

Pacioli and Renaissance Humanism

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Abstract

Despite the wide cross-disciplinary influence of Fra' Luca Pacioli's *Summa de Arithmetica, Geometria, Proportioni et Proportionalita (Summa)*, it has been criticised as having been difficult to read and written in a mixture of bad Italian and bad Latin; but, paradoxically, intellectuals of Pacioli's day praised the style of writing in *Summa*. Can both viewpoints be correct?

The answer to this question is sought by identifying what may have inspired Pacioli to write *Summa* in the manner he did. In doing so, it considers the times in which he lived. In particular, it considers the impact that Renaissance Humanism and Humanist Education may have had upon his writing style.

The paper finds that both views were correct in their own timeframes and contexts and that Pacioli's writing style was both an appropriate one with which to address a contemporary merchant society and one which would impress and gain the approval of his fellow humanist educators and patrons.

Key Words: Pacioli, *Summa*, Bookkeeping Treatise, Renaissance, Humanism, Humanist Education

Pacioli and Renaissance Humanism

Introduction

Pacioli's *Summa* (1494) contained the first known printed exposition of double entry bookkeeping, which has been identified as the foundation of modern accounting (Fogo 1905). It is also acknowledged as having given rise to advances in mathematics during the 16th century (Rose 1976); to have provided the catalyst for the development of statistics in the 17th century (Strathern 2001); and, to have assisted the development of perspective in architecture and art (Gambardella and Martusciello 2004).

Consideration by accounting historians of Pacioli's bookkeeping treatise¹ and the style of writing he adopted have typically focused on the accounting content (e.g. Geijsbeek 1914; Nobes 1995; Yamey 1994, 2004). A similarly narrow focus has also been adopted in other disciplines, such as mathematics, when considering the content of *Summa* relevant to their fields. Little has been written concerning the motivation behind his writing in his chosen style, a style which, it could be argued, was instrumental in bringing what he wrote to the attention of the world.

From approximately 50 years after its publication up to the present day, *Summa* has been criticised as having been difficult to read and poorly written in a mixture of bad Italian and bad Latin,² yet the style of writing was praised at the time of its publication by, among others, the highly educated bibliophile, Guidobaldo, Duke of Urbino (Taylor 1942, p. 196).

This paper investigates whether both viewpoints may be "correct" by attempting to identify what may have inspired Pacioli to use the style of instructional writing that he adopted, incorporating switches of language, classical referents and popular sayings to convey ideas, concepts, advice, images and moral values.

When investigating issues of this type that are rooted in a different time and culture from today, the context of the period during which it occurred must be considered or we risk misunderstanding the approach he took (Pin 1993, p. 166). Pacioli wrote *Summa* when the humanist movement was gathering pace and when its influence was widespread through all branches of society in Renaissance Italy, particularly in education and the arts. To this end, the next two sections of this paper look at the nature of Renaissance Humanism and at Humanist Education and the influence of his humanist mentors, and Humanism in general, upon Pacioli.

Overviews are then presented in the context of Renaissance Humanism, of both *Summa* and the heavily humanist-influenced decoration of the *Sala dell'Udienza* (the *Sala*) in the *Collegio del Cambio* (Moneychangers Guild) in Perugia, the city in which Pacioli held his first university-administered appointment and where he spent more than eight years teaching during the 1470s and 80s. These are followed by a comparison of the use of language

¹ *Particularis de Computis et Scripturis*, the bookkeeping treatise contained within Pacioli's *Summa*.

² See, for example, Yamey (1994). See Belloni (1994) for a discussion of the variability of the Italian in *Summa*.

and other devices in Pacioli's *Summa* with the frescos of the *Sala*. Finally, the analysis is discussed and conclusions drawn.

Renaissance Humanism

The Renaissance began in Italy in the late 14th century and spread throughout much of Western Europe in the period up to around 1620. Fuelled by the rediscovery of classical Greek and Roman texts, it was brought to life and incorporated into Italian culture by Dante (1265-1321) and, in particular, Petrarch (1304-74). By 1400, it had emerged as a recognisable intellectual movement (Grendler 2006, p.3). Its influence accelerated with the immigration of refugees bringing large numbers of ancient Greek and Roman texts following the fall of Constantinople in 1453 (Hooker 1999), an event which virtually coincided with the invention of the moveable-type printing press which, in turn, enabled such ancient texts to become widely available.

A massive expansion of trade and the growth of the merchant class in Renaissance Italy, both in size and in terms of individual wealth, provided a basis for the development of Humanism, a philosophical ideology that justified activities that had for a long time been discouraged – consideration of self and personal gain – and encouraged the pursuance of personal pleasure in life rather than conducting life in servitude or in deference to others (Kreis 2004).

Humanism developed from a desire for human expression, for the rediscovery of old values, including the importance of civic virtue and of doing good rather than simply knowing what is good, and the replacement of dogma with truth or, more precisely, convincing argument. It was “*a cultural and educational program which emphasized and developed an important but limited area of studies*” (Kristeller 1961, p.10): grammar, rhetoric, poetry, history and moral philosophy – the *studia humanitatis* (the humanities) (Grendler 2006, p.5).

Adherents to Humanism used the standards of classical Greece and Rome to measure their efforts, learn how to challenge received wisdom, and to seek and embrace change. Those described by the term ‘umanista’ (‘humanist’) were generally scholars, students and teachers of the humanities in the humanist Latin (or Grammar) schools and in the universities (Kristeller 1961, p. 9; Grendler 1967).

Upon leaving the education system, they worked in many of the governments within Renaissance Italy, as advisers, secretaries, civil servants, lawyers and judges; and they encouraged people to develop their full potential, to be less narrow in their focus and, to develop their talents in whatever field they lay, so leading to the many polymaths of the Renaissance – the multi-talented ‘Renaissance Men’. (Grendler 2006)

Humanist education

During the Middle Ages, education was built around the seven liberal arts³, but Humanism changed this, first in Renaissance Italy, then in the rest of Europe. Petrarch led the way by rejecting the Aristotelean-based Scholastic education of the Middle Ages as being too abstract and disembodied, too dry and too scientific (Grendler 2006, pp. 1-2). Vergerio (1368-1444), in the first humanist pedagogical treatise (1402/3) took forward Petrarch's ideas and proposed a more appropriate focus for pre-university study. He advocated the retention of the liberal arts but suggested a very different foundation for education – the study of the humanities.

With its emphasis upon the humanities as a preparation for civil life, humanist education “*sought to foster good character and learning in youth and included a strong emphasis on history, moral philosophy and eloquence*” (Grendler 1987, pp. 341-2) – the art of using language to convince others. To that end, facility of expression, elegance of expression and harmony, imitating the rhetorical skills in Latin recommended by the Roman, Cicero (106-43 BC) were key skills.

The humanities were studied in the humanist elementary schools and then further developed in the humanist secondary schools. Two of the subjects taught, grammar and rhetoric, were inherited from the liberal arts *Trivium*. However, the third subject in the *Trivium*, logic, was replaced by poetry, history and moral philosophy.

Instruction in how to use Latin in the style of the classic authors (i.e. “good” Latin⁴) was a key element of this education (Grendler 2006, p. 3). It was viewed as training for citizenship and was fostered and flourished in the courts of powerful princes, nobles, monarchs, and in the city and papal states, whose patronage was vital to fund humanist studies and its expression in architecture, art, and printing.⁵

Mathematics was taught in the vernacular abbaco schools (which focused on business and its practicalities and, in particular, mathematics relevant to business (Van Egmond 1981; Radford 2003). Mathematics was not taught in the Latin schools (Black 2007). In universities, there was some teaching of mathematics with some students studying three of the liberal arts *Quadrivium*: geometry, arithmetic, and astronomy, but not the fourth, music (Kristeller 1965, p. 147; Grendler 2002). However, there

³ For more details on the background to and nature of the seven liberal arts of the *Trivium* and the *Quadrivium* see, for example Grant 1999a and 1999b. For a summary of what constituted the seven liberal arts see, <http://members.aol.com/oldenwilde/members/diu/quadriv.html> (available on 6 May 2007). Black (2007) stated that teaching of *all* seven liberal arts had ceased in Italian schools, possibly by the 11th century and certainly by the 13th century.

⁴ Petrarch divided history into eras defined by their culture. The Roman or Classical or Ancient era, which ended in the 4th century, was typified by the use of “good” Latin. In the Middle Ages that followed it, people learnt and wrote “bad” Latin. (Grendler 2006, pp. 3-4)

⁵ For further information on humanist education see, for example, Santayana (1930) and, for the development of humanism in general, Kristeller (1965) and Burkhardt (2002).

were very few teachers of these subjects in the universities (Grendler 2002; Black 2007). Most university students studied one of the three specialist subjects: theology, medicine, or law.

In order to reach a wider audience, adherents to Humanism, such as Leon Battista Alberti (1404-72), were prepared to mediate their humanist attachment to Latin elegance by using the vernacular (Taylor 1942, p. 110), as Pacioli himself did in *Summa*. They still, however, maintained attachment to Latin as an instructional device, particularly in universities, where all instruction and all texts were in Latin (Grendler 2004, p. 3).

Humanist education did not become the norm in northern and central Italian Latin schools until around 1450 (Grendler 1989, p.139). Pacioli's Latin has been described as "bad", i.e. Scholastic Latin (see, for example, Ciocchi 2003, p. 24), which suggests he may have received a Scholastic Latin school education. However, this is unlikely. His first job was as tutor to the sons of a Venetian merchant in 1464 (Antoni 1995, p. 266⁶) when he was at most 19, and possibly as young as 16. To have been able to take on this role, it is likely that he attended a vernacular *abbaco* school, not a Latin school (see, Ciocchi 2003, p. 16).

The *abbaco* schools were an alternative to the Latin schools rather than a part of the Latin school educational process. The *abbaco* school curriculum was taught in the vernacular and Latin was not taught beyond a basic level. The only exception to this was in the city of Florence.⁷ (Grendler 1989 and 1995)

Three of the greatest influences upon the young Pacioli during the 1460s and early 1470s – Piero della Francesca (1416-92); Federigo, Duke of Urbino (1422-82); and Leon Battista Alberti – were all leaders in their fields, multi-talented, and exhibited humanist ideals. Della Francesca was an artist and mathematician (Vassari 1550; Cossali 1857; Mancini 1916; Camerota 2006); Federigo was a powerful patron and one of the most impressive scholars of his day (Burckhardt 2002); Alberti was a polymath⁸ and one of the leaders of the humanist education movement (Santayana 1930).

An example of the influence their humanist ideals had upon Pacioli can be seen in the choice he made when he became a Franciscan monk at some point between 1472 and 1475 (Cavazzoni 1995). Of the two branches of the order, he elected to join the less restricted Conventuals. They had relative freedom to move where they pleased and could own property. Mirroring the humanist ideal concerning the importance of the individual, the Conventuals believed that some individual freedom and the receipt of rewards was necessary to enable true scholarship to take place and so underpin their work as preachers (Moorman 1968).

⁶ Researchers disagree over the actual date, some suggesting 1465.

⁷ In Florence, *abbaco* was taught for a couple of years part-way through school education.

⁸ Alberti was a philosopher, architect, musician, painter, sculptor, poet, cryptographer, polyglot, and writer, as well as being one of the leaders of the development of humanist education.

As will be shown in the next section, an examination of Pacioli's *Summa* reveals how he embraced the ideals of Humanism and humanist devices and harnessed them where appropriate to support his writing and to ensure that, in the spirit of Humanism, his work would have widespread contemporary appeal.

Summa

Pacioli's seminal work is a compendium in two volumes. The first volume contains Arithmetic, Algebra, and a variety of subjects of a commercial nature, including bookkeeping. The second volume contains geometry and trigonometry. The book is reputed to have been purchased by merchants from all over Europe (Favier 1998) which supports a view that the primary audience for *Summa* was neither mathematicians nor university students of mathematics – vernacular literature was not written for the university-educated or those educated in the Latin schools (Kristeller 1959, 24) -- but for the abbaco-school-educated Italian merchant class (Strathern 2001), of which the merchants would have used it as a reference text, which may explain the survival of a large number of copies to the present day (see Sangster 2007).⁹

The contents of *Summa* reflect two central themes of Renaissance Humanism:

1. It mirrors the humanist ideal of rediscovering classic texts and making them available to the masses. For example, in *Summa*, Pacioli summarised and translated into the vernacular some of the geometry of Euclid (c.300 BC) and presented it for the first time in a vernacular printed text.
2. It embraced the wider humanist educational principle of bringing important work, old or new, within the reach of as wide an audience as possible. Through *Summa*, Pacioli sought to disseminate advice and instruction in matters not previously readily available, such as operating a business, and also to give the merchant class an intellectually wider education than that which a simple instructional manual on business would have provided. His success at doing so can be seen in the plaudits the book has received over the last 500 years. For example, it is recognised that:
 - Pacioli was first person to write that the coordination of the rules and accounts of a business not only had to be done, but that it was fundamental and necessary for good governance (Bariola 1897, 369-70);
 - accounting today can be traced directly back to *Summa* (Fogo 1905; Geisjbeek 1914);

⁹ Notwithstanding the primary market for *Summa* not being university mathematic students, it was considered such an important book on mathematics that Bernardino Baldi (1553-1617), the renowned humanist of the Court of Urbino (and first biographer of Pacioli), who wrote the first European history of mathematics between 1587 and 1595, *Vite de' Matematici*, promoted the reading of *Summa* to friends and colleagues.

- *Summa* laid out the programme for Renaissance mathematics (Rose 1976);
- mathematical problems within it led, some 150 years later, to the development of the theory of probability (Strathern 2001); and,
- it was important to and assisted in the development of perspective in architecture and art (Ciocci 2003, p. 19; Gambardella and Martusciello 2004).

Pacioli's instructional style exhibits a clear humanist influence through the inclusion of epigrams¹⁰, laudatory verses¹¹, and dedicatory letters to his patron in the Introduction to the book; using language to suit his audience, switching from the vernacular to Latin where appropriate – he even did this with the two rhetorical verses in the Introduction, one of which is in the vernacular and the other in Latin; and he includes features of humanist writing in the form of autobiographical information and personalised examples in his text.¹²

The next section describes the humanist decoration of the *Sala dell'Udienza* in the Collegio del Cambio in Perugia. Parallels are then drawn between it and Pacioli's humanist-influenced instructional style.

The Sala dell'Udienza in the Collegio del Cambio, Perugia

At the end of the 15th century, Perugia was an important trading city in central Italy (Bamber 1997), approximately two-thirds of the way from Venice to Rome; and was developing as an important centre for art and culture (Blanshei 1979). Various trade and craft guilds had become essential institutions in the life and politics of the city; and membership of one of the guilds was a requirement for political office. Due to the needs of merchants to exchange the various currencies in use, and to facilitate the creation and hiding of loans¹³ few of the guilds were as important to the city as the Moneychangers (or Bankers) Guild.

Construction of the *Collegio del Cambio* building in Perugia on behalf of the Moneychangers Guild was completed in 1473. The programme for the decoration of the entrance hall, where merchants and moneychangers met and discussed their business – the *Sala* – was drawn up by the humanist, Francesco Maturanzio, and the painting of the frescos on the walls and ceiling were commissioned by the guild and undertaken by another humanist,

¹⁰ A short, witty poem expressing a single thought or observation.

¹¹ Verses expressing or conferring praise.

¹² See Kristeller (1992) for further details on the manner in which texts were written in Renaissance Italy

¹³ Loans on which interest was paid, though essential to commerce, were officially regarded by the Church as usurious and unchristian. Moneychangers, therefore, trod on lucrative and essential but tricky ground – see, for example, De Roover (1974).

Perugino¹⁴ (Blanshei 1979). The frescos were completed between 1498 and 1500.

The iconography of the *Sala* carries an overwhelmingly moral tone. It is a sophisticated mix of referents with wide appeal which demonstrated the learning, culture and civic status aspired to or attained by those engaged in commerce by whom and for whom it was built and decorated (Bamber 1997, Fusetti and Virilli 2003). It was highly fashionable in its day and was the source of influence for other major works of art of the period, including the Sistine Chapel in Rome (Michelangelo) and the Papal apartments in the Vatican (Perugino and Raphael).



Figure 1: *Sala dell'Udienza*, wall to left of entrance door, first Cardinal Virtue lunette (of two): Prudence and Justice with Six Antique Wise men

The fresco decoration of the *Sala* covers most of the walls above the intarsia panels, and the ceiling. In true humanist style, all the figures and imagery are from classical sources or depict classical figures. For example, Cato the Elder (234-149 BC),¹⁵ is depicted standing guard to the left of the entrance, representing civic virtue. The adjacent wall depicts, in allegorical form, the four cardinal virtues in two lunettes: Prudence and Justice in the first (see Figure 1) and Fortitude and Temperance in the second. The far-end wall depicts the Transfiguration and the Nativity of Christ as representations, respectively, of the theological virtues of Faith and Charity (Love of God). The main decoration on the remaining wall is a fresco of the third theological virtue, The Almighty appearing before angels, prophets and sibyls (prophetesses), signifying Hope (Redemption).¹⁶ This wall also includes a self-portrait of the artist, Perugino.

¹⁴ Pietro Vanucci who, according to Taylor (1942), was a good friend of Pacioli during his time in Perugia.

¹⁵ A Roman politician and the first Censor of the Senate (charged with guarding public moral). He also wrote poetry and moral aphorisms.

¹⁶ This interpretation of these three religious scenes is taken from Fusetti and Virilli (2003)

The ceiling decoration depicts astrological gods chosen to represent the first seven Orders of Angels as described by Dante (1308-21):¹⁷ All are riding in triumphal chariots, a feature inspired by the triumphs of Roman emperors and the *Triumphs* of Petrarch¹⁸, an iconography that was very much in vogue in this period and featured, for example, on Piero della Francesca's diptych¹⁹ paintings of Federigo, Duke of Urbino and his wife, Battista Sforza, painted in 1465.



Figure 2: Sala dell'Udienza ornamentation of the ceiling, detail of Apollo (centre)

This programme of decoration was elegant, beautiful and, as required for a humanist audience, informed by ancient sources. In keeping with the humanist ideal that pictures should have a dual purpose – to please and to instruct (Fara 2007) – it also included a strong moral philosophical message and, relevant to any comparison with *Summa*, uses Latin text in two different ways, as an eloquent appeal and for instructional emphasis. More detailed analysis of the frescos²⁰ is included in the next section when the devices incorporated within them are compared with the writing style adopted by Pacioli.

Comparison of the use of language and other devices in Pacioli's *Summa* and in the frescos of the Sala dell'Udienza

Use of the vernacular by Pacioli

Summa was written in the vernacular with occasional phrases in Latin; and the same mix of languages was used throughout the book (Antinori 1995, p.

¹⁷ The acknowledged source of the planetary deities in the *Sala* is a set of prints first published in Florence in 1464 (Fusetti and Virilli 2003).

¹⁸ "...Love triumphs over Man; Chastity triumphs over Love; Death triumphs over both; Fame triumphs over Death; Time triumphs over Fame; and Eternity triumphs over Time." The Sonnets, Triumphs, and Other Poems of Petrarch. By Various Hands, with a Life of The Poet by Thomas Campbell. p cxi (www.gutenberg.org/dirs/1/7/6/5/17650/17650-h/17650-h.htm on 21 June 2006).

¹⁹ A work consisting of two painted or carved panels that are hinged together. This example had the portraits of Federigo and his wife hinged together and, on the back, paintings of triumphal chariots.

²⁰ See www.wga.hu/index1.html and <http://pietro-perugino.gemaelde-webkatalog.de/> for further examples of the decoration within the *Sala* (on 13 July 2006)

29²¹). The humanist influence on Pacioli's writing in *Summa* is clear to see (Belloni 1994, p. 43) and the fact that Pacioli used the vernacular is not surprising – Dante had done so when he wrote his Divine Comedy so as to make it available to the unlearned (Boccaccio 1355-9, 263) – and the greatest humanist educators of the mid- and late-15th century, including Pacioli's mentor, Leon Battista Alberti, promoted the use of the vernacular in order to reach the widest possible audience.

Use of the vernacular was not without its problems. In the 15th century, the Italian language was in a state of flux. There were a number of regional dialects spoken in what was to become Italy and no clear indicator of which would ultimately become the dominant language.²²



Figure 3: The States of Italy c. 1494²³

[Source: www2.wnorton.com/college/history/ralph/resource/italy.htm on 20 May 2007]

For someone who wanted to disseminate his work as widely as possible, this may have represented a significant dilemma. Not just because

²¹ "Inoltre, il Trattato XI risulta perfettamente integrato negli Trattati: stessa lingua usata, stesse espressioni idiomatiche, stessi proverbi, stesse citazioni bibliche che si trovano più volte anche negli altri trattati."

²² This was similar to the situation in many other parts of medieval Europe. For example, in 13th century France, the north spoke langue d'Oïl (which became French) and the south spoke langue d'Oc (Occitan); in 14th century England there were five distinctly different regional dialects, with the London dialect becoming the dominant one in the 15th century (www.courses.fas.harvard.edu/~chaucer/language.html on 26 June 2006).

²³ A more detailed map of Italy in 1494 can be seen at: www.lib.utexas.edu/maps/historical/shepherd/italy_1494_shepherd.jpg on 14 July 2006.

use of one dialect meant that those who spoke another might have a less than clear understanding of what was written but, also, there was a possibility of ridicule in later years if the chosen dialect fell out of use. Anyone who has compared the heavily Latin-and-French-influenced Middle English used by Chaucer (1343-1400) in *The Canterbury Tales* to the, by then, established English of Shakespeare (1564-1616), will appreciate the situation he was in. An example of the treatment that could result is to be found in the writing of the English printer, Caxton (1422-91), concerning the standard of English in books of the 14th century:

“[I] took an old book and read therein, and certainly the English was so rude and broad that I could not well understand it. And also my lord Abbot of Westminster had shown to me recently certain evidences written in old English for to translate it into our English now used. And certainly it was written in such a manner that it was more like Dutch than English. I could not translate it nor bring it to be understood.”
(Caxton 1490)

While Pacioli is unlikely to have been aware of this statement, he was a learned man and would have appreciated the risks should the vernacular he used fall into disuse. However, he had two good reasons for assuming the risks were acceptable. Tuscan was the underlying dialect of the vernacular he used. It was the dialect of the three main catalysts for the Renaissance – Fibonacci, Dante, and Petrarch – and it was the vernacular used at the heart of the Renaissance, Florence.

Secondly, many abachists were Tuscan and Tuscan was used routinely in Venetian abbaco schools where sons of merchants were educated. As a result, the merchant class were likely to have been familiar with the dialect.

In addition, printing erected barriers around dialects, leading to the demise of dialects that were not printed. Printers standardised the differences between the dialects that survived and “paved the way for the more deliberate purification and codification of all major European languages” (Eisenstein 2005, p. 92). While Pacioli would not have been aware of this, he would have been very aware of the power of the written or printed word in enlightening thought and shifting perspectives and, most importantly, transmitting and preserving ideas, concepts, theories and language.

Latin was a different matter. Whatever the position regarding the choice of an appropriate regional dialect, Pacioli had a major problem in using Latin because the dead language simply did not have the vocabulary to present and explain mathematical theories without artificially extending it (Taylor 1942, p. 144). In addition, the merchant class for whom he wrote *Summa* were not generally educated in either the scholastic or humanist schools and so would not typically have had sufficient knowledge of Latin to follow a practical book written in that language.

He had, therefore, every reason, both pragmatic and humanist, not to use Latin. Accordingly, while he did include small amounts of Latin in the text, he followed the advice of Alberti and wrote virtually all of *Summa* in the vernacular which, despite regional differences in dialect, made it largely

understandable to all Italians who could read, not just the minority who could read and understand Latin.

The use of the vernacular in *Summa* is not as straightforward as it would have been had it been solely in one vernacular. Some writers (for example, Lee 1989) have suggested that it was printed in Tuscan but, with some (mainly) Venetian variants. If so, this may have occurred because the printer or the compositor/ typesetter of *Summa* converted Pacioli's native Tuscan inconsistently into Venetian²⁴, a hypothesis that is supported by Lee (1989, p. 126) and Field (1999, p. 301); Yamey's (1994, p. 22) discussion of the spelling of Venice and the use of the Tuscan 'i' at the end of words in place of the Venetian, 'e'; and by the use of both the Tuscan and the Venetian spellings of Venice in the printer's colophons (i.e. identifying text) in *Summa*.

An alternative view of the nature of the vernacular used by Pacioli was offered some 10 years ago by reference to his manuscript book, *De Viribus Quantitatis* (1496-1508). In the introduction to its 1997 translation into Italian, Marinoni assesses the quality of Pacioli's language and the style of writing. He concludes (p. x) that Pacioli's vernacular was not pure Tuscan, nor Tuscan mixed with Venetian, but a hybrid mixture of dialects from the markets of northern Italy. Belloni (1994) used Pacioli's handwritten Perugian abbaco manuscript of 1478 as an exemplar of the manner in which Pacioli wrote in the vernacular. His conclusion concerning the language used by Pacioli was the same as Marinoni's.

It seems more likely, therefore, that it was Pacioli himself, not the typesetter who was chiefly responsible for the hybrid form of the vernacular used in *Summa* and that it was used by him because it was typical of the language used by merchants across Northern Italy at that time.

As evidenced by the printing of a second edition of *Summa* in 1523, this proved an appropriate form of the language for a book intended mainly for the merchant class. Further support for the appropriateness of the form of the vernacular adopted by Pacioli in *Summa* is given by its having been highly praised by his patron, the humanist, Guidobaldo, Duke of Urbino (Taylor 1942, p. 196) who was neither Venetian nor Tuscan. But *Summa's* hybrid vernacular plus occasional Latin later led to some commentators echoing Caxton and describing the language used as barbaric (see, for example, Franci and Rigatelli 1985, p. 62; Yamey 1994, p. 18).

In contrast to the mixed dialect of the vernacular used in *Summa*, Pacioli's decision to include some Latin in *Summa* can be explained with rather more certainty, as can its use in the *Sala* frescos.

Use of Latin in the *Sala* and by Pacioli

The vernacular is not used in the humanist-designed and decorated *Sala*. Latin is the only language in evidence and, in all cases, the Latin in the *Sala* is of an instructional nature or statements of significant prophetic truths. It is employed in two ways, each of which was commonly in use in paintings during the Renaissance. The first is in rhetorical verse, in the form of either

²⁴ The printer and the compositor were working against the clock, so omissions were always likely if they were converting the text from Tuscan to Venetian.

laudatory verse or epigram, within or alongside the images. These styles of rhetoric were very popular in humanist circles, and much admired. The self-portrait of Perugino contains a laudatory verse, translated from Guerrini (2000, p. 419), it reads:

*If the art of the painter had been lost by now,
he has reclaimed it.
But if it had not been invented up until now,
he has created it.*

The depiction of Cato includes an epigram which reflects his moral stance. Fusetti and Virilli (2003) translate it as:

*Whoever you are, whether you stand up to pronounce a discourse with solemn words
Or you hasten to render justice to the people,
Set aside your own affections.
He whose heart is troubled by love or hatred
Cannot follow the straight path*



Figure 4: Sala dell'Udienza, right hand side of entrance, Cato standing above an epigram in Latin.

Laudatory verses and epigrams were intended to please the ear and the senses and to impress the courts of Humanism. They were used to draw attention to the importance of civic virtue and responsible citizenship, to the importance of using rather than ignoring the learning of ancient times, and to encourage the adoption of humanist views of reason (science).

The text in the frescos of Perugino and Cato were written for the *Sala*, but in the classical style. The second use of Latin in the *Sala* is in the form of quotations from ancient classical authors.

Mirroring this form of use of Latin in the *Sala*, Pacioli uses Latin in *Summa* to draw attention to things of importance, invariably exaltations to good practice or moral behaviour. In doing so, he is, in effect, applying the art

of oratory to instructional writing and, in so doing, supporting and promoting the moral philosophy facet of Renaissance Humanism.²⁵

In an obvious attempt to add a stamp of courtly style and as a marker of the humanist movement, on the reverse of the first folio of the Introduction to *Summa* (the front of the page being a list of contents) and after a dedicatory letter to the Duke of Urbino, Pacioli included two laudatory verses. One of these verses is in Latin: 'The Epigram of Fra Pompilius to the Reader'. It praises the book and Pacioli (Lucas) to its readers. Taylor (1942, pp. 188-90) presents an abbreviated translation:

The things which have been wasting away in the midst of their hiding places

Lucas oh friend has restored to you

Specks of everything in the world.

Whatever you want to do and where you live this book will help you.

Most books do not. Consequently this book is unique.

Both this verse and Perugino's verse in the *Sala* are designed to make claims of authority through rhetoric and reference to recovered ancient authority.

There is, nevertheless, a significant difference between the use of Latin in *Summa* and in the *Sala*. Pacioli appears to have used Latin, not to make a separate point but, for emphasis. He enabled his readers to always understand what was being said in Latin by either following the Latin immediately with a translation into the vernacular; or by making the same point in the surrounding vernacular text. The Latin drew the attention of readers to the surrounding text as they searched for its meaning or, if they understood the Latin, as they noted the repetition of the point in Latin, so emphasising the point being made.

For example, in Chapter 4 of the bookkeeping treatise in *Summa* there is a quotation from St Mathew's Gospel in Latin, "*Primum quaerite regulum dei, et haec omnia adjicietur vobis*" followed immediately by its translation in the vernacular. The original text in *Summa* is shown in Figure 5.

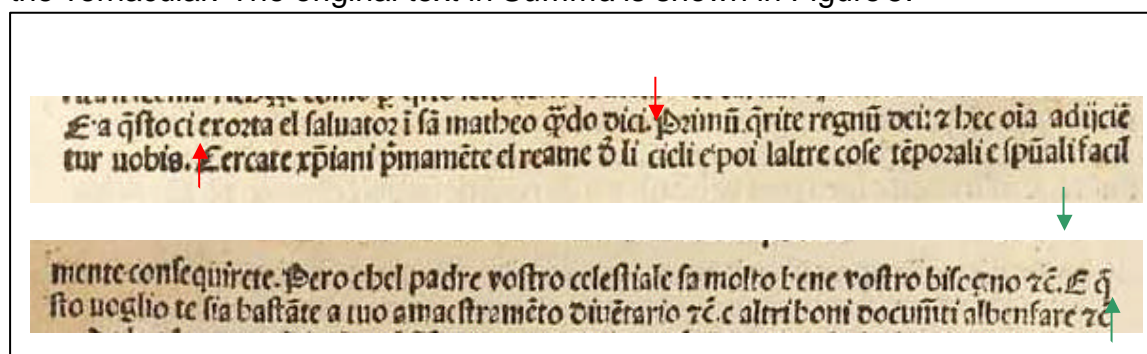


Figure 5: Extract from *Summa* folios 199 verso (back) and 200 recto (front)
[Source: diglib.hab.de on 29 June 2006]

²⁵ It was suggested by one referee that this occasional use of Latin adopted by Pacioli was typical of vernacular printed books of the 15th century, We draw attention to it because his use of Latin appears pre-meditated and for a specific purpose, rather than simply because it was the 'normal thing to do'.

[The quote in Latin is between the first two (red) arrows, Pacioli's translation of the phrase into the vernacular is between the (red) second and the (green) third arrows, and the final sentence of the chapter (in the vernacular) is between the (green) third and fourth arrows.]

Other examples of the use of Latin to emphasise a point, all taken from the bookkeeping treatise, include:

- In Chapter 1, “*Ubi non est ordo, ibi est confusio*” (“where there is no order there is confusion”) followed by the translation into the vernacular.
- In Chapter 4, a quotation from municipal law, first in Latin “*vigilantibus et non dormientibus Jura subveniunt*” (“the law helps those that are awake, not those that sleep”) followed by the vernacular translation.
- In Chapter 4, Pacioli reinforces his advice for merchants to keep God in their mind and to observe mass daily and assures them that they will not lose their riches by this means with a quotation in Latin from holy verse, “*Nec caritas opes, nec missa minuit iter etc.*”, this time with no translation but the surrounding text conveys a similar message to the one given in Latin.

In contrast, the imagery of the frescos provides a second message rather than an explanation of the Latin phrases. Consequently, anyone who did not understand the Latin in the *Sala*, would have needed someone to provide an explanation before they could understand the message being conveyed in Latin.

Nevertheless, just as it was used in *Summa*, Latin was used in the *Sala* to make a point. It was also designed to impress. It represented quality and old and good values and, irrespective of whether they understood Latin or not, it would have instilled in those within the *Sala* the perception that this was a “good” place to be, a place of virtue, and a place of trust – a place of high morals and ethics; and a place where humanist ideals were to be found and followed.

The use of Latin in *Summa* and in the *Sala* is consistent with the humanist goal to engage and persuade the intended audiences. In both cases, use of Latin carries strong moral philosophical messages as well as portraying eloquent rhetorical style. As in the *Sala*, all the Latin phrases used by Pacioli are of an instructional nature or are statements of significant prophetic truths. In both *Summa* and the *Sala*, the intended audience was the same – merchant society, and its noble patrons. The humanist symbolism discussed in the following section served a similar purpose.

Use of other humanist symbolism by Pacioli and in the *Sala*

Similarly to Pacioli's use of Latin being comparable to its use in the *Sala*, there are symbolic similarities between *Summa* and the frescos in the *Sala*, including references to the Cardinal Virtues, Theological Virtues, Dante and Cato.

Virtues and sayings

The virtues have a dominating presence in the *Sala*. The four Cardinal Virtues (Fortitude, Temperance, Justice and Prudence) are shown in the frescos along the long left wall with Latin inscriptions on waxed tablets or, more probably, slateboards; and the three Theological Virtues (Faith, Hope and Charity) appear in the other major frescos. In the fresco of the third theological virtue (God appearing before angels, prophets and sibyls), the prophets and sibyls each carry a 'phylactery' – a sash or a scarf – bearing a Latin inscription which emphasizes their part in the prophecies of the Redemption, quoted in each case from 'The Divine Institutions' by Lactantius (c.240— 320 AD). For example, the text on Isaiah's phylactery translates from the Latin as, "*behold the Virgin, she will conceive*".

The frescos abound with such Classical referents of Humanism. Each of the Cardinal Virtues is supported by three prominent figures from Roman and Greek antiquity, identified by their inscriptions. The source for the inscriptions was '*Factorum ac dictorum memorabilium libri IX*' [Nine books of memorable deeds and sayings] by Valerius Maximus (c.20BC – 50AD), in which morals and civic virtues were represented by exemplary figures from ancient history. The book was deemed of such importance to the humanist movement that it was one of the first books to be printed in Venice after the first press was established in the city in 1469, and was widely used in humanist circles during the Renaissance (Fusetti and Virilli 2003, p. 16).

Pacioli did not adhere to the strictly humanist approach adopted in the *Sala* of using classical ancients as the sources of authority. Rather, he adopted a practice common among Franciscan preachers of taking material from whatever source it can be found (Moorman 1968) to present wisdom, moral ideals and good habits. He used Cato, an ancient authority, and Dante, an early humanist authority, and references to scripture; and he took wisdom from wherever it could be found in everyday parlance, common sayings, municipal law, and from commonly known poets. His wider use of sources clearly presented him with many more examples that could be used than would have been the case had he adopted a strictly humanist ancient-classical-based approach.

In the bookkeeping treatise, Pacioli uses these sayings mainly in Chapters 1 and 4, where he is laying out the approach he wants his readers to adopt; and in the concluding chapters, 34 and 35, when they act as reminders. He is particularly keen on emphasizing watchfulness and hard work. Three examples from Chapter 4 illustrate the manner in which he did this. (All translations are from Crivelli 1924, p. 17):

A common proverb:

"A merchant rightly resembles a cock which, among other things, is the most watchful bird that exists. In winter or in summer it makes its nocturnal vigils, at no time resting."

On the same theme but quoting from municipal law:

"Help comes to him who is watchful and does not sleep."

And then another common proverb:

“A merchant’s head is also compared to one that has a hundred eyes; yet these are not enough for him, either in words or in actions.”

Pacioli utilises sayings and expounds good deeds in line with, and in a manner that mimics those of Valerius Maximus. Furthermore, and in keeping with both his role as a friar and the humanist education principle of education for a good Christian life, he opens and closes his instructions with exhortations that each page of a merchant’s books should start with the Sign of the Cross and that God’s name should always be kept in mind. For example, in the opening part of Chapter 3 of the bookkeeping treatise, he gives an example of how to head up an inventory and states that you should start with the following form of words in the vernacular: *“Al nome de dio. 1493. a di. 8. novembre in venegia”* (“In the name of God, this 8th day of November, 1493, in Venice”).

Dante and Cato – the order of the world and civic virtue.

The ceiling of the *Sala* shows the ruling of human destiny by the astrological signs and seven of the Orders of Angels (as defined by Dante). It clearly situates the moneychangers and merchants (who undertook their business in the *Sala*) beneath the established order of the heavens. Pacioli also uses Dante: in Chapter 4 of the bookkeeping treatise:

“Alas my son, it is necessary that you shake yourself, for one does not attain to fame in fine feathers and under quilts. He who wastes his life under these leaves only a trace similar to that left by smoke in the air or by foam on the water.” (Crivelli 1924, pp.17-18)

Similarly to the use of the planetary gods by Dante within the *Sala* to represent moral order, they are featured by Pacioli in another reference to Dante concerning Mars, this time mirroring the victory represented by the chariots on the ceiling of the *Sala*.

“Work should not seem strange to you, for Mars never granted victory to those who resting fed themselves.” (Crivelli 1924, p. 18)

The guardianship of Cato at the entrance to the *Sala*, with his associations with defence of civil order, suggests lofty aspirations which both demand an exemplary standard of public morals and flatter Perugia by implying that the city values can be equated with those of the great days of the Roman Republic. Pacioli uses Cato in a similar manner in *Summa*, advising merchants to learn to be good mathematicians and to be careful to learn practices from teachers of good reputation, as translated by Taylor (1942, p. 63):

“... keep in mind the precept of Cato the moralist: ‘Learn from the wise and teach the ignorant yourself, that is, don’t learn from ignoramuses who have more leaves than grapes.’”

Discussion and Conclusion

This paper has found that Pacioli's choice of language and use of classical referents and sayings to convey ideas, concepts, advice, images and moral values in *Summa* appears to have been deliberate; it was calculated and was consistent with the humanist age in which Pacioli wrote his text.

The humanist programme of the decoration in the *Sala dell'Udienza* is a sophisticated mix of referents with wide appeal which demonstrated the learning, culture and civic status aspired to or attained by those engaged in commerce by whom and for whom it was built. As the decoration of the *Sala* claims a status for merchants and money changers, so Pacioli claims a status for merchants in *Summa*.

Pacioli's *Summa* was an innovation in its day. He called it a 'compendium'. It contained the mathematical knowledge that was taught in the abbaco schools (Franci and Rigatelli 1985), thus inferring that it was primarily intended for the merchant class and their abbaco teachers and that it was designed to help them in the conduct of commercial affairs (Sangster et al. 2007). Supporting this view, Pacioli is considered to have been one of the foremost teachers of abbaco (Camerota 2006, p. 327) and as much a teacher of abbaco as he was a master of theology (Ciocci 2003). *Summa* is considered to be the finest example, and the most comprehensive of all the abbaco texts (Jayawardene 1971; Rowland 1995), and to have represented a bridge between the practical knowledge of technicians and merchants and the theoretical teaching of mathematics in university (Ciocci 2003, p. 23).

The examples presented in this paper illustrate the moral authorities Pacioli appealed to in his writing and also his teaching (for *Summa* is written in the style of a didactic lecture); and show that his approach has major humanist similarities with the moralist programme used in the decoration of the *Sala dell'Udienza*.

In *Summa*, Pacioli embraces humanist education ideals. His choice of language would have been careful and deliberate. In his introductory letters and dedications in *Summa*, as well as through the inclusion of two rhetorical verses, he demonstrated that he understood how to appeal to his fellow humanists, admirers and patrons. He also used Latin as an instructional device in a humanist style that had significant similarities with its use in the *Sala*; and he did so in a manner that ensured that his message was conveyed as widely as possible – another ideal of humanist education.

Pacioli had a range of choices open to him concerning the language and writing style to use when he wrote *Summa*. As a pre-university teacher of abbaco (see, for example, Grendler 1989; Camerota 2006; Ciocci 2003), he had many years experience of teaching in the vernacular. As a university teacher, he would have lectured in Latin and would have known how to use it effectively. He would also, as a Franciscan preacher, have been used to addressing a common crowd and catching their attention so that they listened to his message.²⁶ He would have known precisely how to pitch his text for his intended audience.

²⁶ See, for example, Moorman (1968) and Lesnick (1989).

His writing in *Summa* sought wide and public appeal among the merchant class in a way not dissimilar to that sought by the designers of the decoration in the *Sala*, and so educated and impressed its merchant class audience. *Summa* was a serious attempt inspired, at least in part, by humanist thinking in education, to raise the level of business education for those running and those aspiring to run businesses. His use of the vernacular in *Summa* was appropriate for such a text and his use of Latin and instructional imagery in a humanist style was consistent with and would have appealed to those for whom the book was intended.

In answer to the question posed at the start of this paper, the views of both the critics of Pacioli's writing style and of his supporters were justified within their own contexts and time. However, as the "Italian language" was developing rapidly in the late-15th century, Pacioli's critics ought, perhaps, to have paid more heed to that situation and, possibly, to the mores of printing in 1494 before lambasting him in the manner they did. In 1525, Tuscan was identified as the preferred source dialect for a common Italian literary language. It is unsurprising, therefore, that 50 years after publication *Summa's* hybrid version of the vernacular was considered outdated by, for example, the mathematician Federico Commandino (1509-75)²⁷ and in need of up-dating to the Italian of the mid-16th century.

Pacioli's Latin in *Summa* was clearly not the "good" Latin of the classical period aspired to by the humanists. However, it does not matter which form of Latin it was. What mattered was whether Pacioli's Latin was a correct representation of the form of Latin he was using (Grendler 2006). Given the praise his writing received at the time of its publication, it probably was.

Despite the linguistic criticisms it received, for 50 years from 1494, Pacioli's *Summa* was the most widely read book on mathematics in Italy (Olschki 1918) and the fitness-for-purpose of Pacioli's use of language and style in late-15th century Italy is indisputable. Further, Pacioli's humanist-inspired literary style was undoubtedly a significant step in the search for an appropriate style of educational writing in the humanist tradition and represented a major step in the development of humanist approaches to education – approaches which are still important in education today.

Pacioli was a man of his time. His primary goal was to educate those around him, to help them in their daily lives. He was writing for men of his world, not the world of 50 or 500 years in the future. That he did both is a testament to the quality of the contents of *Summa* and to his choice of style of composition and writing, irrespective of how they were presented linguistically.

Had Pacioli not adopted a humanist style in writing *Summa*, it is doubtful that it would have gained either the audience or the dissemination it did, questionable if bookkeeping would have developed along the lines he set down, and doubtful if mathematics would have progressed at the pace it achieved in the 16th century. Indeed, his bookkeeping treatise would possibly

²⁷ Commandino was considered the seminal translator of Euclid from Greek into Latin (1562) and then into Italian (1575). He also translated works by Archimedes, Ptolemy, Aristarchus, Pappus, Apollonius, Eutocius, Heron and Serenus. He founded the Urbino School of Mathematics, thought highly of the content of *Summa* and introduced the work to other important mathematicians of his day (Rose 1976).

have remained as unknown and uninfluential as the five pages on bookkeeping written in Naples in 1458 by the Ragusan, Benedetto Cotrugli, but not published until 1573 (Tucci, 1991), by which time the world had moved on, a fate that certainly did not befall *Summa* when it was published in 1494.

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