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## **LOCATING THE SOURCE OF PACIOLI'S BOOKKEEPING TREATISE**

*Abstract:* There is much we do not know about the early development of double entry bookkeeping. What, for example, caused it to be used by sufficient merchants for it to be formally taught to their sons in Northern Italy before anyone had apparently written anything about it? And, what did Pacioli use as the source for his 1494 treatise, the earliest known detailed written description of the method, something that has challenged researchers for at least the past 130 years? Discovering Pacioli's sources could broaden our knowledge of the Renaissance roots of accounting and of its early role and place in business practice; may provide some insights into the reasons for the emergence of double entry bookkeeping; and may give us further insight into the early instruction of double entry bookkeeping. But, previous attempts to find his sources have failed. Making use of hitherto overlooked information, this paper identifies two periods for which knowledge of Pacioli's whereabouts would indicate where to focus any search for his sources and suggests where to initiate the search.

### **INTRODUCTION**

And so the probings into the origins of double-entry bookkeeping lead from one speculation to another. [Yamey, 1947, p. 272]

Accounting has evolved over the past ten thousand years [Basu and Waymire, 2006, pp. 213-4] and now bears no resemblance to its earliest known form. During what N.S.B. Gras [1947] described as the 'era of the petty capitalists', bookkeeping emerged in its single entry form. During the era which followed and lasted from around 1300 until 1800, the era of the sedentary merchants, the mercantile age, double entry bookkeeping emerged and, ultimately, became widely adopted.

Many authors have speculated on what gave rise to the emergence of double entry bookkeeping and have suggested a

number of contributory factors, including population growth, expansion of trade, the acceptance of credit, educational advances in medieval universities, the growth in the use of agents, joint ventures, partnerships, the switch to a monetary economy, and the increased stability of currency in 13<sup>th</sup> century Venice (e.g.; De Roover [1942], Yamey [1947], De Roover [1956], Williams [1978], Hoskin and Macve [1986], Edwards [1989], Mills [1994], Macve [1996], Arlinghaus [2006], Carmona and Ezzamel [2009], Oldroyd and Dobie [2009], Heeffler [2010]).

While each of the factors offered by these authors may have served to support the growth of business, they were not themselves catalysts that would necessarily have propelled Italian merchants to adopt double entry bookkeeping, and the evidence suggests that they did not (*see*, for example, Yamey [2004, 2005]). When considered in detail, these hypotheses focus primarily upon the spread of bookkeeping, not the spread of *double entry* bookkeeping. They also generally fail to acknowledge the impact of Luca Pacioli's bookkeeping treatise of 1494 which was carried across Europe and resulted in a stream of other books largely based upon it which, without doubt resulted in the method described by Pacioli being the one that, ultimately, emerged as 'the' way to record details of financial transactions. That it had this impact can be attributed, at least in part, to its having been the first text on this topic to have been printed.

*The influence of the printed text:* Supporting this view of the importance of Pacioli's treatise, Yamey [2004, p. 153] suggests that printed books and their use by teachers played an important part in the diffusion of knowledge of double entry, a point previously made by Lane [1945, p. 173] who drew particular attention to the reputation of Venice as "*Europe's schoolmaster in bookkeeping and accounting.*" Nowhere was better prepared at the time when Pacioli's treatise was printed to disseminate his Venetian method of double entry bookkeeping than Northern Italy with its schools specializing in mercantile education for sons of merchants.

These 'abbaco' schools emerged in the early 13<sup>th</sup> century and included, in some cases, classroom tuition in bookkeeping [Grendler, 1989; Arlinghaus, 2004, p. 148]. One example occurred in 1285 in Perugia, arguably the most mercantile of all the cities in Northern Italy at that time,<sup>1</sup> when the city council

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<sup>1</sup> According to Barker and Kleinhenz [2004, p. 875], control of Perugia by the nobility ceased in 1214 and from the mid-13<sup>th</sup> to the mid-16<sup>th</sup> century, Perugia was run as a commune and then a republic by the guilds, of which the merchant

founded a Studio where, “eminent professors taught grammar, logic, law, medicine, philosophy, moral issues, and mathematics applied to business and **accounting... [to] many young people seeking to improve their knowledge and prepare them [mainly] to undertake commercial activities**” [Cavazzoni, 2006, p. 4, translated by the author, emphasis added].

Although it is known that bookkeeping was taught in some of these schools, the absence of any extant teaching manuals on the subject suggests that bookkeeping was taught mainly in the workplace rather than by bookkeeping tutors. However, by the 15th century, this was no longer the case [Arlinghaus, 2004]. Luca Pacioli's 1494 treatise on double entry bookkeeping was the first of a number of printed (and so widely available) textbooks on this topic, setting the basis for standardisation of the method and its wider adoption: it stands to reason that just as accountants who were trained in double-entry bookkeeping methods would probably advocate its use when they encountered other systems [Jones, 1994], merchants who had been taught double entry bookkeeping at school would probably have adopted that system in their business.

Yet, there is much we do not know about the early development of double entry bookkeeping. How, for example, did it come about? What caused it to be used by sufficient numbers of merchants for it to become part of the *abbaco* school curriculum before anyone had apparently written anything about it? And we also know little about the source, if any, for Pacioli's treatise. While it is widely believed that Pacioli based it upon one or more extant bookkeeping treatises (*see*, for example, Hernández-Esteve, [1994]), we do not know if this is the case. This is the focus of the present study: what material, if any, did Pacioli use as the source for his treatise?

Before considering how progress can be made towards answering this question, the relevance to accounting scholars of doing so is presented in the next section. It begins by recounting some of the known details of the emergence of double entry bookkeeping in business and in education. The paper then considers why finding Pacioli's sources would be of interest to accounting scholars. It then considers what information we have that may guide any search for those sources, identifies two distinct periods, one when Pacioli would almost certainly have had any source documents in his possession and a later one when he may have done so. The paper concludes by calling for

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guild was particularly powerful and influential.

archival searches in the places where he was in those two periods of time.

### THE EMERGENCE OF DOUBLE ENTRY BOOKKEEPING AND ITS EARLY INSTRUCTION

The first acknowledged instance of the use of double entry bookkeeping was by an Italian firm in Southern France in 1299 [Lee, 1977; Smith, 2008] but it was a further 160 years before the first known manuscript to contain a description of double entry bookkeeping was written, by Benedetto Cotrugli in 1458.<sup>2</sup> Although the invention of moveable type printing occurred in Germany in 1454, it was another 10 years before the first such press was established in Italy [Sangster, 2007, p. 127], and a further 30 years after that innovation before the first book was printed which contained a description of double entry bookkeeping – Luca Pacioli's treatise in his *Summa de Arithmetica Geometria Proportioni et Proportionalita (Summa)* of 1494.

As mentioned in the Introduction, it has been suggested that Pacioli's treatise on bookkeeping was based on one [or more] existing bookkeeping tutor manuscripts (Vianello [1896, p. 116]; Yamey [1967, 1994, pp. 20-21]; Hernández-Esteve [1994]; De Almeida and Marques [2003]). Melis [1950] presented another view, believing that Pacioli himself wrote the bookkeeping treatise, but his is a lone voice and Pacioli's own statement in *Summa* that the book contains nothing that is original adds support to the majority view. However, no earlier manuscripts on double entry bookkeeping have been found and, as a result, we have no evidence to confirm or refute either view, leaving us with the question that has troubled accounting historians for over 130 years still unanswered: Did Pacioli write the treatise himself and, if he did not, what sources did he use?

When we face a situation that we simply do not know which of two views is correct, in the absence of evidence to the contrary, we side with a reality that corresponds with the facts we know. But, in this case, we know very little. Hernández-Esteve [1994] presents a compelling case for Pacioli having based his treatise on one or more sources but this does not eliminate the possibility that Pacioli was himself the author of those sources, especially given Pacioli's background and teaching activities in both universities and schools<sup>3</sup>. Melis may be a lone voice in

<sup>2</sup> Cotrugli wrote a 5-page description of the method. Unlike Pacioli, he did not attempt to give detailed instructions on how it should operate.

<sup>3</sup> See, Sangster [2011] for an overview of Pacioli's career as a teacher at both

the literature but this may be a situation where the exception is correct. Melis's theory is also the only one of the two opposing views that can be refuted by falsification and doing so is the only way in which uncertainty may be removed from this debate.

To this end, this paper adopts a Popperian stance<sup>4</sup>, seeking to falsify Melis's theory by finding evidence that demonstrates that it is incorrect. So long as no such evidence is found, current theory, in this case, Melis's view that Pacioli wrote the treatise himself cannot be disproved and the uncertainty continues. Pacioli's handwriting has survived and was used to confirm his authorship of the book of chess problems attributed to him in 2006. If his sources are found, similar examination of the handwriting may resolve whether or not he was the author.

Despite all that has been written on the topic of Pacioli's bookkeeping treatise, we are scarcely beyond the point of the first stage of discovery concerning its origins. In part this is because, with the exception of Fabio Besta who oversaw an extensive search of archives in Venice in the late 19th century [Vianello, 1896, p. 116], few have devoted time to a search either for the manuscript of *Summa* or for the manuscript of the bookkeeping treatise which Pacioli prepared, nor conducted a search for any documents upon which Pacioli may have based his treatise.

The fact that such documents have not been found does not eliminate the possibility that they may still be discovered – in 2000, Postma and Van Helm reported the discovery of 21 folio sheets<sup>5</sup> containing 50 lines of instruction in double entry bookkeeping and 266 examples of journal entries,<sup>6</sup> some of which date from 1440 or earlier.

The present author has located abbaco manuscripts which appear to include accounting instructions from the late 13th and 14th century unknown by accounting scholars in the archives of Florence. It is likely that many other documents exist in Italian private archives, and the archives of communes, banks, libraries, churches, and museums which have not, as yet, been studied by accounting scholars. Among them, as Fabio Besta believed, we may find evidence to refute the tentative theories

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levels.

<sup>4</sup> See, for example, Heil [1998, p. 162]. Through such an approach, scientific discovery progresses: we develop tentative theories which we seek to refute and, in so doing, we develop a progressively deeper understanding of the subject that, in turn, leads to new tentative theories that we, once again, seek to refute.

<sup>5</sup> A page is a side of paper, so folio sheets each represent two pages.

<sup>6</sup> Pacioli's treatise is approximately 24,000 words in length and contains examples of 25 journal entries.

that have been espoused for the past 130 or so years, and move forward the discourse and development of our understanding of, not just whether or not Pacioli penned his treatise without reference to other sources, but to the roots of the development of double entry bookkeeping itself.

### WHY IT WOULD BE WORTHWHILE FINDING PACIOLI'S SOURCES

Finding Pacioli's sources may take us closer to identifying what led to the emergence of double entry bookkeeping and a better understanding of how it became sufficiently commonplace for a treatise to be printed for the use of merchants and their sons<sup>7</sup> on how to adopt the method. From such documents, we may also discover more about how double entry bookkeeping was taught while it was developing into the method described by Pacioli, particularly if, as has been suggested, such documents pre-date Pacioli's treatise by at least 40 years – see Hernández-Esteve [1994, p. 69].

One thing is clear: Pacioli's manuscript was in Venice during the printing of *Summa*. What is unclear and has never previously been considered beyond the level of speculation<sup>8</sup> is: when did Pacioli actually work on preparing his treatise for publication and where was Pacioli when he did so? This may not help us find his manuscript but it may help us find the sources he may have used in writing it.

Discovering when and where he wrote his treatise may lead us to being able to undertake a more focused search of relevant archives, such as the one Fabio Besta undertook in Venice when he determined that Pacioli was likely to have used the manuscript of a Venetian bookkeeping tutor as his source. Besta failed in his search but that does not mean such a focused search elsewhere would be similarly fruitless.

This paper now considers how we might locate Pacioli's sources.

### FINDING PACIOLI'S SOURCES

Over the past 130 years, a number of attempts have been made to locate contemporary records and documents relating to or referring to Pacioli. Boncompagni found information on Pacioli in Italian university records and municipal records [1879].

<sup>7</sup> See, Sangster, Stoner, and McCarthy [2008, 2011].

<sup>8</sup> See, for example, Nobes [1995, p. 383].

Seventy years ago, Ricci discovered documents in Sansepolcro concerning Pacioli's later life in that town [1940]; and Nakaniishi [1979] followed-up on this work by searching the records of deaths in the convents of Sansepolcro, Perugia, Urbino, and Florence, ultimately finding a note recording Pacioli's death on June 19, 1517 in the Santa Croce convent records in Florence.

Shortly thereafter, Van Egmond [1981] published his extensive analysis of extant abbaco school texts, including Pacioli's *Summa*. His work was derived from a search through libraries and private collections. He found one manuscript book written in 1522 that described Pacioli as a perceptive teacher but found no bookkeeping text that predated Pacioli's treatise. Yet, as anyone investigating this topic in the Italian archives will soon realise, many more abbaco texts predating Pacioli have survived than were identified by Van Egmond, a great number of which have not been examined by accounting scholars.

In 1994, Jayawardene, author of a biography of Pacioli in 1971, concluded his presentation at a conference held in Sansepolcro in memory of Luca Pacioli with a call for research in the archives and libraries of the cities where Pacioli lived and worked, "in order that some hitherto unknown detail of his life may be revealed" [Jayawardene, 1998, pp. 27-28].

Jayawardene's call for archival searches remains largely unanswered and we are no closer to discovering the source of Pacioli's treatise today than we were when Boncompagni published his text about Pacioli in 1879.

Just as Nakanishi [1979] focused his successful search for a record of Pacioli's death upon places where he was most likely to have died, any search for the sources Pacioli used would surely have the greatest chance of success if we focused upon where those documents are most likely to have last been consulted by him. At first glance, this may appear a ridiculous suggestion – how can we look for his whereabouts when we do not know the period during which he last worked on his treatise? However, we have sufficient information to deduce that he did so over a relatively short period, and it is information that has been entirely overlooked by accounting scholars.

#### WHAT WE KNOW

Evidence in the treatise identifies the period when Pacioli prepared his manuscript. This evidence has been in full view of all readers of Pacioli's treatise but, presumably due to interference from modern contextual norms, it has been overlooked.



Nowadays, to elongate the life of a textbook and so increase sales and total royalties, authors use dates in the future when they write their original text so that readers do not sense that they are reading something that is 'old'. Doing so extends the life of the edition and eliminates one motivation for readers using another source. However, that was not something of which an author of a text in 1494 would have been interested – they were not paid by their publishers for their books and did not receive royalties [Febvre and Martin, 1984, pp. 159-161] – and there is no reason why dates in texts would not have been contemporaneous with when they were written – so, for instance, if an example was written on August 6th, 1493, that was the most likely date to be used in the text.

Thus, in comparison to today, textbooks such as Pacioli's *Summa* were not written for personal gain, but to spread knowledge. The first printing of Pacioli's *Summa* had a shelf life of 29 years. The second printing in 1523 did not include any changes in the dates that Pacioli used in the first printing of 1494. Clearly, no importance was placed upon the dates in the text by either the author or the printer.

On this basis, the dates Pacioli used in his treatise indicate he was working on it both immediately before and during the year or so that it took to print *Summa* [see Sangster, 2007]. Printing practice at that time also provides an indication of when Pacioli may have been working on it after completing his first draft prior to the commencement of printing of *Summa*.<sup>9</sup> Combining these two items may reveal a window of time when knowledge of his whereabouts may be most usefully sought and a search undertaken for his sources.

*The Dates in the Text:* Pacioli implies in the Introduction to his treatise that it was a last-minute addition to *Summa* and virtually all the dates in the treatise are in November 1493. This is just a few weeks before his printer is likely to have started printing *Summa*.<sup>10</sup> Only one date used in the treatise is not from that month: April 17, 1494 which appears once in Chapter 35, on the 4th last page of the treatise, suggesting a first draft was completed in November 1493 and that this was revised by Pacioli during

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<sup>9</sup> Printing could have commenced without the bookkeeping treatise but that would have presented the printer with potential problems in avoiding blank pages at the end of the volume. The printer needed to know the lengths of all parts before printing started if he was to schedule the pagination of *Summa* accurately.

<sup>10</sup> The completion date of last known work undertaken by the printer before *Summa* was December 9, 1493 [Sangster, 2007].

April 1494. In support of this hypothesis, there is a reference in Chapter 20 of the treatise [folio 204v] to a specific range of folios in an earlier part of *Summa*, something Pacioli could not have known before printing began.<sup>11</sup>

*The most likely location of the source document(s):* Once the manuscript was completed in November 1493, it is unlikely that Pacioli would have needed to refer again to his source documents. Consequently, they are most likely to have remained where he was at that time. This, therefore, is the most likely location in which his source document(s) may be found. At that time and until the end of December, Pacioli was in Padova [Antinori, 2000, p. 13], presumably working at the university.

*A possible alternative location:* In the unlikely event that he did not leave his source documents in Padova, the most likely place to look for them would appear to be Venice. Pacioli stated himself in *Summa* that he attended the printing. Doing so enabled him to have access to the rest of his manuscript and to the pages already printed, so ensuring that he could cross-reference correctly from the treatise to earlier material as he revised the manuscript of his treatise. However, the period for which his whereabouts are relevant goes beyond April 1494.

Even though he was revising the manuscript that month, he did not finish doing so before it was printed: the final page is missing explanatory text essential if its aim and purpose is to be properly understood [Sangster et al., 2013]. While he clearly left his manuscript with the printer so that it could be printed on schedule, he may have had his sources with him after April 1494 and intended writing some explanatory text to insert into the final page, but never did so. As will be seen, the period when it would have been possible for him to do this and complete it in time to be included in the printed treatise extends considerably beyond April 1494.

Based on the speed of printing identifiable from dates in *Summa* and the possibility that the treatise was printed after, rather than before the treatise on tariffs that follows it at the end of Volume 1 of *Summa*,<sup>12</sup> that date could have been as late as mid-July 1494. This is shown below.

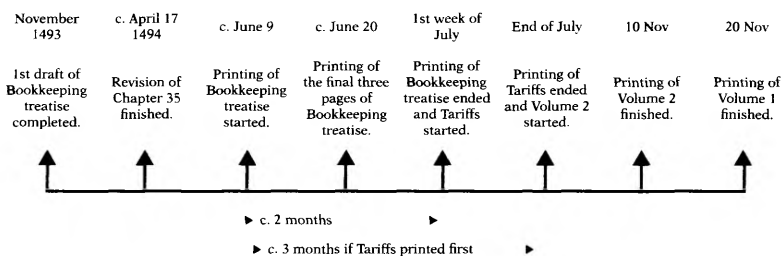
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<sup>11</sup> While the printer could have entered the folio numbers at the time of printing, this is unlikely, particularly when the author was present through much of the printing, as Pacioli claimed he was.

<sup>12</sup> For a discussion of this point, see Sangster [2007].

FIGURE 1

## Event Dates Based on Printing Practice and Dates in the Text



While it is likely that Pacioli was in Venice in April 1494, it does not appear that he was there during printing of the bookkeeping treatise [Sangster, 2007, p. 138]. He may, in fact, have been absent from Venice throughout much of the 2 to 3 month period from mid-April 1494 until the printing of Volume 1 of *Summa* ended in mid-July. Thereafter, he was probably in Venice to oversee the far more complex typesetting of the second volume of *Summa*.<sup>13</sup>

The Venetian archives have already been searched, making this an unlikely location in which to find the source documents for the treatise. As to where Pacioli may have been during those three months, it would not have been far from Venice in case he was called back by his printer. If he did have his sources with him at that time, any search for them needs to start by locating his whereabouts and then looking in the local archives, whether they be held by universities, municipalities, convents, libraries, museums, banks, or private individuals.

**Summary:** Returning to the more likely location of the source documents used by Pacioli, any search ought to start where he was when he drafted his treatise: Padova. If that proves fruitless, as shown above, in the unlikely event that he took the source documents with him in order to complete revising his manuscript, and if a new search of the Venetian archives is either not undertaken or proves unsuccessful, the next most likely location where they may be found is wherever he was during the three

<sup>13</sup> Typesetting imperfections in the bookkeeping treatise would not have affected Pacioli's reputation but, Pacioli, the famous mathematician, risked ridicule if his mathematical diagrams which fill the margins throughout the geometry volume of *Summa* were incorrectly printed. He surely would not have left his reputation as a mathematician in the hands of others.

months between mid-April and mid-July 1494. However, the available evidence does suggest that efforts to locate his source documents should centre upon Padova.

## CONCLUSION

The investigative approach adopted in this paper is, of course, open to challenge. Nevertheless, the analysis presented is consistent with the information available. In Popperian terms, it is a tentative theory, but one which is defensible until such time as it may be refuted. It offers considerably more guidance to researchers than has previously been the case. If source documents are found, accounting scholars will be able for the first time to establish Pacioli's true contribution to our discipline and, perhaps, to identify someone more appropriate to wear the accolade of "father of accounting".

The most likely location of Pacioli's sources appears to be Padova and any search for them should start in the archives in that city. As Pacioli was a prominent member of his order and probably stayed in a convent in the city, any archives held by the convents, and especially those of the Franciscan order would probably be the best place to start.

Should a search of the archives of Padova prove to be fruitless, a search of the archives of the convents of the Franciscan order in, and relatively close to, Venice for a record which indicates he was staying in one or more of them during the three months from mid-April to mid-July 1494 may indicate where else to look. This could then be extended to a search for the sources of his bookkeeping treatise in the archives in the locations identified. Such archival searches are not new to enquiries concerning Pacioli. Quite apart from Boncompagni's search [1879] of municipal archives, Ricci's [1940] search of the Sansepolco archives and Nakanishi's [1979] search of convent archives, as recently as 2009 Elisabetta Ulivi reported that she had found evidence in the Sansepolcro archives of Pacioli's presence there in the 1480s which shed new light on when he joined the Franciscan order.

Echoing the quotation from Basil Yamey at the start of this paper, we must speculate to accumulate knowledge of our past. We must look where no-one has thought to look and take note of signs that may guide us to do so. This paper has identified signs that may guide us in a search for the sources used by Pacioli when writing his bookkeeping treatise.

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