage in which de Ste. Croix discusses the basis of ancient taxation:

A conclusive argument against any assessment in terms of money income is provided by the extremely primitive nature of ancient accounting, which was incapable of distinguishing properly between what is nowadays kept apart as 'capital' and 'income', let alone enabling a merchant or even a landowner to arrive at a concept of 'net profit', without which the taxation of money income is unthinkable. There seems to have been no really efficient method of accounting, by double or even single entry, before the thirteenth century.

The 'primitive' nature of ancient accounts refers both to their content and to their form. GRA demonstrated that the content of ancient accounts comprised 'receipts and payments'; and their form shows no evidence of 'double-entry' and scarcely any systematic interrelationship of accounts. While some tabulation and grouping of items often appear in summary accounts, many accounts are in the form of mere chronological narratives with receipts and payments intermingled.

Demonstrating that the Greeks and Romans did not develop bookkeeping illustrate the impossibility to exhibit a clear 'profit and loss account' and balance sheet'—the statements that purport to give the 'income' and the capital of a business.[22]

Another reason behind the lack of improvement in their accounting systems, other than an appropriate social-economic context, may rely on the absence of an opportune numeral system. The use of Roman numerals continued to impose the aid of the abacus, making summations laborious and hampering the development of double-entry systems.

By examining the seminal work Libber Abbaci written in 1202 from the merchant and mathematician Leonardo da Pisa, has been observed a clear encouragement towards the adoption of the Hindu-Arabic numerals for commercial accounting instead of the Roman figures. In fact, a revision of De Ste.Croix of this manuscript lead the author to state that:

Once figures began to be disposed in a single column, instead of being scattered all over the page and reduced to order only outside the account-book, on the abacus or in the mind, the advantages of having two clearly separated columns, simply to facilitate computation, would very quickly become apparent; and this would of itself result in the emergence of the bilateral form of account, with debits and credits visibly distinguished. The final step, the further advance to double entry, could then equally well be made by those (no doubt still the large majority) who continued to employ Roman numerals.[23]

Therefore, the combination of technical factor, as the adoption of an innovative numeral numbers, and a favorable social environment, which encourages new forms of business and partnership among merchants, have generated the possibilities to slowly adopt and invent a new bookkeeping system: the double entry.

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[21] Dobie A., Oldroyd D., *Bookkeeping,* in Edwards J.R., Walker S. P., *The Routledge Companion of Accounting History*, Routledge, London, 2020, p.110

[22] Macve, R. H. (1985). Some glosses on 'Greek and Roman accounting'. History of political thought, 6(1/2), 233-264

[23] Williams, John L., (1978) "New perspective on the evolution of double-entry bookkeeping," Accounting Historians Journal, Vol 5

As can be noted, the social structure of the Greek and Roman society hampered the development of bookkeeping practice despite the economic framework detains important elements such as the monetary systems, the abacus and a written language.
Their reliances on the slavery hampered an entrepreneurial mentality in the merchants' activities which has been reflected on a primitive bookkeeping system, based on narrative recording and accounts books disconnected.
The main focus of the accounting systems was the stewardship function, exercised both in the private and public framework. In the first case, for example, it was used in the agricultural context with the aim of production monitoring and performance measurement. It is important to underline that the control was not exercised for economic purposes, like profit calculation, but the main purpose was to monitor the behavior of workers and calculate the production.
In the second case, the State officials employ stewardship activity to avoid corruption, control payments to the troops and to monitor the flows of bullion and obsolete coin into the Roman Treasury.
In conclusion, despite the notions of expenditure and revenue were approximately the one's employed in the current literature, the absence of distinction between capital and income made it impossible the definition of profit and loss statement which is the results of a single or double entry system.

4.3 Middle Ages

Northern Italy inherited a unique legacy from the Roman Empire: great concentrations of landed wealth and precious metal, large cities, a well-educated military and administrative elite of lesser nobles, an international language, religion, outlook and connections, both East and West.

The collapse of the Western Empire in the fifth century was preceded and followed by falling productivity in agriculture, an unfavorable social context, and repeated pestilences from the second to the mid-sixth century. As the population declined, the trend towards larger, self-sufficient estates employing semi-independent serfs, instead of slaves, rapidly accelerates.

From the later eighth century the population of Europe begins to increase. Although still largely in the classical Roman tradition, the large estates of northern Italy employed methods well in advance of those elsewhere. As land which has lain fallow since the collapse of the Empire was brought into production, food surpluses increased, and the towns emerged from their long depression.

The Romans identifies "civilization" with cities, and during the Empire many of the rich owners of the large estates lived in them. After its collapse the landed rich left the cities for their great estates, but many of the lesser nobility, who often own land around the cities remains as urban as they had been since the first century AD when army officers, administrators, and the lesser landowners tended to make up the governing class in the cities of Italy outside Rome. These cities were, up to this point, smaller and poorer, but there survived a class of merchants and a population of craftsmen.

Uniquely, in Italy a tradition of urban life survived to provide a tenuous but unbroken thread connecting the ancient Italian city with the late medieval one. From the ninth century, however, their lesser nobility is absorbed with increasing rapidity into a new merchant class, the bourgeoisie.

In the later Empire merchants became virtually state employees, second-class citizens even though some became wealthy. To the extent that they accumulated wealth they invested it in land. With the collapse of the Empire many merchants, lesser nobles and administrators returned to their land.

However, the contacts that several northern cities maintained with the still-prosperous Eastern Empire, and the international links provided by the Catholic church and Jewish merchants, meant trade continued. Although the landed nobility still remains aloof, the status of merchants improves, their number grow, and their background merge into those of the lower nobility and administrative classes.

From the ninth century Venice leads the way, reaching in the eleventh century the controls in the upper Adriatic. From the middle of the eleventh century the magnates in many northern Italian cities combine with each other and with the population to claim independence from political control by the landed nobles, and other would-be feudal rulers.[24]

The social co-operation which this required is expressed in the representative merchant governments of the revolutionary communes, which naturally protected and promoted trade above all. The emergence of this co-operative attitude provided the basis for the formation of a solidly grouped merchant class, which is the basis for the social foundation of the "commercial revolution".[25]

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[24] Independence for the cities is finally secured in 1176 by the battle of Legano where a coalition of Lombard towns defeated Emperor Fredrick Barbarossa. In England, by contrast, "the plain fact is that lords were reluctant to let their towns go. Fully autonomous towns did not develop in England.

[25] Bayer R.A., Double-entry bookkeeping and the birth of capitalism: accounting for the commercial revolution in the medieval Northern Italy, Critical Perspective on Accounting (1993) 4, 113-140

Not only did the northern Italian cities throw off their feudal lords but, following the example of Venice, they financed, equipped and ventured in their own interests.
By the twelfth century usurious borrowing to finance expansion of trade is eclipsed by the socialization of capital expressed through novel formulas of partnership and other arrangements for the sharing of risks and profits.
However, from an outline of the history of the socialization of merchant capital emerged the need of the merchants of northern Italy to escape the clutches of usury. As a matter of fact, the credit associations set up in the twelfth and fourteenth centuries in Venice and Genoa arose from the need of the sea and wholesale trade to emancipate themselves from the rule of old-fashioned usury and from the monopolizing of money-dealing.
The idea of co-operatively pooling capital and risk-sharing was not invented in the late Middle Ages. Roman law recognized contracts between travelling merchants to share the risks and losses from jettisoning cargoes at sea; and Greco-Roman law recognized a partnership contracts called "societas" where partners pooled capital and sometimes labour and had unlimited liability. However, the small number of "socially obscure" upper-class Romans who used the societas only did so for investment in large, virtually riskless, building contracts.
Prior to the thirteenth century, partnership in the northern Italian cities were typically organized as patriarchal fraternal, a contract between brothers jointly to administer their inheritance invested in trade. To enlarge the capital employed, it became necessary to spread participation beyond familial networks, to create what came to be called the capital of the society.
Limited liability, however, had long been available for the very much riskier sea-trade. Greco-Roman law allowed "sea-loans" to carry interest so long as the loan and interest were waived in the case of total loss, in which case the lender's liability was limited to the initial loan. Initially, the Church accepted the total-loss waiver as justification for interest as an "insurance premium". However, when marine insurance became available in the mid-thirteenth century the Pope rule the interest usurious. To avoid ecclesiastical condemnation, the sea-loan was increasingly replaced by a contract named "commenda", whereby one partner provided the capital and" stayed at home" but bore all risks and took ¾ of the profit, and the "travelling" partner provided no capital, but took the remaining quarter of any profits.
It appears that in no other part of Europe did the mercantile class reach as great an economic and political power as in the Italian cities; and in no other place was there so large a segment of the population involved in commercial activities. An indication of the scale of capital amassed for trade in northern Italy is the fact that in the late thirteenth century the export trade of Genoa alone was worth four times as much as the whole of England's.
It is within this socio-economic framework that the accounting practice of recorded two times a transaction emerged, which has been slowly adopted and improved until the double-entry recording took place.
DEB emerged at the high point of the "commercial revolution" of 1250-1350 because capital was pooled for investment in commerce; it means that, instead of individual merchants or merchant families trading with their own capital, the capitals of many independent individuals become diversified across many independent enterprises, and individual capitals lost their identity.
Thus, with the socialization of capital, attention increasingly focused on "fairly" sharing collective risks and returns, and there would emerge a collective demand from capitalists for frequent calculations of the rate of return on capital.
Thus, DEB emerged as capital became socialized in response to a collective demand from investors for the frequent calculation of the rate of return on capital as the basis for sharing profits.

The double-entry techniques requires that for every "debit" there must be a "credit". Every transaction, or event, must be recorded twice so as to maintain the balance sheet equation assets-liabilities=equity and reveal its effect on equity: the change in net assets, profit or loss.
In other words, double-entry bookkeeping is a method of recording transactions so as to calculate automatically their effect on both opening and closing equity and profit or loss. The major alternative to double-entry is "single-entry" bookkeeping which records only the effect of each transaction on net assets and movements of capital. The difference between them is that whereas double entry automatically produces equity and profit as the direct result of the system of basic record-keeping, single-entry produces them by subsequently calculating and deducting closing from opening net assets and adjusting for capital transactions.
It is suggested that understanding the significance of this in social contexts in which the method emerged and spread may provide a key to understanding why it appeared where and when it did. [26]
As the commercial revolution gathered pace, with the emergence and rapid growth of large companies and the widespread use of the commenda form for large partnerships to create, in effect, "joint-stock companies", the focus of bookkeeping would become the calculation of profit and changes in equity, reflecting the demand for calculation of the rate of return on capital as the generally accepted basis for dividing profit. Assuming need comes before invention, the socialization hypothesis predicts that initially these calculations would be based on single-entry methods, and that double-entry would emerge through a gradual process of inventing and improving bookkeeping systems to more "perfectly" meet it. As de Roover surmises:
"By 1300 the times were ripe: the merchants were already using equity and expense accounting and very little was needed to perfect the system by making it the rule that there should never be a debit without a corresponding credit or vice versa. This result was most probably achieved gradually; double entry did not grow out of any pre-established theory but was developed step by step by a process of trial and error".[27]
From the late fourteenth century onwards, there are many examples of partnerships keeping their account books in double-entry, particularly those of the merchant bankers, for example those of the De Medici family.
The Medici family gradually expanded its banking activity internationally by establishing what nowadays would be defined as branches, not only within the Italian market – in cities like Rome, Venice, Milan and Naples – but also throughout Europe in the most important European trade centres such as London, Geneva, Bruges, and Lyon. The Florentine bank headquarters, called "Tavola di Firenze", were responsible for coordinating international banking operations. The headquarters were known as the "Tavola di Firenze" because of the name "Tavolieri" given to the Florentine bankers, as they performed their business seated behind a counter or table. As the Medici Bank represents one of the first examples of a bank holding company, which employed accountability techniques and governance systems quite similar to those in practice today.
The origins of the Medici Bank can be traced back to 1397, the year in which Giovanni di Bicci de' Medici (1360-1429) moved the main headquarters of his bank from Rome to Florence. Giovanni di Bicci, who may be considered the founder of the Medici family, established the bank in 1393, by buying out the Roman branch of the bank of Messer (Sir) Vieri di Cambio de' Medici (1323-1395), a distant relative, who was at the time considered

[26] Ibidem
[27] Williams J. L. (1978), New Perspective on the evolution of double entry bookkeeping, Accounting Historians Journal, Vol (I)

among the leading bankers. Giovanni di Bicci remained director for many years, learning the art of administration.
The initial equity of the bank amounted to 10,000 "fiorini", half of which was provided by Giovanni di Bicci, and the remainder by two partners, Benedetto de' Bardi and Gentile Boni. As was common in medieval banks, a small number of people were employed, and at the beginning of the 1400s the Medici bank only employed 17 people.[28] In addition to the headquarters, the Medici opened branches in Venice, Naples and Gaeta. This structure remained unaltered at the bank until 1426.
Figure 5 shows the distribution of the profits of the Medici bank from October 1, 1397, until September 1, 1420. The profits are values net of resources allocated to cope with unrecoverable credits and the compensation of the branch director.
The profits are values net of resources allocated to cope with unrecoverable credits and the compensation of the branch director. He was not merely a bank employee earning a salary, but rather a partner who participated in the profits. Among these profits, only a portion remained within the company for self-financing, while the most significant amount was allocated to purchase real estate in the name of various family members. The most profitable branch was that established in Rome, since it was closely linked with the Papal Court, which used the Medici Bank to deposit and transfer funds.

Branches	"Fiorini"	%
Florence	25,344	16.9
Court of Rome	79,195	52.1
Venice	22,705	14.9
Naples	15,458	10.2
Gaeta	485	0.3
Others	159	0.1
Bank and trading earnings	**143,348**	**94.5**
1° Wool Branch	1,634	1.1
2° Wool branch	6,837	4.4
Total	**151,820**	**100.00**

Figure 5. Cumulated profits from October 1, 1397, to September 1, 1420. Source: A modern look at the Banco de Medici: Governance and Accountability systems in Europe's first bank group. P.3

The years from 1397 to 1425 can be considered the first period in the history of the Medici bank. Only a few years later, in February 1429, the founder Giovanni di Bicci died, after having gradually bequeathed the management of the bank to his two sons: Cosimo and Lorenzo. [29]
Over the following years, with a dynamic approach worthy of modern banks, many branches were opened and closed. The first was in Basel, where a small office, originally established to meet the needs of the church, eventually became an important subsidiary, but then lost relevance to the extent that it became an underling branch of Geneva. The branches of Ancona and Fermo, set up by the Medici to benefit from the profitable transport of goods along the Adriatic coast, were also short-lived, as they were not able to ensure adequate earnings. The next step involved the opening of branches in Bruges in 1439 and Pisa in 1442. Then, in 1446, the Medici established a bank in London, and another in Avignon, which was considered the most important commercial center in southern France. The Milan branch was the final one opened by the Medici in 1452 and marked the end of the period of expansion and prosperity for the bank. Therefore, in 1452, the Medici group included the holding company in Florence, as well as the Italian branches in Rome, Venice, Pisa and

[29] Fazzini M., Fici L., Montrone A., Terzani S. (2016), A Modern Look at The Banco De' Medici: Governance and Accountability Systems In Europe's First Bank Group, International Business & Economic Research Journal, Vol 15

Milan, the foreign branches of Geneva, Bruges, London and Avignon, and two businesses devoted to the production of silk and wool (Figure 6).

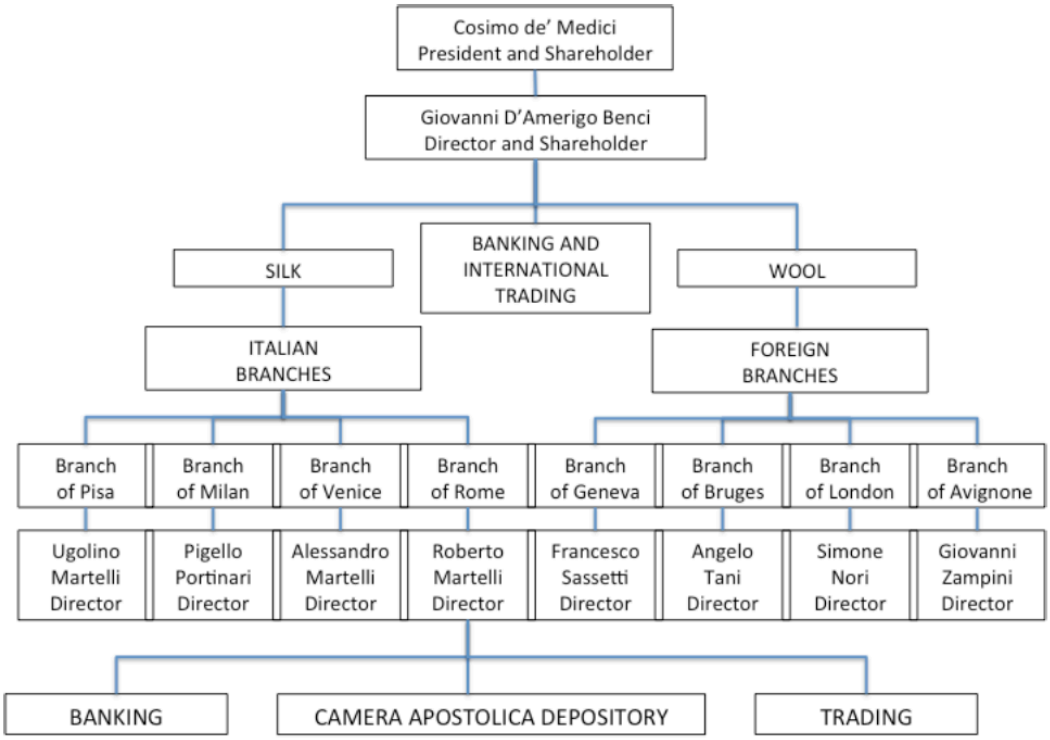

Figure 6. Organizational chart for 1452. Source: A modern look at the Banco de Medici: Governance and Accountability systems in Europe's first bank group. P.4

A gradual decline in the life of the Medici Bank began just before the death of Cosimo in 1464 and ended in 1494 with the expulsion of the Medici family from Florence.
The Medici bank marks a key turning point, especially when compared to other contemporary organizational models; the Medici company was not made up of one sole corporate body, but the main headquarters, located in Florence may be compared to a holding company. Each branch was a distinct company with its own name, equity, administration and accounting books and each branch treated the others as customers. The branch's directors had to settle their accounts once a year and send a copy of the balance sheet and the profit and loss account to the holding company.
As anticipated before the concept of usury, according to the law of the time, was very wide, so wide as to include any type of interest gained upon capital. A loan had to be granted for free; otherwise, it would be interpreted as a contract of usury. The method bankers used most often to escape the accusation of usury was the exchange by letters, which consisted of the negotiation of bills payable in other markets, usually in different currencies. The bill, otherwise known as a "lettera di cambio" (bill of exchange), included interest in its nominal value, which was, however, disclosed as a commission or a transaction fee. In this way the Medici bank used the commission included in its bills of exchange as implicit interest rates for their loans. This activity was possible thanks to the international structure of the group and the presence of many branches of the bank all around Europe. [30]
"Compagno" was the term generally used to indicate the shareholder. He signed the partnership agreement and had the right to a share of profits. Even if working within the company, he did not earn a salary, merely a reimbursement of expenses if he resided abroad. "Fattore" indicates an employee of a foreign branch assisting the director. This figure was usually associated with the company by a notary agreement that described his tasks, limited

[30] Ibidem

his powers and defined his related obligations. The "fattore" earned a salary but did not receive a share of the profits. It is interesting to observe that the Medici family's behaviour was unusual for the medieval economic environment. The director of a branch, chosen from among the personnel, was usually promoted to the rank of minority shareholder, and earned a fixed sum for maintenance expenses, integrated with a share of the profits. Therefore, according to this medieval form of "stock option," a proactive "fattore" had the possibility of becoming a director and, thereafter, shareholder, thus providing him with an effective incentive to work productively. The idea of the Medici family to structure the bank as a group of companies was, therefore, suitable to this purpose. The group structure, indeed, gave the possibility to a number of "fattore" in each branch to become a shareholder so providing them an economic incentive to improve the global performance of the group.

The Banco de' Medici holding company generally possessed more than 50% of the equity of its subsidiaries. Moreover, a partnership agreement clearly specified that the "maggiori" (majority members) had the authority to control the company, even if the Medici were not that concerned with frequently inspecting their branches. However, while the retention of the majority of shares limited the decision-making power of minority shareholders, the Medici family was willing to make concessions in the distribution of profits. According to the formula of incentives that they followed, agreement clauses provided more than proportional profit shares to minority shareholders, as demonstrated by the act dated March 25, 1435, regarding the Venice branch as stated by the Florence State Archive, MAP, 153, n. 2, cc. v-6v., in which the holding company contributed the bulk of the equity, receiving a minor share of profits in order to reward the directors. However, holding the majority of the equity was not the only means the Medici used to control branches. Each partnership agreement contained a clause stipulating the ownership of their "trademark", along with the accounting books and other records upon the closure of a business.

The bookkeeping system was held according to the Datini[31] model. The director of the holding company in Florence kept the "secret books", which contain the accounting records concerning relationships between the shareholders and the company. Moreover, it must be emphasized that each branch kept a "secret book", a "cash book", a "book of creditors and debtors", the denomination of which often varied. Particularly attention can be concentrated on the third "secret book". The most interesting part regards the opening lines, which emphasized that the accounting book was kept according to the practice of the double entry method:

"*E tegniallo alla viniziana, nell'una faccia il dare e nell'altra l'avere, e lle due faccie mettiamo per una charta".*[32]

The most influential explanation for the gradual invention of DEB remains that of Littleton for whom double-entry bookkeeping is a tool for rational management decision making.

In his view the purpose of DEB is to help the "proprietor", not simply measure, but explain the results, and make appropriate decisions. Chatfield also suggests that DEB is a superior analytical tool which emerged and spread in response to a demand for more rational management administration.

In fact, extensive commerce leading to increased complexity in business management was the major cause of DEB. It seems, in fact, that Italian business organization was already so complex that merchants could not get along without an efficient system of bookkeeping.

Furthermore, the emergence of double-entry bookkeeping may have been the result of a social evolution in the perspective of agency relationships between individual merchant and

[31] Francesco di Marco Datini of Prato was a merchant and a banker which employed a double-entry bookkeeping system in order to run its business. In the ledger there was a section dedicated to the debit and credit side. On both side of the ledger amounts have frequently been added up, but the addition is not accompanied by the word total.

[32] Fazzini M., Fici L., Montrone A., Terzani S. (2016), A Modern Look at The Banco De' Medici: Governance and Accountability Systems In Europe's First Bank Group, International Business & Economic Research Journal, Vol 15

the agents. As trade continued to expand under the stimulus of the crusades and wealth kept accumulating in the Italian city states, the practice of each merchant's being his own trader was largely replaced by the practice of trading through agents or partners.
Stable businesses give rise to investment account-keeping of the capitalists themselves because only then would they need a profit and loss account for the convenient summarization of numerous separate gains and losses, so that periodically, or whenever a change occurred in the make-up of the partnership, the relative position of the partners could be properly ascertained. In other words, it has emerged the necessity to keep records of changes in the owners' equity.
It is also possible analyze the double entry bookkeeping developed during this historical period from the perspective of control. As a matter of fact, leaving aside the accounting implication as the balance of profit and equity, this system was useful to management as a particular form of the new textuality, a commentary, a writing which meticulously followed the chronological narrative while re-writing it in a new chronological and impersonal format which produced a new power. Thus, its primary function was providing a new measure of control overflow of goods, over excessive monetary outgoings, and over subordinates. Full double-entry could through examination, re-write itself into increasingly meticulous new kinds of control. In other words, DEB is explained as simply a form of the new power-knowledge, an application of new scholarly skills. [33]
A general idea of the "Tavola di Firenze" businesses and managerial policies can be obtained through the analysis of its balances sheets and accounting data. Among the few documents available, it was decided to focus on the first balance sheet, dating back to 1427.

Panel A:

ATTIVO

Voce	Numero delle partite	Importo in fiorini		
		f.	s.	d.
Debitori al quaderno di cassa:				
Danari in cassa	1	4.223	-	-
Altre compagnie Medicee	3	11.087	21	4
Varii conti "propri" dei soci	3	2.891	-	1
Merci in magazzino	2	12	16	7
Crediti varii	60	4.055	19	7
Totale parziale	69	22.269	28	7
Debitori al libro rosso G:				
Merci in magazzino	4	3.509	18	4
Altre compagnie Medicee	7	6.102	25	3
Corrispondenti su altre piazze, escluse le filiali	13	4.913	10	4
Prestiti ad altri enti pubblici	2	3.689	1	10
Varii conti "propri" dei soci	8	8.424	8	8
Conti varii	90	35.804	8	7
Totale parziale	124	62.443	15	-
Debitori ai libri di ricordanze F e G:				
Crediti derivati da vendite di seta e di lana	19	4.910	6	2
Debitori al libro segreto:				
Folco di Adovardo Portinari, direttore	1	423	17	11
I nostri di Roma	1	10.000	-	-

Figure 7. The Balance Sheet of the "Tavola di Firenze" (1427), Source: A modern look at the Banco de Medici: Governance and Accountability systems in Europe's first bank group. P.8

[33] Bayer R.A. (1993), Double-entry bookkeeping and the birth of capitalism: accounting for the commercial revolution in the medieval Northern Italy, Critical Perspective on Accounting (1993) 4, 113-140

PASSIVO				
Voce	**Numero delle partite**	**Importo in fiorini**		
		f.	**s.**	**d.**
Creditori al quaderno di cassa:				
Varii debiti	47	3.880	26	0
Creditori al libro rosso G:				
Varii conti "propri" dei soci	7	3.790	1	5
Altre compagnie Medicee	12	47.411	17	2
Corrispondenti su altre piazze, escluse le filiali	6	6.717	23	1
Depositi e varii altri debiti	57	13.489	3	2
Totale parziale	82	71.408	15	10
Creditori al libro di ricordanze F e G				
Debiti derivanti da compre di panni e drappi di seta	20	2.355	25	7
Creditori al libro segreto:				
Corpo o capitale:				
Giovanni de' Medici e Ilarione de' Bardi	1	10.500	0	0
Folco d'Adovardo Portinari	1	1.500	0	0
Sopracorpo o utili non ripartiti	1	2.938	4	7
Salari maturati	1	280	0	0
Riserva per crediti inesigibili	1	630	4	9
I nostri di Venezia	1	4.000	0	0
Totale parziale	6	19.848	9	4
Totale passivo	**155**	**97.493**	**18**	**9**
Eccedenza dell'attivo sul passivo		2.553	19	11
Totale generale	155	100.047	9	8

Figure 8, The Balance Sheet of the "Tavola di Firenze" (1427), Source: A modern look at the Banco de Medici: Governance and Accountability systems in Europe's first bank group. P.9

In Figure 7 and 8 it can be observed that:

- the assets typical of banking activity were more prominent than trade assets; indeed, unlike the activities of other contemporary bankers, the investments of the "Tavola di Firenze" in trade, especially in wool and silk, were limited and of little relevance;
- there was scarce availability of cash reserves, which would not have been sufficient to cover a possible lack of liquid funds. This practice was common however, even among other bankers who, in the occurrence of a financial crisis, preferred to pay from their personal wealth, rather than keep non invested funds within the bank;
- there were some "personal" accounts of the partners, which recorded the sums paid in by members of the Medici family and other partners and the loans granted to them for personal use;
- the total assets did not tally with the total liabilities and equities, probably due to an incorrect observance of double entry principles.

The Medici essentially preferred to operate using loans in the form of deposits, whereas they reduced the use of personal capital to the minimum. Such a strategy ensured high earnings, thanks to the existing spread between the interest rates applied on the loans and those paid to depositors. The capital of the "Tavola di Firenze" amounted to 12,000 "fiorini" and corresponded to almost a tenth of the total financing resources. The "Tavola di Firenze" however, was not the only undercapitalized company, since the Rome branch was also operating with no equity. The directives of the holding imposed an attentive policy of self-financing, and while a high share of profits was re-invested within the company, huge sums were also allocated to face the possible insolvency of creditors.

Eventually, an interesting issue is related to the uncollectible credits. The fear of uncollectible credits was so strong that, in their company agreements, banks usually inserted two clauses: one clause imposed the constitution of a special reserve for uncollectible credits, and the other prohibited the granting of credit to anyone who was not a "trustworthy merchant". The attention of the Medici family to the uncollectible credits demonstrate that this subject was relevant also at that time and not only nowadays. It is interesting to notice that the instruments used to reduce the uncollectible credits were the same than nowadays:

a “rating” to select only the “trustworthy merchants” and a special reserve in the balance sheet.
The social and economic situations emerged in North Italy jointly with the expansion of the mercantile activities has laid the foundations to the creation of partnership, which has two fundamental features: limited liability and the requirement of an advancement in control systems.
Despite the Church has hampered this improvement in the entrepreneurial activity, by requiring the forbiddances of usury, partnership developed anyway with other instrument to earn interest.
In order to handle these new forms of business in which there is an agency relationship situation among partners, the double entry bookkeeping was invented to keep track of changes in equity during the business operations.
As it is demonstrated by the De Medici bank, which is one of the first organizations in the history to assume an “Holding Company” structure, without a system as the double entry would be impossible handle subsidiaries around Europe avoiding misconduct as corruption, fraud or bribes.
Furthermore, other than abuse by employees or directors, double entry systems help out managers undertake and monitor daily operations and take rational decisions; it is used as instrument to reward or punish, according of the results of those decisions, managers; and keeping track of the change in equity calculates the share of profits owed to any shareholders.
Eventually, the instrument of double entry is still use today, representing one of the main fundamentals on which our current accounting systems is based. In fact, international agency has been developed in order to smooth differences among countries to globalize unique systems recognize by any culture.

4.4 Early Modern Ages

The present treatise will serve all their needs with regard to accounts and recording, and for this reason only do I insert it. I therefore intend to give sufficient rules to enable them to . . . keep all their accounts and books in an orderly manner. The second thing looked for in business is to be a good accountant and sharp bookkeeper and to arrive at this, as we have seen above, we have regular rules and canons necessary to each operation, so that any diligent reader can understand all ... by himself. The third and last thing necessary is that all one's affairs be arranged in good order so that one may get, without loss of time, all particulars as to the debit and also the credit of all of them, as business does not deal with anything else. This is very useful, because it would be impossible to conduct business without due order of recording, for without rest, merchants would always be in great mental trouble.[34]

This is Luca Pacioli's introduction to his famous treatise named *Summa de Arithmetica, Geometrica, Proportioni et Proportionalita,* on the double-entry method, published in Venice in 1494.

Pacioli, a Franciscan Friar and mathematician, did not invent double-entry system, but his work provided a detailed exposition.

This book, written as a guide to existing mathematical knowledge, covered five topics including bookkeeping, for which there were 36 short chapters. And it is regarded as the official beginning of double entry bookkeeping. He recommended the Venetian bookkeeping above all others and said that the most important point worthy of note about the Venetian bookkeeping was that "All the creditors must appear in the ledger at the right-hand side, and all the debtors at the left. All entries made in the ledger have to be double entries – that is, if you make one creditor, you must make someone debtor.

He tried to emphasize the utility of this particular method of keeping books because the method illustrated could be used to convince the readers of the legitimacy of commerce in general and of the integrity of the business enterprise in particular.

The elements of an account, as set forth by Pacioli, were the inventory, memorandum, journal, and ledger.[35]

The inventory is a document, on paper or in a book, that details all a merchant's assets or belongings and debts at a point in time, from which the original memorandum, journals and ledgers are composed. The inventory is compiled at the commencement of the records and may be repeated at later dates.

The memorandum is a detailed log of all transactions draft when needed; from 1613 to at least the nineteenth century, it was often referred to as the "waste-book". Though sometimes omitted from the formal books, for example in small businesses, Pacioli stresses the importance of such a detailed account of all transactions.

The journal is the first part of the double entry system as such and comprises the journal entries that are necessary to post the items listed in the inventory and all transactions from the memorandum into the ledger accounts. All entries in the journal are to be detailed, including details of quantities and marks and a clear valuation standardized into the merchant's currency of accounting.

The ledger is the book containing all the double entry "T accounts" with the debits on the left and credits the right, all fully detailed, referenced to the journal, cross-referenced and indexed.

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[34] Carruthers B. G., Espeland W. N. (1991), Accounting for Rationality: Double-Entry Bookkeeping and the Rhetoric of Economic Rationality, The American Journal of Sociology, Vol. 97, No. 1. pp. 31-69

[35] Ibidem

Pacioli provides a detailed description of these books and of how they should be maintained within the context of good administrative and business practices, including the cross referencing between and within the account books and the marking of posted entries.
A practical example is not provided inside the Pacioli's treatise; however, it is possible to extract from its guideline's models of DEB in handling purchases, sales and closing of accounts.
In outline Pacioli's treatment of purchases and sales is as follows:
On acquiring goods:

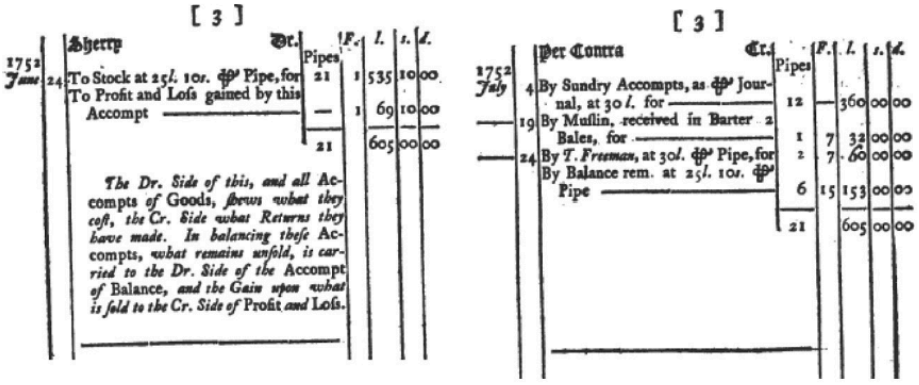
Dr	Goods inventory account	At the "usual" value (cost)	
Cr	Cash or Creditor's personal account		At the "usual" value

On selling goods:

Dr	Cash or Debtor's personal account	At the sales value	
Cr	Goods inventory account		At the sales value

Note that the debits to goods inventory accounts are recorded at the usual value, which is cost or opening valuation, and those sales are recorded at sales value.
The balance on the merchandise account is then taken to the Profit and Loss Account in the ledger, so, as Pacioli states, "… you will be able to see readily and at a glance whether you made a profit or a loss, and how much".
In summary, the journal entry according to Pacioli on closing a goods inventory account is:
On closing a goods inventory account as all the specific stock is sold (assuming a profit was recorded):

Dr	Goods inventory account	The balance on the account (=profit made)	
Cr	Profit and loss account		Ditto


[3]

Sherry Dr.

1752 June 24 To Stock at 25l. 10s. ℔ Pipe, for 21 Pipes 1 535 10 00
To Profit and Loss gained by this Accompt — 1 69 10 00
21 605 00 00

The Dr. Side of this, and all Accompts of Goods, shews what they cost, the Cr. Side what Returns they have made. In balancing these Accompts, what remains unsold, is carried to the Dr. Side of the Accompt of Balance, and the Gain upon what is sold to the Cr. Side of Profit and Loss.

[3]

Per Contra Cr.

1752 July 4 By Sundry Accompts, as ℔ Journal, at 30 l. for 12 360 00 00
19 By Muslin, received in Barter 2 Bales, for 1 7 32 00 00
24 By T. Freeman, at 30l. ℔ Pipe, for 2 7 60 00 00
By Balance rem. at 25l. 10s. ℔ Pipe 6 15 153 00 00
21 605 00 00

Figure 9. Closing a merchandise account (sherry). Source: The perseverance of Pacioli's goods inventory accounting system, p.5

In Figure 9 it is exposed a practical example from a merchant's closing entry; note that in addition to showing the two closing entries, namely:

- CR: the calculated value of closing stock being carried forward
- DR: the balance then taken to the profit and loss account
- The account includes "inner columns" for quantities, which are also balanced. [36]

If Pacioli's methods were followed, the accounting books of a business would be structured as a convincing argument. To attain business excellence, effective business governance is indispensable. From past times to the present, accountants, internal auditors and external auditors are called upon to fulfill critical roles in the governance function, notably in measuring and benchmarking business performance.

The fundamentals for measuring and benchmarking were succinctly laid down by his work, which provided a foundation for the future work of rule-setting bodies such as the Financial Accounting Standards Board (FASB) and the International Accounting Standards Board (IASB).

Between Pacioli and the 19th century, there were few changes in accounting theory. There was a general theoretical consensus that the double-entry method was superior because it could solve so many accounting problems simultaneously.

Accounting practices varied across countries, industries, and individual firms. The application of double-entry accounting depended, in part, on its audience. This audience shifted in general from the proprietor alone to a larger more dispersed group of partners, co-investors, shareholders, and even eventually the state, as capitalist forms became more sophisticated.

[36] Stoner G. (2011), The perseverance of Pacioli's goods inventory accounting system, Accounting History, 16(3), p.313 - 329

4.4.1 The Venetian Arsenal

A venetian example of application of managerial practices in order to monitor and direct the production is provided by the Venetian Arsenal.
As a matter of fact, consulting secondary sources one may discovers a particularly visionary set of accounting and management innovations being either proposed or introduced in the Venice Arsenal, with at least two major elements of interest.
First, it shows the existence of rather sophisticated managerial and accounting discourses in the Renaissance period, where modern forms of management through accounting can be highlighted inside the Venetian method.
Second, and of great interest, it shows how a modern form of economic discourse gradually established when approaching to the first Industrial Revolution.
The broader political and economic context in which the Arsenal episode takes place is one in which the Venice maritime Republic acts as one of the dominating states around the 15th and 16th century, certainly in the Mediterranean area. Within this context, the role of the Arsenal was clearly crucial, and possibly increasing in parallel to the development of the Turkish threat in the 16th century. Founded around 1100, it was up until 1300 relatively small, and indeed may not have consisted of more than a storehouse for supplies. By 1300, however, with the construction of the 'New Arsenal', shipbuilding had begun on site with a mix of private merchant vessels and ships for the state. From 1302, the provision of a monopoly was established, forbidding the building of ships for the state elsewhere. Such a character of permanent production and its associate complexity represents a distinctive element of this entity, also in comparison with other maritime republics of the time, which seems to anticipate size and complexity that will become common just after the industrial takeoff. A vast number of people concentrated into one site - about 2-3,000 workers - made it one of the biggest concentrations of workers in the world at that time.
It is precisely within this context of a 'hybrid organisation' - i.e., modern and pre-modern at the same time, whereby working relations are already internalized according to a capitalistic mode of production, though labour itself is not totally under control, with the persistence of premodern forms of labour organisation - that in the second half of the 16th century a series of initiatives were introduced in an attempt to map out more consistently the overall organisational scheme.[37]
Firstly, it is important to outline the report written by an expert within the Arsenal named Baldissera Drachio, which in 1586 wrote “Memories about the Arsenal house”.
It represents an articulated proposal for restructuring the major managing rules and routines of the Arsenal, which manifests pluri-dimensional understanding of its organisational problems. The Drachio’s report expose three main issues in managing the Arsenal:

a) organization of production and logistics;
b) organization of labour;
c) overall organisational structure.

a) Procedures for better control of raw materials, particularly oak, are provided with a standardization of design characteristics in the manufacturing process. Drachio propose for a change, recommending a new standard ship design, to be stored and issued centrally. This will minimize mistakes and reworking, thus averting the consequent waste of oak, labour, and additional costs, while promoting the principle that the Arsenal should function as a body with just one head.
   In addition, he suggests that a record of the period of construction should be maintained for each ship, thus enabling those begun first to be finished first. Such a

[37] Zan L. (2004), Accounting and management discourse in proto-industrial settings: the Venice Arsenal in the turn of the 16th century, Accounting and Business Research, Vol 32, No. 2, p.145-175

sort of first-in-first-out logic would put an end to cases of ships rotting before being finished, with more associated waste.

b) Drachio come up with new organisation of labour, rationalizing the number and composition of shipbuilding gangs, with the creation of new functionally differentiated divisions, and the constitution of groups dedicated to specific projects within them.

   Those working at one body should not be allowed to have other jobs and tasks, either inside or outside the Arsenal in order to maintain the number of employee stable. As he puts somewhere later in the document, they 'should always come at work at the Arsenal, except right impediment for sickness or because incarcerated', and obtain extra pay for doing so. They should also be removed when reaching the age of 60.

   Provisions to minimize expenses are then explicitly address. He proposes standardizing all the components required for each type of ship commissioned, setting them out in a list one by one, and then charging out any ad hoc changes to those requesting them.

   Here a crucial accounting issue is addressed: order is necessary not just for stewardship reasons, but to know periodical outcomes to ensure cognition of the number and things that will be made from time to time.

c) The overall organisational structure is finally discussed, concerning the design of a 'top' fully legitimated and empowered, with the aim of coordinating the proposed reorganization. Drachio recommends the appointment of one 'superintending executive' with overall authority. This superintendent should be supported by three assistant executives, and should have the power to regulate, order, and reform the Arsenal, having authority and absolute power to remove, imprison or ban workers for a period or for a life. It is not, however, the appeal for a personalistic form of power: the ending of the document reveals the modern sense of this suggestion, with in embryo at least some notion of accountability. The superintendent ought at any time report and give account - which also means comparing and balancing - any material and quality of things inside the Arsenal. Indeed, some rhetorical elements are in themselves interesting for an history of management rhetoric in general: the ideal profile and characteristic of a good boss in the case of a foreman, a sort of job description for foremen, gang bosses and timekeeper; a list of case-studies or incidents referring to actual events, analyzing mistakes and suggesting the right behaviour. [38]

For what concern the accountability perspective of the Arsenal, the deliberation of 11 October 1586 by the Venetian Senate, imposed the requirement that the Arsenal's internal working phases within the galley production process should be recorded by accounts. In this sense, a comprehensive stocktaking should be carried out every three years, as well as ad hoc accounts to be set up, where the various passages, conversions, of materials and work-in-process from one production unit to another had to be recorded by physical quantity and value.

The 1586 deliberation by the Venetian Senate marks a relevant attempt towards a re-ordering of the Arsenal's administrative life, setting a new direction in the accounting system and the accountability of this organisation. Until that moment, the Senate was much more interested in the amounts of the financial flows to be annually allocated to the Arsenal for its different production needs as salaries, stuffs purchases, oars, etc., and far less in the internal efficiency and administrative responsibilities of this organisation.

The control by the Senate was therefore essentially exercised through setting constraints in terms of the maximum amounts to be spent on the various items. In this approach, the notion of cost could not easily emerge.

[38] Ibidem

The Senate's attempt was to impart order and to govern, not only in financial terms, the operations and management of the Arsenal by means of the accounting instrument and its capacity of mirroring the production phases of the construction and preparation of a war galley.
The 1586 ordinance can be broken down into the following relevant points:

a) description of the Arsenal situation in accounting terms;
b) re-initialization and new functioning of the Arsenal's accounting system;
c) compulsory periodic stocktaking;
d) implementation and organisational aspects of the new accounting system;
e) mandatory selling of the Arsenal's old 'stuffs' (robbe);
f) closing of the previous accounting books and reconciliation of the accounting items.

a) The deliberation begins with a short description of the difficult situation at the Arsenal as to the accounting control and management of the production inputs as wood, weapons, iron and the manufacturing process.
   The same lack of control and knowledge applied also to the transformation process which converted raw materials into end products (e.g., fustian into sails), as well as to the goods that were taken out of the Arsenal for one reason or another. The Senate underlines that the official accounts were adjusted only when and to the extent an acquisition of a raw material implied a monetary outflow.
   The deliberation, therefore, describes a situation of deficient official and informal accounting records regarding both the goods and raw materials entered or sent out for some reason, and those transformed into end products. Only the personal books of the warehouse keeper and the admiral kept account of these movements, but in a way which the Senate considered not completely trustworthy and disconnected with the Arsenal's official public books.
b) In the light of the above description of the Arsenal's administrative deficiencies, the Senate determined to re-start the accounting system from scratch by imposing the two Supervisors (Provveditori) and the three Patrons (Patroni) of this body to carry out a new and comprehensive stocktaking of all the stuffs which are in the Arsenal under the control of the warehouse keeper and the admiral. Following this exercise, the Senate set our instructions relating to the accounting treatment of four major aspects of the Arsenal's activities: the existing stuffs; new purchases; the transformation process of the inputs; and the transfers/sending of products and materials outside the Arsenal. [39]
   Examining these in turn:
   i) On the basis of the outcomes of the stocktaking, new accounts should be established and opened in the Arsenal's ordinary book for each type of material, writing the total amounts of that 'stuff' on the debit side, with a description of both the type and of the quantities which are in the hands of the officers. The description includes also weight or numeration, where appropriate, so that out of the accounting records one could immediately see both the cost and the overall amount.
   ii) When the stuffs are converted into the final product due to the Arsenal's transformation process the Senate required that the recording process of the internal activity should take place periodically. Consequently, the administrator and the admiral could monthly communicate the changes in the nature of the various raw materials and the related accounting movements to the Arsenal's appropriate Patron, who record them in the Arsenal's ledger.

[39] Zambon S., Zan L., (2007), Controlling Expenditure, or the Slow Emergence of Costing at the Venice Arsenal, 1586–1633, Accounting, Business & Financial History, Vol 17, No 1, p. 105-128

iii) When the stuffs or the raw materials were to be sent outside to the Venetian army, the accounts relating to the concerned material(s) had to be credited, while the account of the receiving body had to be debited for the same amount.

c) The deliberation also required that, every three years, a stocktaking should be made vis-à-vis the stuffs which were in the hands of the warehouse keeper and the admiral. It is important to point out that the outcomes of these compulsory periodic stock takings should be accompanied by the so called 'authentic faith', i.e. an audit certificate.

d) In order to effectively implement its provisions, the deliberation set out two relevant aspects:
   i) the Supervisor (Provveditore) over the Artillery was made co-responsible, together with the Supervisors and Patrons of the Arsenal, for the correct application of the instructions set out;
   ii) the Senate, together with the Arsenal's Supervisors and Patrons, would elect a bookkeeper to carry out the initial stocktaking in order to start off the Arsenal's accounting system. The deliberation also fixed the monthly salary of ten ducats for accomplishing this task.

e) The Senate also took the opportunity to limit the habit of the warehouse keeper and the admiral of selling off old materials. From the time of the deliberation, any selling off of the Arsenal's stuffs should be voted and approved by a majority of its Supervisors and Patrons. If this instruction was not respected, then the warehouse keeper and the admiral would lose their offices.

f) As a closing provision, the Senate instructed that the old accounting books of the Arsenal should be carefully checked and audited by ad hoc external officers.

It is then possible draw some consideration on the measure adopted by the Venetian Senate in 1586.

First, it is worthwhile observing that the beginning of the 1586 deliberation closely resumes the Venetian official act issued by the Council of Ten in 1581 setting up the Collegio dei Rasonati (College of Accountants), which all those engaged in bookkeeping, for whatever purposes, had to join as a guarantee of their expertise and competence.

Second, it also appears that the idea of double-entry recording underlies the Senate indications for the new Arsenal's accounting system: indeed, the same phenomenon has to be simultaneously represented in two different accounts and in counterbalancing sections: the debit side and credit side.

Third, another emerging consideration is the importance attributed by the Senate to theflows of the manufacturing process (stuffs), which formed the driver of the whole accounting system: when they enter the Arsenal, when they are used in the transformation process, when they leave the Arsenal are the moments at which the accounts are modified. In addition, the recording of the monetary aspects can be supposed to coincide with that of the physical materials instead of constituting an independent moment on its own.

An example may be provided by the Chief Accountant of the Arsenal in 1588 Bartolomeo Tadini, which in its report written in 1593 provided a forecast of labour costs, as exposed in Figure 10.

Tadini proposes a system of production for the long term, capable to save money, as a good accountant. The explicit aim is to overcome too personalist a structure and keeping expenses under control. On such a basis, in fact, Tadini then develops a calculative reasoning, devoted to estimate the savings associated with the proposed structure.

The notion of annual cost is here adopted – in a way which is explicit and aware as never found in previous documents. Starting from the total cost per day, he determines the basic monthly wage-bill (526 by 22 working days equals lire 11,572), adding also the incentives and bonuses awarded to privileged shipwrights (lire 440) and gang bosses (lire 18, soldi 6,

and denari 8). Multiplying this value by 12 months, adding the further semester incentive of lire 248 to foremen, he ends up to a total annual expense of lire 144,612, which equal ducats 23.324, lire 3, and soldi 4.
He then calculates the beneficial effects of the reorganization, claiming that it will more than halve labour costs, given existing labour costs of 50,000 ducats. He also argues that additional benefits will accrue, via quicker completion times, materials savings, and indeed, purely through having an accurate knowledge of expenses and work done.

160	Walk-clerks	at *soldi*	8 per day each	£.	64	
160	apprentices	at *soldi*	20 per day each	£.	160	
60	shipwrights	at *soldi*	24 per day each	£.	72	
60	ordinary shipwrights	at *soldi*	30 per day each	£.	90	
60	privileged shipwrights	at *soldi*	40 per day each	£.	120	
6	ordinary foremen	at *soldi*	50 per day each	£.	15	
2	privileged foremen	at *soldi*	50 per day each	£.	5	
N° 508			sums up	£.	526	
I multiply by 22 – working days per month 22					22	
					1052	
					1052	
				£.	11572	
For 60 privileged shipwrights for the additional day every 6 days				£.	440	
For 2 privileged shipwrights				£.	18	:6.8
				£.	12030	:6.8
I multiply by XII which is the one year					12	
					24060	
					120303	:12
						.8
					144364	:—
For the bonus to foremen of ducats 10 each every six months				£.	248	:—
				£.	144612	

Yearly expenses lire 144612 which is 23324 lire 3 soldi 4

Figure 10. Forecast of labour costs of the proposed structure by Tadini. Source: Accounting and management discourse in proto-industrial settings: the Venice Arsenal in the turn of the 16th century p.19

Fifth, there is a confirmation of the already strong belief within the Venetian public administration in the revision of the accounts and their capacity for revelation and deterrence: this reflects the view that the audit process constituted a kind of magnificent obsession within the administration of the Venetian republic over the centuries.[40]
Further insights within the management of the Arsenal were provided by Bartolomeo Tadini, who was the Chief accountant, employed at the Arsenal from 1588 until 1593 with its two reports written in 1593 and 1594.
While little is known about the precise circumstances and reasons which led him to write his two reports, the opening of his 1593 document epitomizes Tadini's concerns and his accounting lens to examine the costs of the Arsenal - 'The major expenditures of the Arsenal, consist of labour and the causes of their increase.
The Venetian Arsenal is particularly relevant for the management control practice because of its hybrid organisation which embedded features belonging to organizations of the Industrial Revolution period. The most important features are the number of workers

[40] Zan L. (2004), Accounting and management discourse in proto-industrial settings: the Venice Arsenal in the turn of the 16th century, Accounting and Business Research, Vol 32, No. 2, p.145-175

employed in the production – two or three thousand according to the sources – and the system enacted by policy makers to control the manufacturing process.
The last one is an innovative practice belonging to the industrial mindset, in which the capitalist needs were to control labour and manufacturing process to lower as much as possible cost, enhancing efficiency. While the first one requires an improvement in the organizational structure through a reform of labour, both at the lower level and the top level. This makes the Arsenal one of the most advanced company of its period, with accounting techniques similar to the current literature, as it is demonstrated by the "Collegio dei Revisori", who employed forecast of labour activity to monitor the production.

4.4.2 The Spanish Royals Factory

Thanks to its pre-eminence in politics, commerce and culture during the sixteenth century, Spain gave its contribution to the literature on double-entry bookkeeping.
Three authors treated the subject in some depth making their works important early-modern sources for the study of accounting and law. These texts are the *Tratado de Cuentas* by Diego del Castillo; *De ratiociniis administratorum* by Francisco Muñoz de Escobar; the *Curia Philippica* by Juan de Hevia Bolaño; and the *Laberinto de commercio terrestre y naval* also by Hevia Bolaño.
First published in 1522, the Tratado de Cuentas is the earliest Spanish contribution to accounting literature. Del Castillo wrote the Tratado in order to appraise stewards and estate agents of their legal obligations in the area of recordkeeping, and to instruct them in a general way in proper reporting and accounting procedures.[41]
As a jurist, it was Del Castillo's purpose to advise agents of their legal responsibilities in the area of financial reporting. He also sought to convince his audience of the importance of careful recordkeeping to winning them a clean discharge at the conclusion of their commissions.
The Treatise is divided into fourteen parts and a prologue addressed to the emperor.
In part one the author defines the term account, called “cuenta”. In parts two through six he discusses who is required to keep and exhibit accounts, to whom the accounts are to be presented, the manner of presentation, the place and the intervals at which an administrator is in general required to surrender his books. Part seven treats the proper arrangement of an account book. Part eight discusses how it is that accounts are accepted as proof of the financial realities they purport to represent. After a general discussion of the agent's responsibilities in the ninth section, Del Castillo devotes parts ten, eleven, twelve and thirteen to the procedures to be request if errors or shortages are detected in the accounts; and part fourteen to the various legal documents that must accompany accounts submitted to the courts for probate.
Defined the account was in the author's view the most important formal bond between the administrator and his principal. In particular, the features of a properly set of account must contained the following features.
First, there was the matter of physical arrangement. The book of accounts was to contain written entries describing "all that the administrator received," whether from principal or other sources, and "all that he gave". A single volume containing both receipts and expenditures was the preferred arrangement although it was also acceptable to set down receipts in one book and expenditures in another. Del Castillo advocated the use of a single volume because it was commonly believed that the two-volume approach invited errors and irregularities. [42]
As for the content of entries, agents were advised to record in addition to monetary values such details as the date of the transaction, the proper name of the other party, the place the business was transacted, the circumstances that gave rise to the transaction and any other details likely to lend credence to the agent's records. However, Del Castillo did not intend to educate readers in current principles of bookkeeping or of any accounting system but rather to discuss financial reporting requirements and procedures. Certainly, Del Castillo gives a good idea of the kind of information to be recorded, but the form of the accounting entity remains obscure. Despite this obscurity, it is safe to conclude that the type of bookkeeping Del Castillo had in mind was one of the several forms of single entry then in use rather than

[41] Mills P. A. (1987), The probative capacity of accountants in early-modern Spain, The Accounting Historians Journal, Vol 14
[42] Mills P. A. (1986), Financial reporting and stewardship accounting in sixteenth-century Spain, The Accounting Historians Journal, Vol 13, No 2, p. 65-72

full-blown double entry. The method as alluded to in the Treatise consists entirely of receipts and expenditures with no differentiation between nominal and real accounts. The Treatise also makes no mention of an account book auxiliary to an original book of external evidence also supports the conclusion of single entry.

The Tratado de Cuentas is still important to the study of accounting history because it is the first work of accounting literature written in Spanish, and from a legal perspective. Moreover, the Treatise explores some of the fundamental principles of accounting. It discusses, among other topics, the nature of the account, the preparation of accounting information in accordance with uniform principles and procedures, and the attest function. It also adds the role of the accountant in early modern government, a role which in terms of accounting history is still largely unexplored.

Muñoz de Escobar responded at length. In 42 chapters, totaling 650 pages, he explained from a juridical standpoint accounting for property held in agency. He included in the discussion such topics as the kind of information important to record; the types of individuals required to keep accounts; methods of reporting; the specific obligations of administrators as farm stewards, guardians of minor children and in other capacities; and most importantly for the present purpose, the probative force of the administrator's accounts.

The Curia Philippica is not a work of accounting literature per se but rather a manual of procedural law. It does, however, make a small but significant reference to the evidential significance of account books. More importantly, the work treats the idea of proof as used in Castilian jurisprudence and thus, provides a context for the discussion of probative capacity.

The author's second work, The Labyrinth of Naval and Land Commerce, is a treatise on commercial law, indeed, the first and only treatise on Spanish commercial law until the beginning of the nineteenth century. In this book, Hevia Bolaño devoted two full chapters to the legal issues surrounding accounts and account books, including probative requirements. [43]

As a matter of fact, the acceptance of the information contained in the account book as true and accurate was not automatic. In addition to satisfying the general probative requirements, the account book had to be written in proper form in order to compel the court's belief in its contents. If the accounts were unclear, confused or in any way unintelligible, they were presumed fraudulent. Lack of detail in posting transactions could also produce an unfavorable opinion. To avoid such an outcome, Hevia Bolaño recommended that the author record for each entry the day, month and year; the amounts involved; a notation as to whether these amounts were in goods or money; the reason for the transaction; the parties and their addresses; and the exchange rate for foreign trade. Another recommendation was to avoid blank pages. The intended effect of this practice is unclear, but it may have been meant to dispel any impression of omissions in the record.

Here, there is a clear influence from the Luca Pacioli treaties *Summa de arithmetica, geometría proportione et proportionalita* in which he made the same recommendation, but unlike Hevia Bolaño explained the procedure:

When an account has been filled and you cannot enter any more debit or credit items, you must carry immediately this account forward to a place behind all the others. Leave no space in the ledger between this transferred account and the last of the other accounts. To do otherwise would indicate fraud in the book.

Paciolo advised in addition that all pages of any business book must be numbered and signed, in order to discourage charges that leaves had been excised. It should be noted that

[43] Ibidem

although the form was important for probative capacity, the air of authenticity it conferred on a document could be overcome by presumed evidence.[44]
According to both Del Castillo and Hevia Bolaño, the weight accorded to this presumptive evidence depended on the magnitude of the amounts involved. Small items of expenditure might pass as factual merely on the basis of the court's surmises regarding their reasonableness, even if confusedly written or lacking in detail. Verisimilitude, on the other hand, was but one among several criteria applied to material amounts.
In the Spanish literature the concept of double entry bookkeeping has been developed centuries later compare to the Italian writing. However, within this context there are important authors who contribute to the literature of management through their treaties. They develop important economic concept as the account and the recordkeeping practice; then, they contribute to enrich the legal framework with text on the subject regarding the probative capacity of this documentation.
Despite the importance of these authors for the Spanish culture on the accounting subject, there is a lack for what concern the double entry practice.
In fact, the richest business in those years were handled by the Crown because it entails important sources of revenue for the Treasure; therefore, the absence of a competitive environment could have hampered the creation of that prerequisite necessary for the invention, by merchants, of innovative bookkeeping systems.
Two examples of business activities handled by the State may be the Royal Factories and the Gunpowder.
In the Middle Ages, the City of Seville enjoyed the reputation of a high-quality soap producer for two reasons: the sophisticated process of soap production, as introduced by the Arabs during their occupation of the city between the 8th and the 13th centuries; and the quality of raw materials utilized, especially the olive oil and ashes produced in the Guadalquivir Valley.
The royal decree that granted soap production and distribution privileges to the Dukedom of Alcala stated that the local government should set the price of soap. Price changes in olive oil, ashes, or any other soap components caused frequent quarrels between interested parties about the fair price of soap.
A local judge supervised the tests to set the price and an accounting expert from the Catholic Church kept cost calculations and wrote the final report. Tests were typically conducted on Saturdays, and the soap that was produced was stored in a sealed room until it solidified – usually on the following
Monday, the final product was weighed and the cost of a pound of soap was thereby determined.
The date of the earliest test remains unclear. A 1675 document referred to the tests as “an operation that was being accomplished since the 15th century by civil servants and the tenant of the soap factory, under royal authorization. In summary, then, there are references in some primary documents to tests having been conducted during the 15th century, but no concrete evidence of testing prior to 1520.
The development of soap tests in 16th and 17th century Seville provides some insights into the evolution of the management of public affairs during this observation period. As noted above, the doctrine of the Schoolmen inspired the deployment of regulated markets in Spain and its overseas colonies. As intended, regulated markets ensured a “just price”, which would ultimately protect the poor. This research allows us to report on several findings about cost accounting in an early regulated market.

[44] Ovunda A.S. (2015), Luca Pacioli’s Double-Entry System of Accounting: A Critique, Research Journal of Finance and Accounting, Vol 6 No. 18

1) There is written documentation available about Rennaisance cost accounting systems, featuring targets, predictions, and results.
2) The use of accounting as a creator of value.
3) The extensive data collected for the soap production testing did not appear to have a strong influence on decision making in day-to-day operations of the soap factory, apart from the pricing decision.
4) Although a wide variety of sophisticated cost accounting techniques were employed during this period, they appear not to have been incorporated into the disciplinary nexus of management practices or to be utilized in the measurement of human performance.

The following section summarizes each of these findings.

First, evidence provides support for the contention that early cost management systems attempted to turn performance into writing and, by doing so, initiated practices in which targets, and results were extrapolated into the future. The use of writing is exemplified by the careful account of tests kept by the Accountant of the Catholic Church.

Second, the parties deployed a complex system of cost calculations that attached values to objects or, as Ezzamel and Hoskin would say, accounting was used as a creator of value.

Taken together, these first two findings reveal the development of forms of cost-keeping practices that were not double-entry based. They also signaled the expertise in ascertaining the constitutive elements of product costing and, ultimately, the notion of a firm's profit.

Third, a debatable issue in historical management accounting research is the extent to which such data informed managerial decision-making. Regrettably, there is no available 16th and 17th century evidence for proper comparison purposes.

Finally, findings show no indication of accounting having been incorporated into the disciplinary nexus of management practices, and thus no shift has been found to extend standards of raw materials to measure human performance. It is contended that the absence of cost data on human performance might be attributed to the extensive use of slaves in shop floor operations. It has also detected the use of a wide variety of complex cost accounting techniques during our observation period–a period that has been widely neglected by management accounting historians. These techniques involved issues that, expressed in present-day terminology, comprised standards of raw material consumption (e.g., olive oil), production capacity (i.e., annual estimation of the turnover), calculation of wastage (i.e., raw materials in the tests), and opportunity costs (i.e., factory building and investment in inventory and machinery).[45]

As it has been possible to verify, the Royal Soap Factory, within the timespan analyzed does provide evidence of record keeping, testing and predictions of results, which are management techniques indispensable in order to monitor and control the business activity. Nonetheless, even if in Italy and other parts of the Europe double entry bookkeeping was already affirming itself as the main method to keep track of the whole range of activities within an organization, in the Spain culture it was not imported yet.

It is only a century later that a business handled by the Crown imported this specific system to run its operation, as the Gunpowder Monopoly in the New Spain.

The Viceroyalty of New Spain was the main source of income for the Spanish Crown and the largest producer of silver in the world throughout the seventeenth and eighteenth centuries. Carlos III, a member of the Bourbon dynasty, initiated a great tax reform in the viceroyalty during the last third of the eighteenth century, and transferred public activities and leased monopolies were brought under direct state control.

The rental system for gunpowder production in New Spain operated between 1569 and 1766. From 1600, gunpowder production, which had previously taken place in the facilities of the

[45] Carmona S. Donoso R. (2004), Cost accounting in early regulated markets: The case of the Royal Soap Factory of Seville (1525–1692), Journal of Accounting and Public Policy, 129-157

tenant, was concentrated in a unique factory built for such purpose in the Royal Place of Chapultepec, outside Mexico.
The tenant was in charge of every organizational aspect and had absolute jurisdiction over all departments of the factory during the rental period. Only the viceroy as the supreme authority in New Spain had the power to visit the factory and inspect the monopoly when appropriate.
Once the state management regime was established in the gunpowder monopoly, the organizational structure and procedures had to strictly conform to the rules brought together in the Instruction and in the Ordinances prepared for that purpose by Josè de Galvez on 15 September 1766. The treasurer was responsible for aspects related to cash inflows and outflows. That is, the collection of everything produced by the sales of gunpowder and its components and by confiscations and the carrying out of payments due to the purchase of raw materials and supplies, workers' wages, staff salaries and director's orders of payment authorized by the accounting office. The factory manager's responsibilities were to look after the factory, its management and the production of maximum quality gunpowder. Therefore, he had to control in detail the production process, avoiding deviations from the regulations. He also had to watch over the quality of the materials used through his direct intervention in their purchase. To make his work easier, bookkeepers and clerks took charge of the control of inputs and outputs and for keeping accounts of recurrent and non-recurring expenses, always under the manager's direct supervision (see Figure 11).[46]

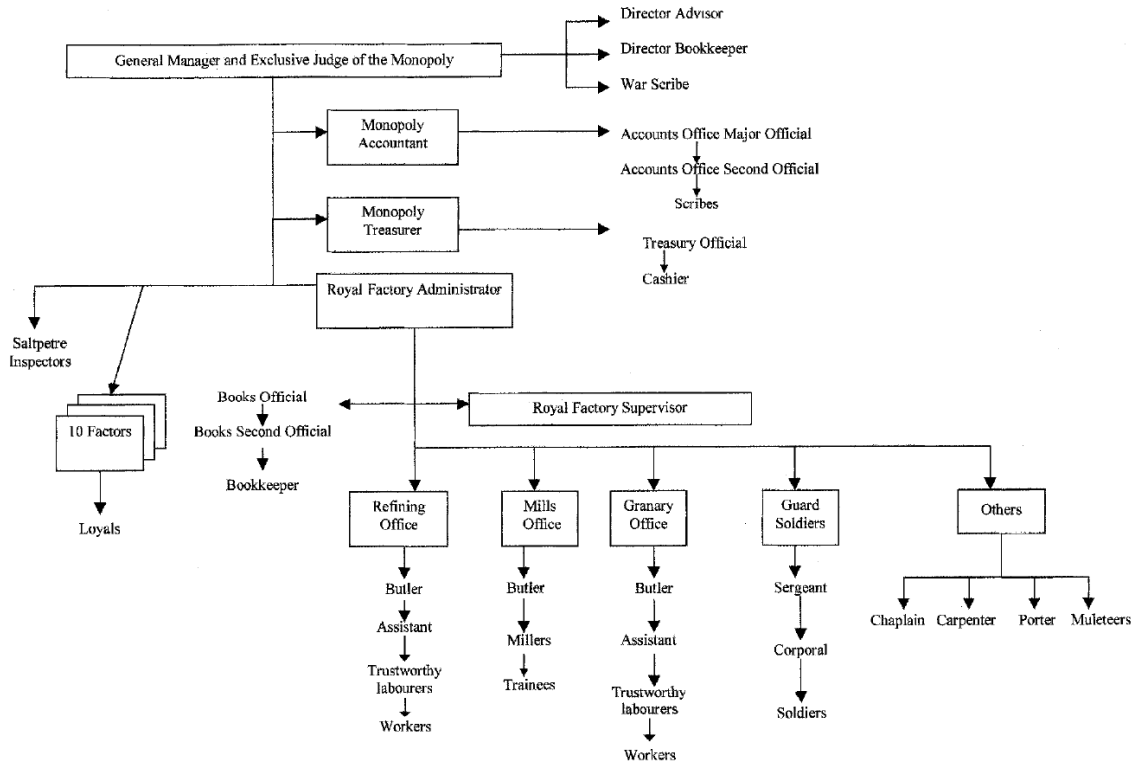
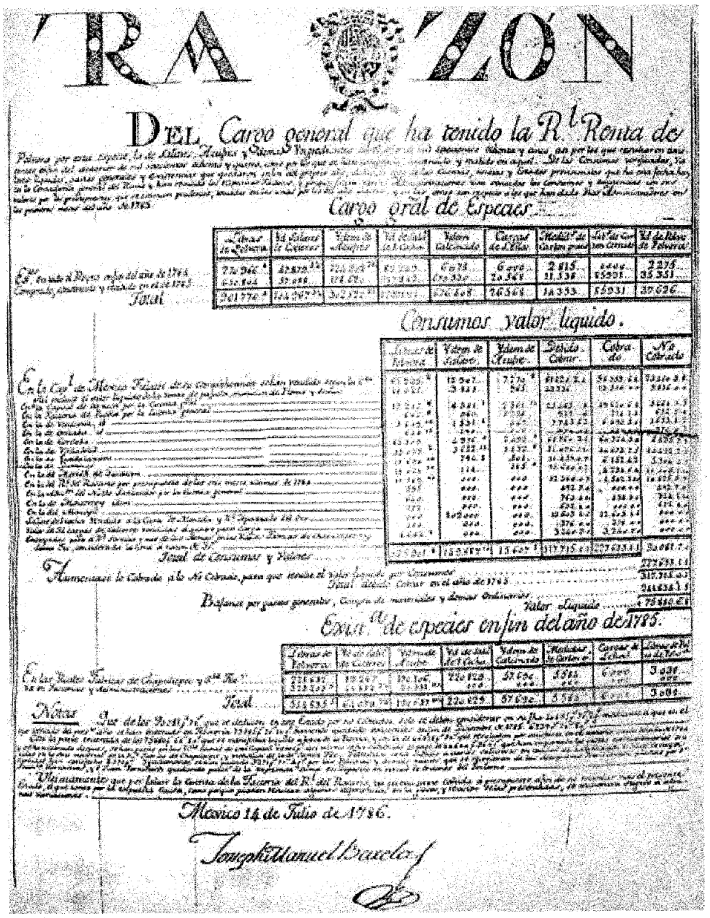


Figure 11 Government Regime and Human resources in the gunpowder monopoly, Source: Organizational change and accounting: the gunpowder monopoly in New Spain 1757-87, p. 19

[46] Nunez M. (2002), Organizational change and accounting: the gunpowder monopoly in New Spain, 1757–87, Accounting, Business & Financial History, p. 275-315

The production process differed according to the final use of the gunpowder: whether it was for military uses, the so-called 'King Gunpowder', or for public sales, 'Ordinary Gunpowder'. There were three central stages in the production process. In functional order they were grinding, paste and seed. They could not be initiated until the main raw materials, saltpeter, sulphur and carbon, reached certain qualitative requirements necessary to guarantee the success of the final product. Therefore, the raw materials were submitted to some prior processing which varied depending on the ingredient and the use to which it would be put.
For what concern the information and control system the measures adopted by Galvez was to put the gunpowder monopoly under direct state administration in order to sort out the Viceroyalty's accounts. The establishment of the direct management system, in October 1766, changed the situation dramatically. From that moment on, an exhaustive control of inflows and outflows and of the stock of goods held by the monopoly began to be carried out. The accounts of the monopoly were first kept by the charge and discharge method, or single entry, which consisted of charging every received sum and discharging all the sums paid out or handed over. This was the prescribed method of keeping the account books of the public administration from 1596 until 1784, when the introduction of double entry, or the debit and credit method, was intended in the Indies Royal Treasury Agencies. The gunpowder monopoly was obliged to report before the Treasury General Superintendent of New Spain at the end of each economic period, which coincided with the natural year ending 31 December. Once the checking was concluded, these reports were sent to the Council of the Indies 'for the general news that is useful to have, and for what it was necessary provide. From the study of these accounting reports, can be deduce their purposes: the control of the monopoly and accountability to superior bodies.
The accounting reports created under the new management system were the following:

- The treasurer had to prepare monthly cash statements to submit to the accounting office of the monopoly at the beginning of each month, together with the expenses and factory consumption receipts.
- The manager had to submit to the accounting office of the monopoly the books of charge and discharge where material and products inventories as well as internal movement of values in the factory were posted.
- The factors in charge of the "*estancos"* (official points of sales of gunpowder and its ingredients all over the Viceroyalty territory) had to hand in six-monthly statements of consumption, values and stocks.
- From previous accounting reports, the accountant drew up the so-called 'annual reason', (see Figure 12) a summary of consumption and inventories at the factory, the *estancos* and the annual General Account of the monopoly.
  During the whole direct state management period, the annual General Account followed the charge and discharge system, except for the years 1786 and 1787 when the double entry system was introduced. The annual General Account consisted of two types of entries: charge and discharge of products and charge and discharge of flows of money. They made it possible to obtain detailed and chronologically ordered information about raw material consumption, process performance, intermediate products, by-products, reuses, raw material, inventories of factory supplies and finished products and, in particular, the resulting net profit**.**


RAZON

DEL Cargo general que ha tenido la R.l Renta de

Cargo gral de especies

Consumos valor liquido.

Exist.a de especies en fin del año de 1785.

Mexico 14 de Julio de 1786.

Figure 12, The Annual Reason, Source: Organizational change and accounting: the gunpowder monopoly in New Spain, 1757-1787, p. 23

In the case under study, the events which caused the change in the management of the Crown monopolies are related to the arrival in New Spain in 1765 of a bureaucrats, Jose de Galvez, as a General Army Quartermaster and General Inspector of Treasury and Justice. It gave rise to a new regulatory framework led by principles of rationality and centralism.

At the beginning of October 1766 four Ordinances and regulations 'in compliance with His Majesty Royal Decrees' came into force aimed at constituting the new normative framework which would govern the establishment of the new organizational structure.

The gunpowder Ordinances pointed out a pattern for vertical relations with different hierarchical levels of authority perfectly defined. Decision making was centralized at the summit of the structure represented by the regime for governing the monopoly. The director was the ultimate authority followed by the accountant, the treasurer and the factory administrator. The director's power went beyond the economic regime of the monopoly, as he also had judicial authority that could not be revoked by other kinds of legal authorities.

The accountant was second in importance due to the significance of the function of rendering accounts before superior requests. The introduction of the rationality tenet made necessary a permanent control of the general running of the monopoly, obtained by the continuous collection of information in the shape of accounting reports. The gunpowder Ordinances did not detail his functions, as the accountant's position was institutionally recognized: that is why they said the accountant's behaviour was expected to be like that of 'An Accountant of the Royal Treasury'.

The control system carried out by the immediate hierarchical superior became direct supervision or inspection, in contrast to previous control systems which had operated through inspections or residence trials. This was possible through the organization of the gunpowder monopoly into sub-units governed by a system of vertical relations with different

levels of authority involved. Written regulations, policies, procedures, and the standardization of information and communication systems are found among the elements that make up the basis of this approach. Control is mainly exerted through the analysis of deviations from pre-established projects. The 1766 Ordinances and the Instruction issued as a result of prior attempts at state interventionism, indicate clearly, and in detail, the procedures to be followed in the gunpowder manufacturing. Strict fulfillment of the regulations was demanded: the method demanded in separate instruction for best gunpowder production and to each of its operations ought to be accurately observed; in which execution the administrator will not allow abuses or alterations to be introduced nor the slightest omission or carelessness, as he must mainly watch the tasks movement and harmony as well as the importance of making it to the highest degree and care. In case any deviation from the regulations, whether casual or deliberate, should occur, the following punishment was applied:

And if any of the employees in the factory, for wickedness or carelessness, broke the observance of the Instructions items, which must be respectively kept according to its occupation or destiny, he will be out of work and will remain incapable of getting another position in the Royal service. [47]

The specialization of tasks in the factory made the direct control exercise possible. But the importance of control was such that other indirect control mechanisms of different sub-units of the monopoly were established: for example, the handing over of coupons to saltpeter and sulphur owners to control their respective productions. In that sense, accounting was an aspect of organizational structure involved in control processes. Accounting could act as a cultural rationalization instrument through the standardization of actors, objects and actions and the reduction of standardized elements to a common measurement rule (not only monetary but also physical). As mentioned previously, the introduction of a new principle of rationality in public administration created the need for a permanent control of the general running of the monopoly. In this way, accounting appears as an element of organizational structure which strengthened a certain concept of power through the creation of a partial pattern of organizational visibility. The obligation to submit a large number of accounting statements with the installation of the new regime provided the Treasury with an efficient means of control from a distance over the behaviour of people in charge of that regime. These reports also acted as spotlights, providing maximum information about the monopoly: they tried to quantify every aspect of the monopoly, considering that what is quantifiable is measurable and what is measurable can be controlled. In this order of things, accounting acts as an element in the creation of organizational rationality, providing a language, an apparently objective set of techniques which enables the calculation of the result and the control of organizational activities (through its financial quantification). So, accounting goes beyond its role of control instrument and appears as a provider of rationality. It is a system of rational beliefs, a set of widely shared ideas which justify the relations of production, and this is what gives it its legitimacy to act as such a control tool. In this way, accounting institutionalizes itself and becomes a rational myth, a social construction that provides the appearance of rationality. Organizations will be rational as they join to their structure a certain accounting technology which enables the rendering of accounts and organizational visibility in both different spaces and in different temporal periods. In broad terms, the taking of the gunpowder monopoly under direct state management was justified because of the lack of knowledge about the income the monopoly could yield. As the public prosecutor of the Council of the Indies pointed out, the decision of the majority of members of the Court of Mexico, in favor of keeping monopoly under direct state management for one or two years to obtain the information they had until then lacked, was correct.

[47] Ibidem

First, the primary sources show that the transfer of the gunpowder monopoly to direct state control had positive effects in respect of the main objectives which the change was meant to achieve. Thus, under the new regime, an increase in Crown yields was obtained compared to that achieved under the leasing system

Furthermore, direct state control led to an improvement in the quality of gunpowder produced, thanks to the establishment of a quality control network, involving strict regulations and a system of rewards and sanctions at different levels. Direct state control also led to improvements in gunpowder supplies thanks to control over the annual production volume (derived from the control of the productive process) and the control of distribution and selling channels.

Second, the importance of accounting as an aspect of organizational structure which allowed the improvement of the monopoly yields has been revealed. Accounting provided the information previously lacking, and through which performance targets could be established, deviations from which could be corrected. Therefore, accounting acted as a control instrument which allowed long distance organizational visibility and improvements in efficiency and effectiveness. The reflexive capacity of accounting is reflected thereby, through its power to reflect the context in which it acts, thereby becoming a social phenomenon.

Third, accounting acted as a model of organizational visibility depending on the information needs and also on the level within the social space, as defined in this study. An example of such is the carrying out of cost calculations in specific circumstances.

Fourth, we have highlighted the importance of accounting as a supplier of rationality and as a system of rational beliefs whose use legitimates the survival of a specific organizational structure: the regime of direct administration versus the previous regime of monopoly leasing.

Finally, the importance of Jose de Galvez as a key institutional agent in the process of organizational change is evident. Throughout the eighteenth century, there were two failed attempts to place the gunpowder monopoly under direct state control in 1757 and 1762. The arrival of Galvez in New Spain as an Army Intendent and General Inspector of Treasury and Justice was necessary to trigger important political, administrative and economic reforms that would change the organic and functional structure of the Viceroyalty.

The enhancement provided from the reform proposed by Jose De Galvez for what concern the management, and in particular the accounting aspects of the organization, improves the efficiency and efficacy of the business process, strengthening control and information flow. This sample is particularly important not only because it demonstrate the relevance of the innovation introduced but also because it illustrates how this reorganization affects the income produced.

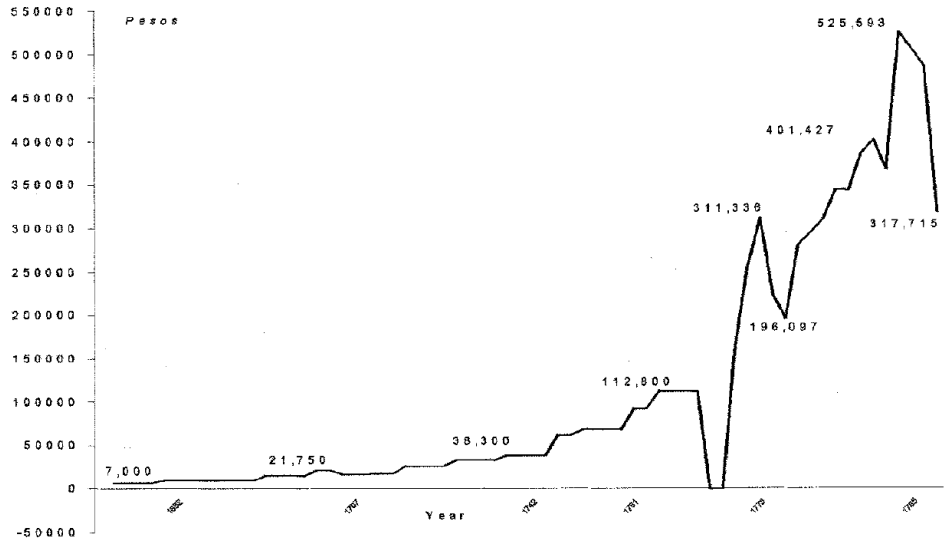


Figure 13, Comparison of income from rental system, 1622-1766, with that under direct state control, 1766-1787, Source: Organizational Change and Accounting: The Gunpowder Monopoly in New Spain, 1757-87, p. 34

As can be seen from Figure 13, the income during the leasing period shows a tendency to grow over time, although at no time does it reach the levels achieved under direct management. The first years under direct state management are the only ones when the income was less than it had been under the leasing system.

This was the consequence of the introduction of the new management system itself, as it took time to bed in, but once it had, the results show more than proportional increases in income each year, with little tendency to fluctuate, and always being at levels higher than those reached under the leasing system.

It shows how implementing control system is relevant for organizations to avoid financial losses or reputational damage, but could also directly boost revenue, becoming an important competitive advantage for the management.

4.5 Industrial Revolution

The division of the world into rich and poor areas is now known to be the cumulative result of differences in the compound rates of economic growth which only emerged with modern industrial capitalism—the so-called Industrial Revolution which started in England in the late 18th century.

But with the Industrial Revolution, particular regions began to grow at exceptionally high rates by past standards, whilst others were left behind. Fast economic growth was largely, if not exclusively, the result of the establishment of large-scale enterprises in manufacturing industry. The countries which have succeeded in becoming large centres of industry have become richly endowed with capital—both in terms of plant, machinery, etc. and of human skills, resulting from education. For in contrast to natural resources which exist independently of human activities, 'capital endowment' is necessarily the result of such activities. It is impossible therefore to separate cause and effect: it is just as sensible - indeed more enlightening - to say that capital accumulation has resulted from industrial development as that it was the cause of such development. For taking manufacturing activities as a whole, the growth of output and the accumulation of capital are merely different aspects of a single process. Capitalistic production is 'production of commodities by commodities'; individual industrial activities make use of goods produced by other industrial provide outputs which (in the great majority of cases) serve as the inputs of further processes.

To explain why certain countries have become industrialized and in the course of industrialization have become richly endowed with capital, and gradually developed relatively high standards of living, it must be enquired why modern industrial capitalism developed when it did—and why it developed in England and not in some other country.

The industrial revolution may be defined as the result of a number of important technological inventions in the 18th century which happened to have been first invented in England. The most important of these were Watt's steam engine; the invention by Abraham Darby of coke and gas by the heating of coal; and finally, there were the vast improvements in labour productivity in the textile industry through the invention of a fast-spinning machine and a fast-weaving machine.

No doubt these inventions played a very important role. So did the triumph of the reformation—not so much on account of changes in psychological attitudes, or in the social status of commercial activities, but through the development of laws and institutions which were favorable to the establishment of freedom of trading, both in goods and in property, and thus of competition and market-orientated enterprise. [48]

On this argument some claims have been made about the relationship between accounting and both rationality and capitalism by such prominent social theorists as Weber, Sombart, and Schumpeter. The common thread in these claims has been the idea that the emergence and development of accounting, as a practical technique used in business, is closely linked to the emergence of capitalism and the development of rationality. These are intriguing claims about such a seemingly innocuous activity. Weber's discussion is the best known and rational capital accounting is a crucial component of his definition of modern capitalism.

In his opinion, accounting makes it possible for capitalists to evaluate rationally the consequences of their past decisions; they can calculate exactly the resources currently available to them and those that will be forthcoming in the future. Capitalists can use the information provided by an account to assess and compare various alternatives for investments.

[48] Kaldor N. (1977), Capitalism and industrial development: some lessons from Britain's experience, Cambridge Journal of Economics, pp.193-207

Weber considered double entry bookkeeping the most highly developed form of accounting. Like Weber, Sombart makes double-entry bookkeeping an important component of modern capitalism.

"*The very concept of capital is derived from this way of looking at things; one can say that capital, as a category, did not exist before double-entry bookkeeping. Capital can be defined as that amount of wealth which is used in making profits and which enters into the accounts*".[49]

Enterprises that embraced the double-entry method enjoyed a technical advantage over those that did not, and, in the long run, the latter would be driven out of the market. Weber argued that, in the precapitalist context of antiquity, the use of slave labor made rational cost accounting impossible and that this was one reason why capitalism failed to develop in ancient society. Both Weber and Sombart, and, to a lesser extent, Schumpeter, postulate a close relationship between capitalism, rationality, and the development of double-entry bookkeeping. They emphasize that double-entry bookkeeping contributed to the historical emergence of a "rational world view." In both ways, accounts help make decision making more rational and so contribute to the maximization of profits. What accounts provide is the information necessary to measure and compare the alternatives in the set. They allow someone to estimate the probabilities of success and the possible payoffs associated with the various alternatives.

According to Sombart, the central idea of capital itself was engendered by double-entry bookkeeping. Double-entry bookkeeping created new categories for classifying and evaluating business transactions. It was a technique that helped to organize and make sense of the business world. Consequently, the relationship between accounting and behavior was not a unilateral one: double-entry bookkeeping was devised to account for business transactions, but once established, it altered those transactions by changing the way businessmen interpreted and understood them.

From the mercantile capitalism of the 15th century to the industrial capitalism of the 19th, accounting audiences changed dramatically. Nearly all the demands made for accounting information by these disparate audiences could be met within a single framework: double entry. Accounting practice that adhered rigorously to the canons of double entry could maintain the distinction between capital and income that 19th-century law required and that co investors in joint-stock companies demanded. From the Middle Ages to the end of the 19th century, double entry has been the accounting method. [50]

Accounting historians who focus on the more specialized, narrow issue of bookkeeping methods similarly argue that modern cost accounting practice did not evolve before the late nineteenth century. They point out that ordinary mercantile double-entry bookkeeping methods were adequate for the external nominal and financial transactions of merchants and traders. These methods did not, however, supply manufacturing firms with data on the results of internal "transactions" involving the transformation of raw inputs into finished and semi-finished goods.

Clearly the integration of cost and financial records was necessary to the development of modern cost accounting as an important tool of management control. Indeed, one accounting historian has described the transition from mercantile accounting to manufacturing accounting as an achievement second only to the original development of bookkeeping according to double-entry principles.

Indeed, it seems that all of the company studies and business histories which have appeared since the early 1930's omit discussion of how industrial firms adapted mercantile

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[49] Sombart, Werner (1953), Medieval and Modern Commercial Enterprise in *Enterprise and Secular Change*, edited by Frederic C. Lane and Jelle Riemersma. Homewood, Ill. : Irwin, pp. 25-40

[50] Carruthers B. G., Espeland W. N. (1991), Accounting for Rationality: Double-Entry Bookkeeping and the Rhetoric of Economic Rationality, The American Journal of Sociology, Vol. 97, No. 1. pp. 31-69

bookkeeping to the needs of modern industrial accounting. This gap in the literature of accounting history can be partially bridged, however, by research in the accounting records of nineteenth and eighteen century industrial firms. Although such records are scarce, an examination of those available sheds considerable light on manufacturing accounting practice during a period hitherto ignored by accounting historians.
It is possible to build up a clear picture of the management information system employed between 1690-1783 from surviving manuscripts, consisting principally of a set of fully integrated journals and ledgers for the DN Works (1690-1765) and the Staveley Group (1750-1765). [51]
The accounting practice to which is given particular attention is the development and use of an integrated financial and management accounting system.
The use of the vertically integrated plant in order to secure sources of supply and outlets for goods manufactured, or simply to organize the flow of goods from raw materials to the ultimate consumer more efficiently, and thereby drive the 'slack' out of market transactions, produced new problems for accounting.
There is general agreement that the vertically integrated plant became more firmly established in British and North American industry in the second half of the nineteenth century, and this observation has led to the conclusion that the integration of financial and management accounting systems was a product of this era.
Business operations at Staveley, during the financial year 1750, were conducted at four sites; the Staveley Furnace; the Carburton and Staveley Forges; and the Renishaw Slitting Mill. In addition, the firm arranged for the supply of ironstone and charcoal from 'colliers' paid on a piece rate basis (Figure 14).

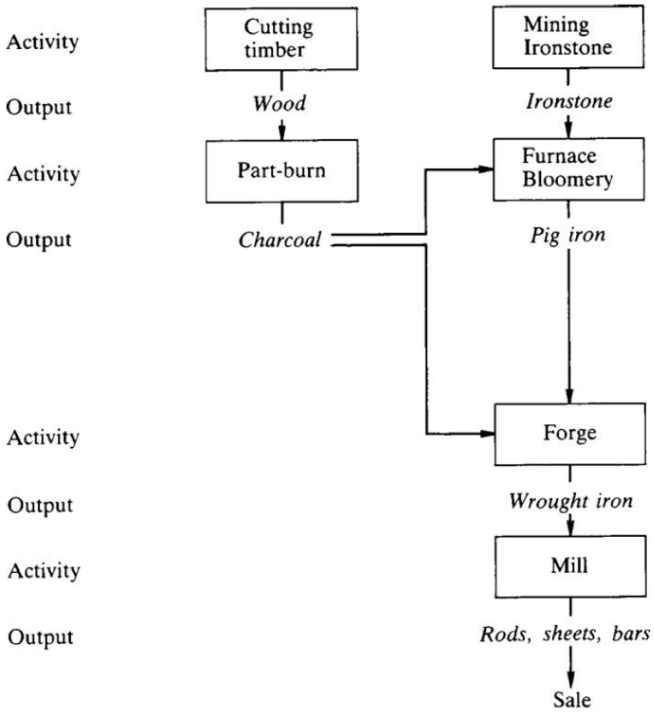

Figure 14 Activity and output at a vertically integrated charcoal iron making company, Source: Industrial Organization and Accounting Innovation: charcoal ironmaking in England 1690-1713, p. 7

[51] Edwards, J. R., Newell, E., (1991), The development of industrial cost and management accounting before 1850: a survey of the evidence, Business History, Spring, pp. 35-57.

Each of the four 'departments' were profit centres whose activities were summarized in individual ledger accounts. The balances-profits or losses-remaining on these and other nominal accounts were transferred annually to a profit and loss account, which is reproduced as Figure15, together with the supporting journal entries showing the buildup of expenses and the allocation of profits between the five partners.
There is no use of the term 'balance sheet' in these records, and little evidence of interest in the separate preparation of such a statement.

Profit and Loss

Journal fo		£	s	d	Journal fo	£	s	d
June 32	To cash	12	0	2	June 36 By Foundry	1882	2	$4\frac{3}{4}$
June 34	To sundry assets	78	14	$4\frac{1}{2}$				
June 35	—	77	13	10				
June	—	1713	14	$0\frac{1}{4}$				
Total		1882	2	$4\frac{3}{4}$		1882	2	$4\frac{3}{4}$

Entries in Journal (supporting the above)

From fo		£	s	d
32	Cash paid			
	Exps. £5.10.10. Letters and errors £1.12.1.			
	Paper 7s 6d. Abatements for iron returned £4.9.9	12	0	2
34	Sundry accounts to take off the following sums			
	Aaron Biggin, abated for carriage and iron	4	5	4
	Foxbrooke furnace, half repairs to building*	51	17	$6\frac{1}{2}$
	Clipstone forge, yearly rent and taxes,	7	11	6
	Whaley furnace, yearly rent†	15	0	0
		78	14	$4\frac{1}{2}$
35	Sundry Accounts			
	Wm Badger, Hillamarsh	4	16	0
	Wm Simpson, Nottingham	34	6	9
	Renishaw Mill	38	11	1
		77	13	10
36	Staveley Furnace	660	16	$10\frac{1}{2}$
	Staveley Forge	741	5	$10\frac{1}{2}$
	Carburton Forge	479	19	$7\frac{3}{4}$
		1882	2	$4\frac{3}{4}$

* Other half written off the following year.
† This furnace starts to be used a couple of years later.

Figure 15, Extracts from Ledger and Journal covering period Midsummer 1750-Midsummer 1751, Source: Industrial Organization and Accounting Innovation: charcoal ironmaking in England 1690-1713, p. 11

- Staveley furnace account: this contains quantity columns for each of the main raw material inputs - ironstone, charcoal - and for metal produced. There is also a value column which provided an overall financial summary of furnace operations. For the first two items, the columns show measures of opening stock, inputs and closing stock, with balancing figures inserted for ironstone and charcoal consumed, thereby providing the basis for making yield calculations. The value column is credited with a small sum for pig iron sold; the main credit entries are in respect of transfers of pig iron to the two forges.
- Staveley forge account: this is effectively a trading account, except that the movement of finished stock is dealt with in the Staveley iron account.
  There are physical quantity columns for charcoal and pig iron, almost all of which was obtained from the Staveley Furnace. There are just two credit entries: closing stock, which consists of various amounts of unused pig iron, again valued at £5 per ton, charcoal valued at 24s per dozen, plus valuations for various implements, producing a total valuation of £661 1s 6d.

- Staveley iron account: the account shows quantities and values of bar iron, and has credited to it sales - 189 tons producing proceeds of £2978 6s 3d (an average of £15 15s 0d per ton) - and the closing stock of finished iron valued as follows: new iron and mill iron each at £15 per ton (i.e. a little below selling price) to give a closing stock valuation of £339 15s 6d. Debited to the Staveley iron account is the opening stock valued in a similar manner, and cash payments of £1 per ton on each ton of iron made in the financial year 1750-51. This was presumably a royalty. The remaining debit entries are balancing items, showing in the quantity reconciliation that there was a surplus of just over 1 ton, and in the value column £2706 11s 6d, which is carried back to the Staveley forge account and represents the market price of goods produced, net of the £1 per ton royalty.
- Renishaw splitting mill account: the account contains quantity and value columns. Debited are opening stock, bar iron transferred from the two forges at £15 per ton and various expenses; credited are sales and closing stock.
- Raw materials and other costs: the two main raw material inputs to the furnace were ironstone and charcoal, while charcoal was also required to reheat the iron in the forge. Ironstone was extracted by colliers, at a fixed rate per ton, from land covered by the lease and often adjacent to the works. It therefore gave rise to no particular accounting problem.

When attempting to assess the significance of information generated for decision making, it must be remembered that management was making decisions in an organizational situation which imposed important limits on its freedom of action. More specifically, the basis for each firm's operations was a collection of furnaces, forges and mills which were located on property leased not owned. Management might therefore have found it possible to surrender a lease which proved unprofitable, and sometimes it did, but it was unable to sell the works, and there is no evidence of sub-letting which may well have been ruled out by the terms of the original lease. There were, however, many decisions which managers could take, including: which suppliers of raw material to use; whether to operate a department or leave it idle; how much to produce; whether to manufacture or purchase from outside; which activity to concentrate on when raw materials were a limiting factor; and whether to further process iron or sell it to the market. The information available suggests that management was interested in a financial input for each of these decisions.

A key element in the management information generating process was the transfer prices used, mainly, to value the pig iron supplied by the furnace to the forge and the bar iron supplied by the forge to the mill. [52]

Therefore, may be see that the financial journals and ledgers contain a wealth of information which could be used directly and indirectly for decision making. It is not possible to discover from today's standpoint the entire range of additional accounting information available to and used by management. Even so a great deal has survived over and above the profit analyses referred to above. There are numerous handstitched booklets setting out movements on departmental ledger accounts, incorporating even more detail than appears there and in the journal. There are also furnace books showing, for either 4- of 5- weekly periods, cash payments, and quantities of pig iron created at and distributed from the furnace, providing the basis for the quantity column of the furnace account in the ledger. The fact that management was also interested in assessing yields is evidenced by the survival of numerous calculations, both in the ledgers and loose documentation, of the quantity of input 'spent' to produce a ton of pig iron and a ton of bar iron, e.g., 1701 at Carburton Forge and for each of the years 1700-20 at the Staveley Forge. The most remarkable feature of the

[52] Edwards J. R., Boyns T. (1992), Industrial organization and accounting innovation: charcoal ironmaking in England 1690-1783, Management Accounting Research, 3, pp. 151-169

accounting system described is the integration of the cost and financial records starting in 1690.
In conclusion, the social and economic context emerged due to the advent of the Industrial Revolution has posed the basis for the born of modern accounting. In fact, as a consequence to the mass production and the large-scale organizations, which are able to move amount of capital never recorded before, have created the need by the entrepreneur to monitor the production phase of the manufacturing process. Within the Sheffield regions, the company took as example demonstrate how the accounting and double entry bookkeeping fulfill this necessity. In order to manage the production process there have been created 4 different accounts which embedded costs and quantities. Through this data the management could take decision appropriate for what concern the production process, something which would be impossible with the mercantile accounting.
Furthermore, the figures produced by the accounting employed in manufacturing process where utilize to produce statement for calculate profit and loss, thanks to the recording of those numbers in journals and ledger.
Another excellent illustration of an advanced cost accounting system in use before 1860 is provided in the papers of the Lyman Mills Corporation, a cotton textile firm incorporated in Boston in 1854.
The basic accounting records at Lyman Mills date from 1856. These include a double-entry general ledger and sub-ledgers which were kept by the treasurer at the home office in Boston, as well as a double-entry factory ledger with related inventory, payroll, and production sub-ledgers which were kept by the mill agent in Holyoke. Reciprocal entries in the home office and factory ledgers were kept current by means of daily correspondence between the treasurer and the agent. The Holyoke factory ledger includes accounts for current assets, current liabilities, and all operating expenses. The factory ledger also includes two accounts, referred to as "mill" accounts, which resemble modern work-in-process control accounts. One of the mill accounts was charged with manufacturing costs related to coarse goods production and the other mill account was charged with manufacturing costs related to fine goods production. The Boston general ledger includes not only all the accounts kept in the Holyoke factory ledger, but also additional accounts for plant and equipment, capital stock, long-term liabilities, and profit and loss. Sales and non-manufacturing expense figures were entered only in the general ledger, where they appear in the two mill accounts. Every six months, the books were closed to determine profit and loss.
Although the amounts charged to the respective mill accounts for cotton, factory labor, and factory overhead are identical in the general ledger and the factory ledger, only the mill accounts in the factory ledger resemble modern work-in-process control accounts. Unlike work-in-process accounts, the Lyman general ledger's mill accounts contain entries for non-manufacturing expenses and sales in addition to entries for manufacturing expenses. These accounts provide profit and loss data useful in determining the semi-annual dividend to shareholders, but they do not serve management needs by providing direct information on manufacturing costs. The mill accounts in the factory ledger, however, are charged only with manufacturing expenses and therefore give direct data on production costs as a regular part of the double-entry bookkeeping cycle. It is notable that regular reports summarizing the data from these various cost accounts provided Lyman Mills' management with useful information on production costs. One kind of report, a "cost of manufacturing statement" which gave a pro forma summary of labor, cotton, and overhead charges, was prepared from each mill account every six months.
These semi-annual statements on the cost of manufacturing give a detailed breakdown of the items in overhead cost, such as starch, fuel, supplies, and teaming. They include, furthermore, data on the cost per pound and per yard of output for each major item of expense. Lyman's accountants also prepared monthly cost of manufacturing statements

which include all the same data as the semi-annual statements, except that the breakdown of overhead costs is not given. These accountants obtained monthly information on actual labor costs from payroll sub-ledgers. They could not ascertain actual cotton and overhead costs, of course, until physical inventories were taken; normally physical inventory occurred every six months. In addition to producing these aggregate cost data, Lyman Mills also produced periodic information on the unit cost of each cloth style which it manufactured. Although actual unit cost calculations before 1886 are not found in the documents that now remain, the raw data needed to estimate product costs appear in the company's records as early as 1875.

It was more difficult, however, to allocate labor and overhead expense among the various styles. Basically, the average labor and overhead cost per hank of yarn was calculated every six months; that average cost was multiplied by the number of hanks per pound in each style to get an estimate of the labor and overhead cost per pound. These calculations enabled the company to estimate total cost per pound for each style produced every six months.

These product cost statistics, calculated semi-annually at Lyman Mills at least as far back as 1886, are probably less accurate than those one might get from a modern textile mill's process cost accounting system; however, they gave a reasonable idea of relative cost differences between styles and of changes over time in unit costs. Clearly, the various cost statements described above were superior to the ad hoc memos usually pictured as typical of early nineteenth-century "cost accounting." The data in Lyman's statements were drawn directly from the company's ordinary double-entry books of account and provided systematic and reliable information on the company's manufacturing operations. Although the statements do not deal with some items of expense, notably depreciation and unexpired conversion costs, in a manner consider appropriate today, certainly these technical shortcomings should not obscure the remarkable efficiency of Lyman's total cost system. Although Lyman's definition of profit and loss does not correspond exactly to the modern concept, the profit and loss figure in Lyman's general ledger was, nevertheless, tied into the manufacturing cost data in the factory ledger mill accounts. Such a "tie-in" permitted the management frequent and useful analysis of manufacturing costs and profits. [53]

In conclusion, as with most textile firms of the period, Lyman's management focused its attention inwards on the company, and not outwards on the industry. All the evidence examined points to the conclusion that Lyman used its elaborate cost system to facilitate control of internal plant operations: for example, to assess the physical productivity of mill operatives; to assess the impact on operations of changes in plant layout; and to control the receipt and use of raw cotton. Although used primarily to rationalize internal control, Lyman's cost accounting procedure antedates by thirty years a system which until now accounting historians have regarded as the earliest example of a completely integrated double-entry cost accounting format.

According to Johnson, the objective of the integrated system, operated at Lyman's in the 1850s, was to look inwards on the shop, and not outwards on the industry and he contrasts this situation with the large-scale oligopolistic enterprises where the data was also, perhaps primarily, used to determine prices, assess the results of operations and evaluate capital intensive technological innovations. At Lyman, the basic aim was to control internal plant operations, for example, to assess the physical productivity of the Mill operatives, to assess the impact of operations on changes in plant layout, and to control the receipt and use of raw cotton. That is, the emphasis was on cost identification and cost control.

By way of contrast, the accounting information generated for the 'Sheffield' partnerships did not suffer significantly from the problem of cost apportionment which is generally regarded as a necessary corollary of departmental profit measurement, and later led to the production

[53] Johnson H. T. (1972), Early cost accounting for internal management control: Lyman Mills in the 1850's, The Business History Review, Vol 46, No 4, pp. 466-474

of arbitrary and misleading information as the basis for decision making. The use of market-based transfer prices in order to measure the profitability of each department suggests that the partners were looking outwards on the industry as well as inwards on the firm, but there is also evidence of the use of unit cost and yield data for comparative purposes.

4.6 The Second Industrial Revolution

During the Second Industrial Revolution emerged the Railroad industry which is particularly important for the purpose of the thesis, because it provides a stimulus for the development of modern accounting.

The railroads were some of the first companies to require major quantities of long-lived fixed assets and one of the first problems faced by early railway accountants concerned that of asset valuation. Due to the major investments required, the railroads were also the first companies to require massive amounts of outside capital; thus, their accountants were the first to deal with the problem of public reporting to stockholders and potential stockholders. Finally, because of the quasi-public nature of the industry, these accountants were first to deal with the problem of providing accurate economic health to users. The disclosures originated from requirements of government regulatory agencies.

Chatfield has stated that the railroads were the first industrial enterprises to be confronted with the whole range of asset valuation problems. Requiring much larger capital investments and more long-lived equipment than most businesses of the early nineteenth century, they were compelled to isolate asset expenditures and account for them methodically.[54] The need was recognized early that the lives of assets were limited and that they would eventually require replacement. This led to an acknowledgement by some parties that there was a need for a portion of earnings to be set aside for the replacement of assets. In 1841 an English publication, The Railway Times, wrote that the declaration of a dividend without making allowance for depreciation of stock, cannot be regarded as other than fallacious. There were three ways that changes in asset values were reflected in early railroad accounts.[55]

The first of these was simply a periodic revaluation of properties, which appeared among the English railroads. The Grand Junction Railway, the Liverpool & Manchester Railway, and the North Union Railway all followed this practice in the 1830's. The Grand Junction, for example, valued its rolling stock according to its current market value; the change in value, whether debit or credit, was entered in the revenue account at six-month intervals.

A second method of reflecting changes in asset values entailed the setting aside of an annuity each year which would accumulate to the amount required for replacement at the estimated time it would be necessary.

Then, there was a third type of early asset valuation which is called the renewal method.

A good description of the use of renewal accounts for valuation is contained in the Report of the Boston Railroad (B&P) for 1859:

In making up the account of expenditures, it will that we have adopted a course which, if adhered secure a good degree of uniformity in the charged expenses of operating the road. In the first place, we assume that there is an annual decay of sleepers, bridges, station house, etc., and that the extent of that decay for each year, is properly chargeable to the expenses of that year. We have endeavored to ascertain, so far as is practicable, from the experience of years, what may be expected with a given amount of business, to be the amount of expenses chargeable to each account, annually; and if any year the amount expended actually falls short of that estimate, we do not rely upon a permanent reduction of those expenses, but charge the expenses of that year with the estimated amount, and carry the difference to a fund to meet what may be expenditures of another year on that account beyond the estimate.

The report additionally contained a summary of receipts and expenditures which showed expenditures for eleven items such as new sleepers, new iron, repairs on locomotives, and

[54] Chatfield, A History of Accounting Thought, Hinsdale, III.: Dryden Press 1974, p.94

[55] Littleton, A.C., Accounting Evolution to 1900, New York: American Institute Publishing Company, 1953, p.228

repairs on stations, buildings, and fixtures. For each of these accounts there was a contra renewal account, for example, "renewal for new iron."[56]

The presentation was remarkedly similar to the modern-day presentation of accumulated depreciation; indeed, the passage quoted indicates that the B&P accountants had a notion of the "annual decay" of an asset's value similar to the modern concept of depreciation. However, charges were not made in a systematic manner but were based on the excess of estimated expenses over actual expenditures and varied from year to year.

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However, charges were not made in a systematic manner but were based on the excess of estimated expenses over actual expenditures and varied from year to year. As early as 1844 the same railroad in its annual report described a tardy recognition of accumulated depreciation from January 1, 1834:

On the 31st ultimo we made a careful estimate of the present value of cars, engines, and other personal property of the corporation, which had been charged to the account of construction, and have charged against such depreciation from the cost to income account, the sum of forty thousand dollars, and deducted the same from the cost of construction.[57]

From 1872 until 1888, when the B&P was absorbed by the Old Colony Railroad, the renewal accounts were not shown nor was any other attempt made to account for decreases in fixed asset values. Apparently, the B&P had adopted the retirement method of accounting for fixed assets, which was the most widespread theory from the mid-nineteenth century until the early twentieth. Under this method, the expense due to the exhaustion of property was recognized at the time of the retirement of a unit of the property. This was most often justified by the argument that as long as the property was maintained in good repair then no decrease in the value of the asset had occurred.

By 1880 the revaluation, annuity and renewal account accounting for changes in asset values had virtually the United States and had been replaced by the retirement This replacement, according to Pollins, occurred in England fifties and sixties as companies found that their past depreciation reserves had been inadequate. Although methods were not strictly depreciation in its modern definition, did represent an early response to the asset valuation were forerunners of the current modern concept.

In the United States a great deal of the impetus to provide funds for the replacement of fixed assets came from governmental agencies. [58]

In 1846 the State of Massachusetts provided a new format for the annual reports submitted to it by its railroads which included disclosure of depreciation estimates. A section of the format was entitled "Motive Power of Cars" and is reproduced in Figure 16.

[56] Boockholdt J.L. (1978), *Influence of nineteenth and early twentieth century railroad accounting on the development of modern accounting theory*, The Accounting Historians Journal, Spring, Vol. 5. No. 1 pp. 9-28

[57] Mason P., (1933) "Illustrations of the Early Treatment of Depreciation," Accounting Review, p.217

[58] Pollins H., (1956), "Aspects of railway accounting before 1868," in A. C. Littleton and B.S. Yamey, *Studies in the History of Accounting,* Homewood, III.: Richard D. Irwin

For repairs of locomotives	xxxx
For new locomotives, to cover depreciation	xxxx
For repairs of passenger cars	xxxx
For new passenger cars, to cover depreciation	xxxx
For repairs of merchandise cars	xxxx
For new merchandise cars to cover depreciation	xxxx
For repairs of gravel and other cars	xxxx
Total for maintenance of motive power and cars	xxxx

Figure 16, Disclosure Requirements – Motive Power of Cars, Source: Influence of nineteenth and early twentieth century railroad accounting on the development of modern accounting theory

Following the computations of dividends and surplus, the railroads were also required to disclose "estimated depreciation beyond the renewals" for roads and bridges, buildings, and engines and cars.
Thus, there is evidence to indicate that early depreciation methods, which first became evident in the railroads, were employed not out of considerations for proper asset valuations based in any accounting theory but were rather instruments management policy in pursuing the best interests themselves.
A further problem was represented by the need of public reporting. The railroads capital needs were so massive that they were compelled to depend heavily on external financing; thus, railroad accountants were the first major group to face the problem of public reporting in order to attract capital. The magnitude of the capital requirements can be seen from statistics compiled by Dogett's Railroad Guide of September 1847. Railroad mileage in the United States grew from 155 miles at the end of 1830, to 5,740 miles at the end of 1847, requiring a total investment of $122,525,937 in this 17-year period alone.[59] Similar expansions were taking place in England and, to a lesser extent, in other European countries.
In order to attract this capital and maintain a market for railroad securities, accountants were forced to develop means both for disclosure of railroad operating results and for ways to report on the custodianship of assets. Since few private companies had previously been required to deal with this problem, there were few precedents to establish the kind of disclosure to be made or the accounting and statistical methods to be followed. A survey of early nineteenth century railroad financial statistics, therefore, provides some interesting insights into the development of current-day financial reporting procedures and measurement concepts.
Initially most railroad accounting records were kept on a cash basis, and as a result their reports primarily dealt with the sources and disposition of cash and with statistical measures of the flow of traffic. The first report issued by the Utica and Schenectedy Railroad covered the period from its opening in 1836 until January 1, 1841.
As an illustration of the early form of disclosure, this data is included in Figure 17.

[59] Boockholdt J.L. (1978), *Influence of nineteenth and early twentieth century railroad accounting on the development of modern accounting theory*, The Accounting Historians Journal, Spring, Vol. 5. No. 1 pp. 9-28

The capital of the company is 20,000 shares		$2,000,000
The total cost of the road, from its commencement to the 1st Jan. 1841, including the right of way, $322,470, and the purchase of the Mohawk Turnpike, $62,500, was		1,901,785
The calls on stockholders have been	$1,500,000	
Ditto, derived from dividends	300,000	1,800,000
The amount received from passengers, the mail and all sources in 4 years and 5 months, from commencement of road to 1st Jan., 1841		1,618,517
The total expenses during the same period		552,598
Nett earnings, 71 percent on 4½ years		1,065,918
The dividends declared to 1st Jan., 1841 being equal to 13½ percent per annum on the capital of $1,500,000, during 4½ years		917,000
The total cost per mile of the 78 miles, including motive power, right of way and turnpike, is	$ 23,580	
Off right of way and turnpike	4,934	18,646

Figure 17, Report of the Treasurer (1841), Source: Influence of nineteenth and early twentieth century railroad accounting on the development of modern accounting theory

A more typical report format provided a tabulation of expenditures. The next Treasurer's Report (Figure 18) of the Utica and Schenectedy was issued in 1842, similarly covered the period from the inception of the railroad until December 31, 1841, and followed a format which was fairly standard in railroad reports for thirty years.[60] It is noteworthy that, although these reports were being issued at yearly intervals in accordance with legislative requirements, they did not attempt to measure changes in the accounts but rather reflected the status of the accounts at a point in time.

Included in the 1842 report were statistics concerning the number of passengers carried and the receipts from various sources (passengers, mail, turnpike tolls, interest and miscellaneous) for each year from 1836-1841. No attempt was made, however, to match expenditures with receipts for these years.

Amount received for installments on stock		$1,800,000.00
" transportation of passengers		1,864,691.53
" " U.S. mail		83,047.10
" tolls of Mohawk Turnpike		22,834.78
" interest on money deposited		10,226.87
" from miscellaneous sources		49,134.71
Total receipts from all sources to Dec. 31, 1841		$3,829,934.99
Deduct expenditures for all accounts up to Dec. 31, 1841, viz.:		
On construction account	$1,968,022.17	
On transportation account	709,230.12	
On dividend account	1,017,000.00	
Total expenditures	$3,694,252.29	
Balance, being excess of receipts over expenditures up to Dec. 31, 1841		$ 135,682.70

Figure 18, Report of the Treasurer (1842), Source: Influence of nineteenth and early twentieth century railroad accounting on the development of modern accounting theory

It appears that by the end of the 1840's, however, the practice reporting receipts and expenditures for periodic intervals come more common. Some railroads followed the practice providing this information in financial reports covering both annual semiannual periods. For example, both the South Carolina Eastern Railroads disclosed receipts,

[60] Ibidem

expenditures, and profits surplus (on a cash basis) for the year in 1846 and also for month period in the year. The report of the South Carolina interesting because it contained, along with the usual traffic mileage statistics, two statements which were remarkedly an income statement and balance sheet. These statements are replicated in Figure 19. The South Carolina was thus one of the earliest railroads to recognize the distinction between capital and expense expenditures and the need for accruals. Note also the property statement item "By shares in the railroad," which is presumably treasury stock being carried in the accounts as an asset.

Gross receipts from all sources in first half year		$251,741.36
Ordinary current expenses for same time		193,592.21
Nett profits for the first half year		$ 58,149.15
Gross receipts from all sources second half year		$337,340.16
Ordinary current expenses for same time		224,578.96
Nett profits for second half year		$112,761.20
Nett profits for the year 1846		$170,910.35
Property Statement, December 31, 1846		
DR.		
To stock — for $35 per share on 34,800 shares		$2,610,000.00
" — instalments forfeited		312,417.65
To surplus income		40,708.52
To balance of indebtedness		2,765,090.74
Total		$5,728,216.91
CR.		
By purchase of Charleston and Hamburgh railroad, embracing road, machinery, &c.	$2,714,377.50	
By purchase of land attached thereto	59,741.30	
" of negroes	11,963.19	
		$2,736,081.99
By construction of Columbia branch		2,863,654.49
By lands purchased since January, 1844	$ 5,083.83	
By loss to credit Aiken lands	35.35	
		5,048.48
By negroes purchased since January, 1844		800.00
By suspense account		8,490.00
By rail iron purchased		15,773.97
By improvement of depots		8,680.29
" of property		30,437.49
By shares in the railroad		40.00
By amount due on pay-rolls and bills not charged, but forming part of balance of indebtedness		9,210.60
Total		$5,728,216.91

Figure 19, General Statement of Receipts and Expenditures (1846), Source: Influence of nineteenth and early twentieth century railroad accounting on the development of modern accounting theory

Such semiannual reporting was exceptional even though the Grand Trunk Railway in Canada was issuing semiannual financial reports in 1875 and continued the practice until as late as 1907. However, by the mid 1850's the annual reporting of receipts and expenditures along with numerous statistical tables was the prevalent practice in this country, a development which was no doubt influenced by the legal reporting requirements which existed in many states.

Another twenty years passed before railroad accountants became concerned with the need for matching expenses with revenues to arrive at a measure of income. Some of the early experiments with depreciation were, of course, attempts to do this, but such practices did not persist as has already been discussed. It was not until the 1870's that the railroads began to show evidence of the use of accruals in their financial statements. By this time many reports had grown to be 60-70 pages in length, and some would contain information, often statistical, from all the major divisions of the company - engineering, operations, and legal as well as financial. The earlier statements of receipts and expenditures had evolved into multiple statements representing both cash flow and earnings. For example, the Allegheny

Valley Railroad Company in its 1866 annual report provided both a "Statement of Earnings and Expenses" which was an analysis of the surplus account in "T" form, and a statement of "Receipts and Expenses" in tabular form. The former was apparently a predecessor of the modern income statement, and the latter of a modern funds flow statement.

The AT&SF was probably one of the first to attempt overhead allocations. In its 1874 report it provided a table which showed a distribution of all overhead expense between receipts from "freight service" and from "passenger service." This table was entitled "Division of Operating Accounts for the Year 1874" and was included for the last time in 1876 theory.

Early railroad accountants were among the first practitioners to be faced with the need for reporting to the public on the results of business operations and the custodianship of assets. In response to this need these accountants developed methods of disclosure from which arose many of the basic accounting concepts and principles of current day accounting theory.

Thus, accounting and disclosure practices in the railroad industry developed as a response to the economic environment created by the industrial revolution; another factor, however, which had a substantial effect on railroad accounting was the increasing power and regulation of governmental authorities.

Government attitudes toward regulation of the railroad companies evolved during the nineteenth century just as did the railroads' accounting policies. The railroads constituted not only the first industry to develop a need for public reporting, but they were also first which was required to operate under extensive governmental supervision and control. This control affected not only the routes they could build and the rates they could charge, but also their accounting policies as well.

Although railroad financial reports during the latter part of the nineteenth century typically contained voluminous detailed tables of statistics concerning shipments, expenditures, receipts, and services provided, the quality of disclosure was generally considered to be inadequate. Concerning this problem, the Railroad Gazette in 1893 made the following comments:

The annual report of a railroad is often a very blind document, and the average stockholder, taking one of these reports, generally gives up before he begins. He hears that reports are often made for the express purpose of concealing the truth, and he naturally concludes that his own managers are the kind of men that follow that method. There are two common ways of discouraging the inquiring stockholder. One is to make a very brief report, telling him, in effect, that the company's affairs are none of his business. The other is to tell him a great many facts, but to leave out those he wants, and to set upside down the most important of those which are shown. The latter is the more common way.[61]

Edwards states that the first of several railroad audits by Price, Waterhouse & Company was undertaken after the Norfolk & Western Railway was placed in receivership during this period. In another Railroad Gazette article in 1893, an unnamed auditor described some of the misleading accounting practices followed by many railroads, and then lamented that such notable railroad failures as those of the Reading and the Baltimore & Ohio could occur without being anticipated by stockholders and the public.

The auditor was not alone in his concern; sentiment in favor of financial regulation of common carriers grew steadily following the Panic of 1893. Congress extended the power of the Interstate Commerce Commission (ICC) in this area by the Elkins Amendment of 1903 and the Hepburn Act of 1906 which empowered the agency to prescribe a uniform chart of accounts for railroads.3839 In its annual report for 1908 the ICC said:

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[61] Boockholdt J.L. (1978), *Influence of nineteenth and early twentieth century railroad accounting on the development of modern accounting theory*, The Accounting Historians Journal, Spring, Vol. 5. No. 1 pp. 9-28

No court or commission or accountant or financial writer would for a moment consider that the present balance sheet statement purporting to give the "cost of property" suggests even in a remote degree, a reliable measure either of money invested or of present value. Thus, the balance sheets published by American railways are found to be inadequate. They are incapable of rendering the service which may rightly be demanded of them.[62]

The movement for additional regulation of railroads received added impetus in the period 1913-1917 as the ICC investigated a number of financial scandals in the industry. The Valuation Act of 1914 directed the Commission to conduct a detailed valuation of the assets of all common carriers affected by the Interstate Commerce Act. Finally in 1920 Congress enacted the Transportation Act, giving the ICC control over the issue of railroad securities and requiring it to prescribe changes in railroad asset valuation methods. In implementing this act, the Commission issued rules to prevent overcapitalization and stock watering and in 1926 required carriers to adopt depreciation methods of accounting for fixed assets. In justifying this requirement, the ICC pointed out that the retirement method, which had been in widespread use since the 1870's, could be used to avoid recapture of excess earnings. Furthermore, "investors must be protected against falsifying accounts and keeping up the appearance of earnings by postponing necessary replacements." Thus, the Congress succeeded in forcing the kind of disclosure in railroad financial reporting which accountants and industry observers had recognized as a need some thirty-five years earlier.

Many of the concepts which are basic to the practice of modern accounting began to appear among the railroads in the middle part of the nineteenth century because of their need to inform stockholders and creditors about their operations. Railroad accounting developed, however, not only in response to this economic environment but also to a political one as well. There is evidence that many railroad accounting policies were adopted, from their early periods of existence, because of the effects of governmental controls and reporting requirements and not from considerations of accounting theory. When it became apparent that the railroads would not voluntarily begin public reporting in a fashion that accurately represented their financial health, govern- mental agencies took action in order to achieve this goal. From ten years after the railroads were introduced in this country until well into the twentieth century, the governmental influence has been a primary force in the development of adequate railroad disclosure

The lesson of the railroad experience to modern day accountants is clear. Modern corporations, like the nineteenth century railroads, may be expected to exploit their accounting records to achieve their own interests, and often these interests will conflict with those of the public in general. If the profession of independent accountants cannot implement changes in current accounting policies to achieve a more realistic disclosure of economic health, then government agencies will attempt to make these changes instead.

In conclusion it is possible to analyzed through evidence how U.S. railroads, in the 1860s and 1870s, developed accounting procedures to aid them in their extensive planning and control procedures. Railroads handled a vastly greater number and dollar volume of transactions than had any previous business and, as a consequence, had to devise procedures to record and summarize an enormous number of cash transactions. These procedures also generated summary financial reports on the operations of the many sub-units within the large, geographically dispersed railroad companies. In addition to the financial summaries, the railroads developed a system of reporting operating statistics for evaluating and controlling the performance of their sub-units. Statistics such as cost per ton-mile and the operating ratio, as operating income divided by sales, were routinely reported for various sub-units and classes of service. Those practices represent an important step

[62] Bernhardt J. (1923), *The Interstate Commerce Commission: its history, activities and organization,* Gale, Making of modern law, p.29

towards the current literature of management and have a relevant role in the development of corporations.

In fact, the development in U.S. corporations has been well traced by the great importance of cost and management control to support the growth of large transportation, production, and distribution enterprises during the 1850-1925 period.

As seen above, the demand for information for internal planning and control apparently arose in the first half of the 19th century when firms, such as textile mills and railroads, had to devise internal administrative procedures to coordinate the multiple processes involved in the performance of the basic activity (the conversion of raw materials into finished goods by textile mills, the transportation of passengers and freight by the railroads).

Later in the 1880s, the newly formed mass distribution and mass production enterprises adapted the internal accounting reporting systems of the railroads to their own organizations. The nationwide wholesale and retail distributors produced highly detailed data on sales turnover by department and by geographic area, generating performance reports very similar to those that would be used 100 years later to monitor the performance of revenue centers in the firm. Mass production enterprises formed in the 1880s for the manufacture of tobacco products, matches, detergents, photographic film, and flour. Most important was the emergence of the metal-making and fabricating industries.

The scientific management movement in American industry provided a major impetus to the further development of cost accounting practices. The major figures in this movement were engineers who, by detailed job analyses and time and motion studies, determined "scientific" standards for the amount of labor and material required to produce a given unit of output. These standards were used to provide a basis for paying workers on a piece-work basis, and to determine bonuses for workers who were highly productive. The names associated with developing the scientific management approach include Frederick Taylor, Harrington Emerson, A. Hamilton Church, and Henry Towne.

This approach included not only the development of work standards but also a new form of organization, supplementing the traditional operating or line functions with staff function designed "not to accomplish work, but to set up standards and ideals, so that the line may work more efficiently." The "scientific management" advocates also started the practice of measuring and allocating overhead costs to products. Innovations came primarily in determining indirect costs or what was termed the "factory burden," and in allocating both indirect and direct (or prime) costs to each of the different products produced by a plant or factory so as to develop still more accurate unit costs. In a series of articles published in the Engineering Magazine in 1901, Alexander Church began to devise ways to account for a machine's "idle time," for money lost when machines were not in use. Henry Gantt and others then developed methods of obtaining standard costs based on standard volume of throughput by determining standard costs based on a standard volume of, say, 80 percent of capacity; these men defined the increased unit costs of running below standard volume as "unabsorbed burden" and decreased unit costs over that volume as "over-absorbed burden". The practice of allocating fixed capital costs to products or to periods, however, had still not emerged. Nor did they concern themselves with the problem of depreciation in determining their capital account. The reason was that, until well into the twentieth century, nearly all large industrial firms continued to use replacement accounting, which their managers had borrowed from the railroads they defined profits as the difference between earnings and expenses, and the latter included repairs and renewal.

The development of standard costs also came to fruition during this time. In a series of articles in 1908 and 1909, Harrington Emerson clearly describes the value of standard costing for timely planning and control. The literature of standard costing continued to evolve so that by 1918, G. Charter Harrison published a series of articles in Industrial Management, exhibiting a sureness of touch and a comprehensiveness in their treatment which shows standard costing to have left the experimental stage and to have attained the

status of established practice. In these articles, he produced the first set of formulas for the analysis of cost variances. In addition to these innovations by practicing managers and engineers, extensive discussions on cost accounting concepts appeared in textbooks, monographs and articles during this time. Factory Accounting by Garcke and Fells, first published in 1887, integrated cost accounts into the firm's double-entry financial accounting system and clearly identified a position that fixed overhead costs should not be allocated to production costs. To distribute the charges over the articles manufactured would, therefore, have the effect of disproportionately reducing the cost of production with every increase, and the reverse with every diminution of business. Such a result is greatly to be deprecated, as tending neither to economy of management nor to accuracy in estimating for contracts. The principals of a business can always judge what percentage of gross profits upon cost is necessary to cover fixed establishment charges and interest on capital. The use of breakeven charts to express the variation of cost with output could be found in writings in England and the United States in 1903 and 1904. Vangermeesch summarizes the extensive writings of A. Hamilton Church, an insightful observer of early twentieth-century cost accounting practices. Church disagreed with the practice of allocating all overhead based on direct labor cost:

We find that as against $100 direct wages on order, we have an indirect expenditure of $59, or in other terms, our shop establishment charges are 59 percent of direct wages in that shop for the period in question. This is, of course very simple. It is also as usually worked very inexact. It is true that as regards the output of the shop as a whole a fair idea is obtained of the general cost of the work. And in the case of a shop with machines all of a size and kind, performing practically identical operations by means of a fairly average wages rate, it is not alarmingly incorrect. If, however, we apply this method to a shop in which large and small machines, highly paid and cheap labor, heavy castings and small parts, are all in operation together, then the result, unless measures are taken to supplement it, is no longer trustworthy. [63]

In commenting on the importance of accounting for overhead costs directly rather than averaging them together and allocating them proportional to direct labor, Church observes:

These shop charges (overhead) frequently amount to 100 percent, 125 percent, and even much more of the direct wages. It is therefore often actually more important that they should be correct than that the actual wages cost should be correct.

Church's admonitions against loading all overhead costs onto direct labor, though, seem to have gone largely unheeded even in today's manufacturing environment where direct labor can represent less than ten or twenty percent of the value added to a product in the manufacturing process. J. Maurice Clark at the University of Chicago made one of the few academic contributions to the emerging cost accounting literature during this time. Clark provides an extensive discussion of the nature of overhead costs and their use in managerial decisions. Driven by a concern with the regulation of railroads and public utilities and with the broader societal implications of cost measurement, Clark examines in depth the nature of overhead costs. Many cost concepts that are widely used today, such as escapable or avoidable overhead, sunk costs, incremental or differential costs, and the relevant time period for determining whether a cost is fixed or variable, can be found in Clark's book. An entire chapter is devoted to a discussion of "Different Costs for Different Purposes," a concept illustrated by considering the changing definition of cost in nine different decisions to be made about a plant and its output. The notion of opportunity cost is implied by the following statement: for certain purposes cost is not a mere present fact but depends on the alternative offered. Also, Clark proposes that a statistical method be used to estimate cost behavior. This would be an alternative to the accountant's somewhat arbitrary allocations,

[63] Davidson, S. (1963), "The Day of Reckoning: Accounting Theory and Management Analysis," Journal of Accounting Research, pp. 117-126

or subjective estimates, of fixed and variable components of total costs. He notes the possibility of both time-series and cross-sectional statistical analyses:

A concern may watch the monthly fluctuations of its expenses and compare them with the fluctuations of output, in order to learn what the differential cost of added output is. Or it may be possible to compare the costs of different establishments some of which are integrated and others of which are not (for example, sugar factories which buy their beets and factories which raise their own).

and the advantages of statistical over judgmental analysis:

The statistical method has a further advantage in that it catches everything which expert judgment might overlook and corrects automatically any possible fallacies due to the semi-intuitive methods of arriving at conclusions. [64]

An excellent discussion of the dangers and limitations of statistical analyses also is presented, a discussion that could well be incorporated in many of today's cost accounting texts.' Finally, Clark understood the importance of keeping the cost accounting information separate from the financial accounting system.

Undoubtedly, the ultimate solution lies in the development of systems of cost analysis which shall be separate from the formal books of account, though based on the same data. [65]

Thus, by 1925 sophisticated cost accounting theories and practices had been developed. Many of these innovations were being used to improve the efficiencies of enterprises actively engaged in the mass production of standard products with relatively high direct labor content. Unlike the situation today, the cost accounting, capital accounting, and financial accounting systems were kept separately, with the cost accounting system typically designed for and operated by the manufacturing departments. Cost information was used to assess operating efficiencies, to aid in pricing decisions, and to control and motivate worker performance. The emphasis was on job and factory efficiency, not on the commercial success of the overall corporation. The demand for a management accounting system to facilitate the control and coordination of a firm's diverse activities did not occur until the appearance of vertically integrated, multiactivity firms. The emergence of these firms in the early 1900s probably marked the start of modern managerial control practices.

Both Chandler and Johnson look to the DuPont Company as the innovator in developing modern managerial control systems.

In 1903, three Du Pont cousins consolidated their small enterprises with many other small single-unit family firms. They then completely reorganized the American explosives industry and installed an organizational structure that incorporated the "best practice" of the day. The highly rational managers at DuPont continued to perfect these techniques, so that by 1910 that company was employing nearly all the basic methods that are currently used in managing big business. The DuPont Powder Company became a centrally managed enterprise coordinating through its own departments most of the manufacturing and selling activities formerly mediated through the market by scores of specialized firms. A centralized accounting system was indispensable to the DuPont Powder Company's elaborate department structure. Information provided by the Powder Company's centralized accounting system enabled top management to carry out two basic activities that comprised the task of planning: the allocation of new investment among competing economic activities (including the maintenance of working capital) and the financing of new capital requirements.[66] The development of vertically integrated, multi-activity organizations for mass production and mass distribution provided the potential for dramatic breakthroughs

[64] Kaplan R. S., (1984), The Evolution of Management Accounting, American Accounting Association, Vol 59, No, 3, pp. 390-418

[65] Ibidem

[66] Johnson H.T., (1975), Management Accounting in Early Integrated Industrial: E.I. duPont de Nemours Powder Company, Business History Review, pp. 184-204

in efficiency. The complexity and diversity of these enterprises, however, could have caused the firms to fail due to lack of coordination, planning, and control, had not new organizational forms evolved to allow senior managers to guide their operations. One innovation was to develop the functional or unitary form of organization that is still characteristic of many contemporary firms. Firms were decentralized into separate departments: manufacturing, sales, finance, and purchasing. The managers of each department became specialists in that area and could pursue strategies that maximized the performance of their departments and the entire firm. The senior managers, freed from day-to-day operating responsibility, could focus more on coordinating the firm's diverse activities and developing its long-term strategies including capital allocation and financing.
Johnson provides an excellent description of the innovative managerial accounting system established by Pierre du Pont, Donaldson Brown, and Alfred Sloan at General Motors in the early 1920s. The following summary indicates the scope and impact of the system. GM's management accounting system did three things to help management accomplish "centralized control with decentralized responsibility." [67]
First, it provided an annual operating forecast that compared each division's ex ante operating goals with top management's financial goals. This forecast made it possible for top management to coordinate each division's expected performance with company-wide financial policy. Second, the management accounting system provided sales reports and flexible budgets that indicated promptly if actual results were deviating from planned results. They specified, furthermore, the adjustments to current operations that division managers should make to achieve their expected performance goals. The sales reports and the advanced flexible budget system provided, then, for control of each division's actual performance. Third, the management accounting system allowed top management to allocate both resources and0 managerial compensation among divisions on the basis of uniform performance criteria. This simultaneously encouraged a high degree of automatic compliance with company-wide financial goals and greatly increased the division manager's decentralized autonomy.
From this summary, it is clear that the organizational form and reporting and evaluation system for virtually all modem enterprises had evolved in General Motors by 1923-60 years. First, the goal of General Motors was to earn an average satisfactory Return on Investment over an entire business cycle, not to achieve annual increases in earnings. There was ample recognition that a below-average ROI would be earned in a year when car demand was slack, to be offset by an above-average ROI in an exceptionally strong sales year. Second, Donaldson Brown devised an ingenious pricing formula to determine a target price that would yield the desired ROI when production and sales were at a "standard" or "normal" volume, defined to be 80 percent of capacity. This formula recognized not only the investment in fixed plant and equipment but also the investment in working capital, especially accounts receivable and inventory, which Brown assumed to vary with the level of production and sales activity. Donaldson Brown's formula, devised in the early 1920s, is as good an approach to a target, cost-based pricing scheme as any that can be found today.
Johnson notes that the Brown pricing formula was not followed blindly: GM did not use standard price data to determine the actual prices to be charged during any given model year. Top management professed the position that the proposed price for any particular year was determined in the competitive marketplace. If the proposed price for any model fell below the dollar equivalent of the standard price ratio, and if the gap between these two prices could not be attributed to short-run competitive pressures, then top management

[67] Kaplan R. S. (1984), The Evolution of Management Accounting, American Accounting Association, Vol 59, No, 3, pp. 390-418

requested a division manager to reduce his proposed operating cost.[68] Thus, the pricing formula provided a powerful link between a division's short-term operating plan and the top management's financial strategy. An additional feature of the Brown pricing formula is that depreciation is included as a fixed expense. Just when this allocation became part of the overall management control scheme is not clear from reading the secondary sources available. Perhaps the institution of the U.S. federal income tax before and during World War I made this accounting treatment more important and visible to senior U.S. managers than it had been prior to 1910. The third highlight of the GM system is an explicit incentive and profit-sharing plan for the senior managers of the corporation. The practice of a formula-based incentive plan, widespread in today's U.S. corporations, can be traced back to the innovative organization designed by Pierre du Pont and Alfred Sloan:

Before we had the Bonus Plan in operation throughout the corporation, one of the obstacles to integrating the various decentralized divisions was the fact that key executives had little incentive to think in terms of welfare of the whole corporation. Under the incentive system in operation before 1918, a small number of division managers had contracts providing them with a stated share of profits of their own divisions, irrespective of how much the corporation as a whole earned. Inevitably, this system exaggerated the self-interest of each division at the expense of the interest of the corporation itself. It was even possible for a division manager to act contrary to the interests of the corporation in his effort to maximize his own division's profits. The Bonus Plan established the concept of corporate profit in place of divisional profits. At first total bonus awards were limited to 10 percent of the net earnings after taxes and after a 6 percent return (on net capital employed). [69]

The GM bonus plan was administered through an elaborate process designed to provide rewards to those employees and managers who had made substantial contributions to the company's performance. While guided by accounting measures, such as divisional return on invested capital, the system involved a systematic review of each individual's performance and also considered special circumstances in a division. Fourth, a sophisticated market-based transfer pricing system was established among General Motors' many operating divisions. The pricing of interdivisional transfers arose initially in the functional organization of DuPont. For DuPont, at about 1905, it emerged that:

Each of the company's mills manufactured many of the intermediate products, such as acids, that were used to make explosives. An important question, therefore, was whether money could be saved by purchasing these intermediate products from outside firms instead of making them in the Powder Company's mills. The Powder Company's cost figures for intermediate products could not be compared with outside market prices, however, because mill overhead and general administrative charges were allocated only to finished goods and not to intermediate products. This accounting policy caused an understatement of the cost of company-made intermediate products. [70]

Alfred Sloan, ten years later, had already worked out the market-based solution to this problem. As president and chief operating officer of United Motors, Sloan reports:

My divisions in the United Motors Corporation had sold both to outside customers and to their allied divisions at the market price.

When the United Motors group was brought into the General Motors Corporation in late 1918, I found that if I followed the prevailing practice, I would no longer be able to determine the rate of return on investment for these accessory divisions individually, or as

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[68] Johnson H.T. (1978), Management Accounting in an Early Multidivisional Organization: General Motors in the 1920s, Business History Review, pp. 490-517.

[69] Kaplan R. S. (1984), The Evolution of Management Accounting, American Accounting Association, Vol 59, No, 3, pp. 390-418

[70] Johnson H.T. (1975), Management Accounting in Early Integrated Industrial: E.I. duPont de Nemours Powder Company, 1903-1912, Business History Review, pp. 184-204

a group. At that time, material within General Motors was passing from one operating division to another at cost plus some predetermined percentage. [71]

Sloan recommended to Durant, then president of GM:

For exclusively interdepartmental transactions the starting point should be cost plus some predetermined rate of return, but only as a guide. To avoid the possibility of protecting a supplying division which might be a high-cost producer, I recommend a number of steps involving analysis of the operation and comparison with outside competitive production where possible. [72]

While Sloan does not relate what transfer price practice, he implemented upon becoming chief executive at General Motors, Donaldson Brown provided a forceful description of GM's policy:

The question of pricing product from one division to another is of great importance. Unless a true competitive situation is preserved, as to prices, there is no basis upon which the performance of the divisions can be measured. No division is required absolutely to purchase products from another division. In their interrelation they are encouraged to deal just as they would with outsiders. The independent purchaser buying products from any of our divisions is assured that prices to it are exactly in line with prices charged our own car divisions. Where there are no substantial sales outside, such as would establish a competitive picture-at times partial requirements are actually purchased from outside sources so as to perfect the competitive situation. [73]

In summary, by 1925 DuPont and General Motors had developed many of today's managerial control practices: decentralization via a functional or multi-divisional organization, the ROI performance measure, formal capital appropriation procedures, budgeting and planning cycles, flexible budgets, target ROI pricing based on standard volume, incentive and profit-sharing plans, and a market-based transfer price policy.

[71] Kaplan R. S. (1984), The Evolution of Management Accounting, American Accounting Association, Vol 59, No, 3, pp. 390-418

[72] Ibidem

[73] Ibidem

5. Discussion and Conclusion

When it is discussed the topic of management control, it is important to relate the accounting practice employed based on the historical period examined.
Starting in chronological order with the ancient civilization of Babylonians and Egyptians, the most important features to highlight respect to the modern societies is the lack of an economic system. Of course, they carry out a set of activities as current societies and they discussed these activities in their talk and their writing. What they did not do, however, was to combine these activities conceptually into a unit, in parsonian terms into 'a differentiated sub-system'.
Babylonians used the tokens practice to enact a management control method able to both maintain behaviour consistent, through the stewardship function, and transmitting economic information with the negotiability of clay tokens.
Egyptians adopted monitoring systems in the production process which has the same aim; however, the invention of writing, and the consequent institution of the role of scribe has made possible to innovate the management practice respect to the Mesopotamians. For examples, the accounting documents used covered a wide range of forms, including journals, ledgers, lists and tables with multiple columns. Dates of transactions or entries were very clearly stated including the day, month, season, and year.
The following period is characterized by the Greek and Romans societies which contribute to the accounting history through two main innovations: a coinage system enforced by the Roman Empire and the development of a primitive bookkeeping system.
The focus of management accounting was still the stewardship function based on narrative recording despite there were all the requisite for an advanced bookkeeping method: the abacus, an economic system, and the writing practice.
The reason behind these rough forms of bookkeeping is on the social structure which relies on military campaign and never encourage the development of an entrepreneurial activity.
It is during the Middle Ages in the Northern Italy area that the mercantile class reach an economic and political power never recorded in other parts of Europe. This social enrichment creates the necessity by entrepreneur to record and control more complex business activity. It entailed the invention of the double entry bookkeeping systems, conceive in the practice by merchants and then studied for centuries thanks to the publication of Friar Luca Pacioli on his book "Summa de Arithmetica, geometria, proportioni et proportionalità".
This period is important because it marks the management control literature. Control systems were suffering major changes both in the contents and the form. From the fifteenth century onwards, the variations would be consisting in innovate a define and written practice, adapting it to the needs of always more complex organizations.
Once Luca Pacioli published its book all the major countries in Europe adopted the double entry bookkeeping method. Then, during the industrialization this technique has become the central idea of capital itself creating new categories for classifying and evaluating business transactions.
It may be noticed how the accounting is linked to society and that, as it evolves, the accounting practice also evolves. Then, it may be very useful both for the accounting history and for the management practice studied the social and technological framework. The issuing and discussing of accounting principles is becoming always more challenging for experts and academics; therefore, a deep knowledge of the society which they impact could simplify this process, smoothing the difference among countries.

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