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# Early Traces of Materiality and Relevance Principles in Luca Pacioli's Tractatus XI

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**Abstract**

This paper aims to investigate the materiality and relevance principles, as observed from a historical perspective, specifically as shown in the Tractatus XI of Summa de Arithmetica, Geometria, Proportioni et Proportionalità, printed in Venezia in AD 1494 by Franciscan friar Luca Pacioli, a real cornerstone for bookkeeping literature. Materiality and relevance principles are today fundamental to manage information and are discriminating for information acceptance. This research questions about how these principles are present in the Pacioli' treatise. Seven fragments from the Tractatus, within which traces of relevance and materiality can be found, are extracted and analyzed under the IASB theoretical framework and their historical background.

This paper contributes to the literature by investigating the principles through a historical approach, that is selected to explore the topic and to argue about the possible causes for which it is possible to find early traces of relevance and materiality in Pacioli's work. Moreover, this research is a contribution to keep the debate open on the need for the participation of the academic world and practitioner, in the standard-setting process, that is currently lacking.

**Keywords:** accounting principles, relevance, materiality, Luca Pacioli

## 1. Introduction

This paper aims to investigate the materiality and relevance principles, as observed from a historical perspective, specifically as shown in the Tractatus XI of Summa de Arithmetica, Geometria, Proportioni et Proportionalità, printed in Venice in 1494 AD by the Franciscan friar Luca Pacioli. As well known the Tractatus is a real cornerstone for bookkeeping literature and is considered a powerful and essential instrument for the management of a business and the relevance on commerce. The Summa achieved full success with 2.000 copies probably printed in 1494 (Sangster, 2007), and the friar's work continues to strengthen the world's interest (Note 1). By adopting a uniform method of bookkeeping the merchants were able to control their business, record transaction, and inventory and audit their books. The Summa has been studied by accountant scholars through six hundred years since for the first time are fully exposed the basis of the double-entry bookkeeping using the Venetian approach. A great deal has been written about the friar's work, but surprisingly an analysis focused on the relevance and materiality principles within the Tractatus XI remains a fully uninvestigated aspect. In the same way, the literature has not revealed and consequently interpreted that Pacioli wrote about materiality and relevance seven times in his Tractatus that is only twenty-six pages long.

Materiality and relevance principles are today fundamental to manage information and are discriminating for information acceptance. For these reasons, they appear as two of the pillars for balance-sheets. Though they are two fundamental and iconic reporting concepts, strictly related to a fair data representation (Edgley, Jones, & Atkins, 2015), little was written about them until the Second World War despite the familiarity and historicity of this concept may easily be overlooked (Edgley, 2014). Nowadays materiality and relevance are both defined in terms of what influences or makes a difference to a decision-maker.

The Accounting Principles, as materiality and relevance, since their first appearance attempted to represent the guidelines to compile financial statements and provide the interpretative keys for it. Through a complex process several entities, as IASB, tried to fix accounting standards aiming to provide for the practitioner's community that guidelines with this interpretative common goal, since the standards have to be clearly based on consistent principles (Dennis, 2008). Analyzing the products of the various committees, it has been noticed that little research has examined the content and structure of accounting standards (Bradbury & Schröder, 2012) and if on one hand, the issue on the principle versus rules in the accounting standards is important and open (Benston et al., 2006), on the other hand sometimes the same accounting principles on which the standards are based on are not completely clear and well defined. (Bradbury & Schröder, 2012).

Since this gap in the literature has been identified, i.e. the lack of a study of the concepts of materiality and relevance within the well-known Tractatus XI, and considering the importance of the concepts of relevance and materiality today, our research question is whether it is possible to identify these two concepts within Tractatus XI for the first time and whether it is possible to identify the reasons why these two concepts emerged. Identifying the origin and possible causes of these two concepts can certainly help to increase their understanding to better adapt them to our current and increasing information management need. We contribute to the literature by investigating the materiality and relevance principles through a historical approach, that is selected to explore the topic and to argue about the possible causes for which it is possible to find early traces of relevance and materiality in Pacioli's work. This research is relevant considering that a debate about the accounting standards is still open, and the need for the participation of the academic world in the standard-setting process, that is currently lacking (Näsi, Saccon, Wüstemann, & Walton, 2010).

The work is developed in the following way. After a brief overview of the two principles investigated, a historical framework of the author's works and context is presented. The historical background will be useful to argue why the principles of relevance and materiality may have emerged under certain conditions and why they are exposed in the Pacioli's treatise. Subsequently, seven fragments in which we found the early traces of the two principles, will be highlighted from the only primary sources constituted by the Tractatus and will be analyzed under the IASB theoretical framework and the historical background. The last paragraph concludes the work.

## 2. Relevance and Materiality Principles: Theoretical Framework and IASB Definition

Tractatus XI makes explicit reference to the information function and management of information, before going to analyze the fragments of the original text of Pacioli it seems convenient to frame the aspects of relevance, materiality, and recognition of information in the way they are used and conceived today.

During business management activity, it is essential to know to decide. Since any organization, both private or public, can be managed through budgeting statements and reports, accountancy and final balance statement are the key instruments for economic and financial information (Torri, 1987). All the various decision-makers who supply the capital and invest it require information, for valuing alternative investments, to measure the performance and control the management. Even in the absence of external capital providers, companies will design their accounting systems for running their business (Zimmerman, 2015). The truthfulness of the information and, necessarily, the correctness of the balance sheet data became of great importance through the accounting survey, whose object is to study the representation of the evolution of the company's activities using quantitative language (D'Atri, 1994). Moreover, a state of unclearness can be a favorable element for possible frauds or voluntary distortions of data as pointed out by Messier et al. (2005): in particular, the concept of materiality is sometimes abused by companies and their auditors to "manage" earnings (Messier, William, Martinov-Bennie, & Eilifsen., 2005). From the point of view of a Rational Management any organization, both private or public, can be managed through three macro-phases, Planning, Execution and Controlling, that are cyclic and backed by several documents, in particular budgeting statements and reports, accountancy and final balance statement, that will become the key instrument for economic and financial information. (Rainero, Puddu, Modarelli, & Migliavacca, 2018). During the Execution phase, the recognition takes place, that is the process of capturing for inclusion in the statement of financial position or performance an item, that meets the definition of one of the elements of financial statements, either alone or in aggregation with other items, in words and by a monetary amount (International Accounting Standards Board, 2018).

Given the impact that information has on fair representation, it is essential to consider the quality of incoming information. There are risk factors that need to be taken into account, particularly when influencing the choice of relevant information, for instance, excessive caution or optimism and excessive exposure tightness as important factors that can distort the significance of the information (Hinna, 1986). The principles of relevance and materiality, in their current conception, are related to the capability of information to impact decisions. In this sense, they are two principles strongly incardinated in the decision-making process, which are placed in the broader context of the problem of a true and fair disclosure of corporate facts through the financial statements. In this direction the Accounting Principles, since their first appearance attempted to represent the guidelines to compile financial statements and, on the other hand, the interpretative keys for it. To regulate financial reporting practices, for the sake of their uniformity, intelligibility, and the protection of stakeholders outside the company, the accountant community was faced with the challenge of setting standards of drafting and the principles on which they are based. As a result of this effort, which now spans more than a century, several committees have been formed since the Second World War to determine these standards, such as the Steering Accounting Standard Committee in the UK, the Financial Accounting Standard Board in the USA and the Australian Accounting Association in Australia. As a consequence accounting standards have been increasingly codified, in particular, the meaning of true and fair view and Generally Accepted Accounting Principles (Ó hÓgartaigh, 2008) through a process that appears not particularly influenced by the elite of the firms (Bamber & McMeeking, 2016).

To this end, it is important to underline that the fundamental objective is to communicate economic measurements and information about the resources and performance of the organization useful for those who have a reasonable right to obtain them. Re-connecting today's views with those of the subject matter of this paper in a contemporary key, it is necessary to stress that to be useful and fulfill its fundamental function. Accounting information must have the following characteristics (Accounting Standard Steering Committee, 1975):

- Relevance
- Intelligibility
- Reliability
- Completeness
- Objectivity
- Timeliness
- Comparability

As seen, the principle of relevance is the first displayed by the Accounting Standard Steering Committee. Nowadays IASB refers to relevance and materiality in terms of what influences or makes a difference to a decision-maker, and materiality is seen as a sub-condition of relevance (Gregoriou & Gaber, 2006).

After having examined the principles of relevance and materiality in relation to business processes, to the collection of information and to the influence on stakeholders, we recall how relevance and materiality are nowadays framed and expressed by the IASB and by the Conceptual Framework (International Accounting Standards Board [IASB], 2018*a*).

In the Conceptual Framework, information is referred to as relevant, if it "is capable of making a difference in the decisions made by users. Information may be capable of making a difference in a decision even if some users choose not to take advantage of it or are already aware of it from other sources" (IASB, 2018*a*).

With regards to materiality, the most recent version of the IFRS Practice Statement, indicates that the definition of Material (Amendments to IAS 1 and IAS 8)) in the following manner:

"Information is material if omitting, misstating or obscuring it could reasonably be expected to influence decisions that the primary users of general purpose financial statements make on the basis of those financial statements, which provide financial information about a specific reporting entity." and "Materiality depends on the nature or magnitude of information or both. An entity assesses whether information, either individually or in combination with other information, is material in the context of its financial statements taken as a whole." (International Accounting Standards Board [IASB], 2018b).

Concerning the last amendments accepted, it is interesting to note that the feedback to previous versions reported that difficulties in making materiality judgments were generally behavioral rather than related to the definition of material, and as consequence, the Board concluded that these difficulties could best be addressed by providing guidance to help entities make materiality judgments. (IASB, 2018a)

Even if materiality might be expressed using thresholds as a percentage of a base amount, a lack of consensus exists in materiality thresholds between auditors, prepares and users, indicating the need for materiality guidelines (Iselin & Iskandar, 2000). The same authors reveal that although in Australia a materiality threshold guideline for financial statements existed, in practice its use was biased by several factors (Iselin & Iskandar, 2000). It's not surprising that the Amendments to the 2018 Conceptual Framework for Financial Reporting added:

"…materiality is an entity-specific aspect of relevance based on the nature or magnitude, or both, of the items to which the information relates in the context of an individual entity's financial report. Consequently, the Board cannot specify a uniform quantitative threshold for materiality or predetermine what could be material in a particular situation." (IASB, 2018*b*).

With regard to the application aspects of the above, it is useful to report for our analysis that" Not recognizing an item that meets the definition of one of the elements makes the statement of financial position and the statement(s) of financial performance less complete and can exclude useful information from financial statements. On the other hand, in some circumstances, recognizing some items that meet the definition of one of the elements would not provide useful information. An asset or liability is recognized only if recognition of that asset or liability and of any resulting income, expenses, or changes in equity provides users of financial statements with information that is useful" (IASB, 2018*a*).

## 3. Historical Background

To understand an event of the past it is good to place it within its daily structures, thus life is made up of men and things, things and men (Braudel, 1979). To correctly outline the role of the Tractatus XI within the discipline of accounting, it is worth remembering that the years in which Pacioli lived were marked by a strong break, both in the economic, political and ideological sense, since it was a world far from the way we conceive it today. In the transition between 1400 and 1500, there was a strong need to understand and explain nature's phenomena, whether the explanation was provided by science, mathematics philosophy, or even magic. It was the Renaissance, the moment of combining science with practice. It was a period of research and study consumed in the foundations of the shop, of the trade from all over the world, far from the construction that we have made for generations. The Renaissance society was increasingly complex and urbanized, with ever greater resources available and wider markets and it was in the early transformation stage from money-lending into commercial capitalism (Pollard, 1963). This impressive change was made on the basis of the expanding nature of commerce in the 12th and 13th centuries and was based on and allowed by the increasing of banks and their creation and maintenance of a ''bank money'' based cashless economy (Sangster, 2016).

With the changing business and corporate world, we would say today, incoming and outgoing information needs also change. The sizes of data become more important, the number of transactions increases, as well as the complexity of the market and business combinations, implying an increasing need for information system management and consequently for the evolution of the accounting techniques. This evolution went in the direction of the double-entry book-keeping system, most probably developed by the banks themselves, evolved to maintain a historical record that was accurate, complete, verifiable, and easily controlled. (Sangster, 2016). As proof of the complexity reached by the accounting techniques, many traces of complete writings in double-entry have come down to us. One among all is the "domestic and merchant company of the Barbarigo" (Melis, 1945) in which the analytical double-entry appears in a complete and correct form (Besta, 1932), through an uninterrupted series of notebooks kept since 1430 and for over a century.

In this context, the role of accountants was becoming more important, and the problem of their education and training for specific education in merchant art was recognized. Such formation could be carried out through tutors or within the abacus schools, private or set up by the municipalities themselves. To understand the spread of the phenomenon, it is reported that only in Florence in 1339 AD, on a population of 90,000 inhabitants, there were about 1,200 young students of abacus and arithmetic, divided into six schools (Villani, 1991). Alongside the schools dedicated to education, we find hundreds of Treaties of Abacus (Note 2), Arithmetic, and Mercature, of anonymous or known authors, often written by the same teachers working in the schools (Franci & Toti Rigatelli, 1982). The Treatises of Abacus take shape from the first of them, the Liber Abaci (Note 3) written in 1202 by Leonardo Fibonacci. Fibonacci, above the undoubted merit of exposing the Arabic numbering to the Western world, showed how to perform easily the calculation by the only use of writing itself, actually surpassing the instrument of the Abacus. Curiously, Fibonacci calls his text "The Book of the Abacus", while its contents make it an obsolete instrument. Fibonacci probably calls it in such a way to make the public aware that it is a book about calculations. Without going into details, from Fibonacci's text onwards, many texts on the art of trade or arithmetic present some or all the same arguments aiming to introduce and solve the typical problems that merchants had to face daily: mathematical problems, setting up of companies, exchanging coins, bartering of goods and so on.

Among the various teachers and authors of treatises certainly emerges the figure of the friar Luca Pacioli. He, went to Venice very young and lived with the merchant Antonio de Rompiasi, being his children's' teacher. In his house, he became familiar with the accounting records and everything related to the merchants' world. He also studied at Domenico Bragadino's school, a public reader of mathematics. He always taught mathematics, at first in Perugia, in Padova and then in Milan from 1496 to 1499 (Antoni, 1974) where he met Ludovico il Moro, Leonardo da Vinci, and the political establishment of the time (Oelker, 1941). Lately, he became a professor in the papal Archiginnasio in Rome (Antoni, 1974). As well as teaching he was the author of several mathematical books, but his most famous work was certainly the Summa de Arithmetica, Proportione et Proportionalia, printed in Venice in 1494. The Summa de Arithmetica represents the expression of all the mathematical knowledge available at the time of Pacioli and its success was achieved immediately by the Renaissance public. The Summa includes the very famous Tractatus XI that has the undisputed merit of having made the double-entry system known to the public. Even if today it is well known, as we have seen before, that Pacioli was not the creator of the double-entry book-keeping and that Tractatus XI is not the first written text in which it appears, Pacioli certainly deserves the merit of having grasped the importance of divulging the double-entry method through a systematic exposition. For the clarity of his exposition, for the practicality of his work, and for the high profile of the public to whom he addressed himself, the main consequence of Pacioli's efforts to disseminate knowledge of double-entry book-keeping is that it became public knowledge (Lee, 2008), in particular trough merchant class. As mentioned above, the Summa is part of a literary genre of technical and scientific dissemination for the use of merchants, and it was designed specifically for them (Sangster, Stoner, & McCarthy, 2008).

The presence of Tractus XI within the Summa, which was a work of dissemination of mathematical knowledge, suggests that Pacioli felt the need for the men of the beginning of the Renaissance, for systematic dissemination of the most current and advanced mercantile techniques and business management existing at the time. This knowledge was certainly represented by double-entry book-keeping and advanced Renaissance banking techniques. More in detail, as we will see in the next paragraph, the arguments present in Tractatus XI indicate the degree of maturity of the techniques of that time and show us that the management of information, related to the management of accounts, was a perceived and widespread problem for the Renaissance merchant.

## 4. Traces of Relevance and Materiality in the Tractatus XI

Pacioli wrote the Tractatus XI, involving the accounting techniques for the preparation of the financial statements obtained through a fair representation of the company events since the "merchant must be a good accountant and ready to compute” (Note 4) (Pacioli, 1494). These financial statements were intended to provide information to the merchant, the stakeholder entitled to the information. In fact, for Pacioli the final purpose of the accounting is to know the variation in the assets of the merchant and his activity: “He has all the matters at his disposal so that he can quickly have the information of each one, whether they're on debit or credit, you don't need to know nothing more” (Pacioli, 1494). This purpose corresponds to a function of information in the interest of the merchant (Ciambotti, Cesaroni, Gamba, & Montebelli, 2010).

Thus accounting consists of data input decisions, a data recording system (book-keeping system), and the provision of useful information to users (Britton, 2013), the problem of the relevance and materiality of the information itself becomes predominant, even for Pacioli. In the light of what has been said so far, let's analyze what we have extracted from his Tractatus.

1) – Chapter II “But first it is better to make his diligent Inventory in this way, always recorded on a sheet, or book aside, what you have of furniture and buildings, always starting from the highest value items and most labile to lose”

2) – Chapter XX “And because at a time you will not know precisely the number of ginger baskets that arrive, but it is not a problem, because in the load you make up for what is missing, and what there is more in that of the case will be missing; in the same way recording the packages of sugar because both should be recorded under sugar but you do not record the number of packages or the weight, because you cannot take into account every little straw”

3) – Chapter XXII “Beyond all the things that have been said, you should have in all your books these items, that are: merchandise expenses, ordinary house expenses, extraordinary expenses, entry, and exit item and a gain and loss item. These items are absolutely necessary for every company to be able to always know their capital, and how the business proceeds; and more we will clarify how they should be recorded in books. The item merchandise expenses are held out of respect because not always every scrap can be put immediately in the item of the stuff that you sell or buy”

4) – Chapter XXII “As it happens to pay porters and employees to the weight and packers and expenses of boats and luggage and so on, to whom a penny to whom two ... it would be long to check in detail, and it’s no worth making the effort since de minimis non curat praetor (Note 5) (the praetor does not care about small matters)”

5) – Chapter XXII “When important expenses occur, such as wheat and wine, wood records in books ... while many people are used to recording items for themselves, so that at the end of the year so they can easily know how much they consume. But for small expenses, such as meat and fish, barbers and ferries, you want to keep one or two gold ducats in a separate bag, because it is not possible to keep them in account one by one.”

6) – Chapter XXXVI “All the jewels and goods that you have earned, inherited, or received as a gift, that you want to estimate in cash, record in the book separately; and you will mark yourself as a creditor for each item. But note that these items have to be greater than ten gold ducats each because small things of little value are not registered

in the Book”

7) – Chapter XXXVI “All your household or workshop items recorded ordered and separated, i.e. all iron with iron items, leaving empty spaces for any additions, to mark those that may be lost, or sold, or donated, or broken; but this does not mean small items of little value” (Pacioli, 1494).

Table 1. Pacioli’s references on non-relevant values. Source: our elaboration on the original text of the Summa

| Ref. | Pacioli’s fragments Synthesis | Our interpretation |
|---|---|---|
| 1. | Always starting from the highest value items | Indication to record assets according to economic values by descending the hierarchy |
| 2. | Because you cannot take into account every little straw | Indication not to record minimum values |
| 3. | Because not always every scrap can be put immediately in the item of the stuff that you sell or buy | Indication not to record minimum values |
| 4. | Praetor does not care about small matters | Indication not to record minimum values |
| 5. | But for small expenses… you want to keep one or two gold ducats …for it is not possible to keep them in account one by one | Indication not to record minimum values below a threshold |
| 6. | These items are meant not to be at least ten gold ducats each because small things of little value are not registered in the Book | Indication not to record minimum values below a threshold value |
| 7. | But this does not mean small items of little value | Indication not to record minimum values |

Once these fragments have been highlighted, it is necessary to proceed with prudence, since it certainly does not seem possible either correct to relate principles described nowadays by the IASB to a 15th-century treatise or to the activities of a Renaissance merchant. Besides the obvious differences in time, mentality, and technique, it must be surely considered that the IASB has to consider accounting standards towards stakeholders in a highly regulated financial environment, while Pacioli wants to describe an accounting technique aimed at the gathering and rapid retrieval of information for the merchant. Pacioli writes the Tractatus XI, involving the accounting techniques for the preparation of the financial statements. These financial statements were intended to provide information to the merchant, the main stakeholder entitled to the information. Though historically double-entry accounting is seen as the perfect and complete set of interdependent records that offer a global and detailed view of a company, in which all the operations and transactions carried out would take place, without missing even one, no matter how small or insignificant it may be seen (Hernandez Esteve, 2017), the growing number of recordings and the increasing complexity of the activities of the Renaissance business world, and of the merchant, in particular, conflict with the minute recording of all events at the time they occur. The concepts of relevance and materiality emerged to help manage this complexity as established and internalized principles, of the highest theoretical level and ubiquitous in practice. Considering these aspects, and after having highlighted the appropriate differences, we can proceed with the detailed discussion of the extracted fragments.

First of all, it can be considered that the seven fragments above can all be referred to the recognition phase, as intended by the IASB. In the specific case of the second fragment, Pacioli indicates to record items in aggregation with other items. Then, by making a very strong simplification, the decision of a merchant can be reduced to the question of whether he wants to buy certain goods at a certain cost or resell certain goods at a certain price. At this point, remembering that in this context the merchant is the main stakeholder, we can try to use the sense of the IASB standards by simplifying and adapting them to the specific context.

In the first fragment Tractatus XI indicates directly to list values starting from the largest, therefore from the most relevant, to the smallest. In the fragments two, three, four, and seven Pacioli indicates not to record small amounts or of little importance. For the reasoning just made, we can say that in this context amounts of little importance, such as small personal expenses, or ordinary expenses, shipping or small services related to trading, do not affect the decision of the merchant to buy or sell goods. So, in this sense, we can find in these fragments the sense of the principles of relevance and materiality.

In fragments five and six Pacioli suggests not to report values below a certain threshold. The first time he suggests to bring in a separate bag one or two gold ducats to support the minute expenses and that these should be not recorded. Then Pacioli reports a threshold value of ten gold ducats as the minimum registration value. As mentioned by Sangster et al., the Summa's selling price was 119 Soldi, just under 1 Ducato, or about $150 in today's terms (Sangster et al., 2008). It might suggest that the current value of 10 gold ducats is equal to about $1,500. From the point of view of the operational cost, Pacioli suggests not to waste time in recording small value. It assumes importance since the registration operations at the time were done by hand, when economic exchanges occurred during the hectic moments of trade.

Bearing in mind that relevance and materiality are principles connected to the capability of information to influence a decisionmaker, we can conclude how Pacioli wants to underline the importance of dedicating no attention to minimum values and, consequently, of focusing on what is most important, and therefore on what is most relevant, to the point of neglecting what has no value.

At this point, it would be possible to think that Pacioli's approach to relevance may lead the reader to the risk of misrepresentation of the information. Pacioli is indeed very focused on the correct representation of information and we can deduce that from two proofs, one direct and one indirect. The first direct evidence is provided by Pacioli himself when he recommends that the new books on which the records are to be kept must be presented to the tax officers to show their authenticity. He stands against the practice of those who write double books, showing one to the buyer and one to the seller “and on that (the false book) (Note 6), they swear and persuade and they are very wrong” (Pacioli, 1494). The second indirect proof arises from Pacioli’s beliefs. As reported by Barret, Pacioli believed that people should integrate, rather than segregate their business and professional careers with their personal lives and religious convictions (Barrett, 2005). Thus his treatise, which taught the mundane details of bookkeeping, also instructed merchants to "begin their business with the name of God at the beginning of every book and have His holy name in their minds." Pacioli also endorsed as "good custom" the practice "among true Christians," which at that time in Venice meant "Catholics," to mark their accounting books and records with the Sign of the Cross. In considering these two arguments, it is clear how fundamental the correctness of the accounting records was for the friar Pacioli.

Certainly, Pacioli was not and did not intend to be a standard-setter, and again we are not surprised if the simple rules set in Tractatus may seem far from the standards formally set today as the IASB since our financial world is regulated differently from the Renaissance one and there is a profound difference of stake-holders to whom to be accountable. The summa, as was argued, is addressed to the merchant (Sangster et al. 2008) and Pacioli showed how to introduce and teach double-entry bookkeeping in a manner that met and meets the needs of business (Sangster & Scataglinibelghitar, 2010). Considering the audience to which it is addressed, again it is not surprising that Pacioli offers, in the case of information recognition, easy instructions to follow, using pedagogic devices to make even abstract concepts easy to understand. To give an example, stores or accounts were compared to persons (Mattessich, 2003). The problem of giving practical instructions on how to behave is present for Pacioli as it is for us today. The difficulties in making materiality judgments are generally behavioral, rather than related to the definition of material, so it is concluded that these difficulties could best be addressed by providing guidance to help entities make materiality judgments (International Accounting Standards Board, 2018). So Pacioli not only makes it clear that it does not report minute values but goes as far as to give a practical threshold below which imports are not recorded. In such a way the concepts are expressed operatively and remained clearly expressed, being exposed through a clear guideline and with a precise threshold of application.

As we have seen, Renaissance society is complex and rapidly evolving, with banks, companies, and markets increasing in complexity, and accordingly accounting records increasing in number. The accounting practice, conceived as a simple "art of keeping accounts" to keep alive the memory of one's own or others' trade, had to evolve to meet the needs of its growing task. The accounting keeping is so required in its most formal aspects, as a chronologically ordered, mechanical and systematic collection of facts. Therefore, the first studies conducted were naturally directed on the research and improvement of the recording methods and this appears formally in line with what was expressed by Pacioli 500 years ago.

## 5. Conclusion

The Tractatus XI of the Summa of Pacioli, a well-known treatise widely studied and cited for more than 500 years, actually contains, besides the famous exposition of the double-entry book-keeping, the first early traces of the principles of materiality and relevance. Within the seven fragments highlighted by the Friar's work, it is indeed possible to see the intention to provide practical advice to help in making materiality judgments. From the point of view of a Rational Management Theory (Rainero et al., 2018), during the Execution phase, when the recognition takes place, following in practice the indications provided by the treatise, it is possible to discern non-relevant information from relevant information, that is information capable of making a difference in the decisions made by users (IASB, 2018*a*).

From what emerged from the analysis of the historical period in which Tractatus XI was written, the reasons why these two principles are exposed within Tractatus XI, even if in an early form, can also be identified. As we have seen, during the Renaissance period, there was a process of a profound transformation of companies from money-lending into commercial capitalism (Pollard, 1963) with a strong trade expansion and change in the banking system.

Considering also the development of the technique, the ability and willingness of the teacher Pacioli to communicate in a simple way to the merchants the double-entry book-keeping, that was the most advanced account keeping technique then known, and the widespread propensity at the time to combine practice with theory, it is not surprising identify early traces of relevance or materiality in the seven fragments from the Tractatus XI.

This research contains some limitations. Since in this article, an analysis of the principles of relevance and materiality within Tractatus XI has been conducted in relation to what has been formalized by the IASB in its most recent version, this could represent a limitation of the work. As we have seen, accounting standards in general and materiality and relevance principles, in particular, are not formalized in a unique way and differ according to the entity that formalizes them and the period in which they are formalized. The analysis of the seven fragments was then conducted through comparison with a single theoretical formalization, thus relying on a limited interpretative framework. From the point of view of identifying the causes for which the two principles emerged in a given period of time, the limit of this study can be represented by the use of a single primary source analyzed.

This work may have possible implications for both researchers and practitioners. If in the time of Pacioli the increasing amount of information to be managed has led to the development of special attention regarding the concepts of materiality and relevance, in the current context it is of utmost importance. Today we are experiencing an incredible revolution in terms of dimensional increases in data availability to such an extent that could induce the auditor's role to move from statement-level assurance to data-level assurance (Krahel & Titera, 2015) and will be of crucial importance improve the skills sets in areas such as modeling, statistics, and text mining (Vasarhelyi, Kogan, & Tuttle, 2015). For these reasons, a better understanding of relevance and materiality principles will allow practitioners to better discern the useful data from the worthless information even in the current society, where large information flows and Big Data prevail. the implications for research can also be considered. As seen above, the participation of the academic world in the standard-setting process is currently lacking (Näsi et al., 2010). This historical reading of the two principles can help to integrate the vision of standard setters into a broader historical and interpretative context, also considering that not all the accounting principles are completely clear and well defined. (Bradbury et al, 2012).

Possible areas of future development of this research could proceed in two directions. On the one hand, the historical aspect of the principles of materiality and relevance can be considered. In this sense, to look for other possible early traces of these two principles, we could proceed through a deep analysis of further texts containing accounting subjects published before the Summa. A comparative study of accounting documents of Renaissance banks or merchants could be conducted to identify the introduction and modification in the application of these principles. It could also be investigated whether and in what way these principles expressed by Pacioli have been accepted by the subsequent technique and literature. On the other hand, the theoretical aspects of these principles can be considered. A more extensive re-reading of these seven fragments could be conducted through the various formalizations of the accounting standards.

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**Notes**

Note 1. An original copy has been auctioned off by Bolaffi for 530.000,00 € in 2014.

Note 2. The Abacus was an ancient calculation instrument, made up of a table and several stones to represent numbers and perform operations.

Note 3. The Book of the Abacus.

Note 4. All quotations from Pacioli's text are freely translated by the authors.

Note 5. This reference was quoted in Latin in the original text and was a well known principle since Roman times, used by Pacioli to further emphasize the concept of not dealing with small matters.

Note 6. Note by the authors.