

PACIOLI, ALGEBRA AND DOUBLE ENTRY. HOW ACCOUNTING HISTORY CAN AUGMENT ONE'S TEACHING**Derek Stone**

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De Computis published this paper in June 2021. It explains how and why Pacioli probably used his mathematical skills when investigating the Venetian Method of bookkeeping, and it also indicates how this interpretation of Pacioli's treatise gives a more logical introduction of accounting to a student.

It is my belief that financial decisions are better made if the decision maker has a firm grasp of how the accounting system captures data, without using the terms, debit, credit, and double entry. Consequently, as well as explaining why the rules were developed in the first place, I wanted to provide a framework that would clarify the way data is captured and then reported. The paper showed how knowledge of accounting history can help teachers improve their skills; a lot can be learned from our predecessors.

Pacioli began with the equation, well known to all of us, of:

$$\mathbf{Assets = Liabilities}$$

He made the point that a business should be regarded as if it were a person, and implied that its records should be kept from its point of view. This means that the owner's interest, whether expressed as capital or equity, is a liability from the business's point of view.

His second point was that a company had to make a profit if it was to survive, and the equation became:

$$\mathbf{Assets = Liabilities + Profit}$$

Since:

$$\mathbf{Profit = Revenues - Expenses}$$

This becomes:

$$\mathbf{Assets = Liabilities + Revenues - Expenses}$$

Which, in turn becomes:

$$\text{Assets} + \text{Expenses} = \text{Liabilities} + \text{Revenues}$$

The fact that assets and expenses are on the same side of the equation explains why they are both dealt with in the same way by the double entry system. Assets become expenses as they are used up.

The accounting system does not have an equal sign in it, and the system was made self-balancing by deducting the righthand items from both sides, ending up with:

$$\text{Assets} + \text{Expenses} - \text{Liabilities} - \text{Revenues} (=0).$$

Double entry with single columns developed next, but it had the disadvantage that increases, and decreases were mixed up in the same column. This was of concern because merchants needed know how much came in, and how much went out, of an account in a period, particularly in the case of cash. Pacioli told them that, if they could not control cash, they would lose it, and their businesses. So, the next step was to have two columns under each heading, one for plus and one for minus amounts.

Assets		Expenses		Liabilities		Revenues	
+	-	+	-	+	-	+	-

Now the numbers were unsigned; they took their signs from the columns that they were in. However, this development introduced two further problems. The first was that the balances had disappeared. How to get them back? The clerks could not do subtraction; negativity was a no-go area in the 15th century, with only maths professors, like Pacioli, understanding it. Today we would say ‘ten, take away 7 equals 3’. In the 15th century the clerks would have said ‘7 and 10? What do we need to add to get 10? Answer, 3’. That is why we have that weird way of ‘carrying down the balance’, with no minus signs in sight! This solved the first problem.

Next it was necessary to get rid of the minus signs at the top of those columns; to disguise them in some way. I think religion stepped in here. According to Pacioli’s first statement a business owes all it holds to its owners, or to suppliers, and its owners and suppliers are trusting it to pay them one day. The verbs for ‘to owe’ and ‘to trust’, are ‘*debere*’ and ‘*credere*’, shortened to ‘DR’ and ‘CR’ and to ‘debit’ and ‘credit’. So, the plus sign was replaced with DR and debit, and the minus sign with CR and credit. Disguises in place!

Assets		Expenses		Liabilities		Revenues	
<i>DR</i>	<i>CR</i>	<i>DR</i>	<i>CR</i>	<i>DR</i>	<i>CR</i>	<i>DR</i>	<i>CR</i>

In My paper I showed these in worksheet form, but they could also be expressed as ‘T accounts’; the double columns of the worksheet being the two sides of the T account.

We have arrived at double entry as we know it. However, introducing these terms created another problem because, as well using the terms as nouns, they were also used as instructional verbs. ‘To debit’ and ‘to credit’, meaning ‘put it into a left column’ and ‘put it into a right column’ respectively. Thus, debits both increase accounts, and decrease them, as do credit entries. This can be compared to a person blowing on hot food to cool it, and then blowing on cold hands to warm them up. They are not blowing hot and cold air out of the same mouth, are they? No, it’s the location that their breath is aimed at which causes the confusion; one is hot, and one is cold. This illustrates the problem we have with debits and credits; it’s because asset and expense accounts have their balances on the left and liability and revenue accounts have their balances on the right. We should blame the destination accounts for the confusion, not the debit and credit instructions!

I avoid this problem initially by getting my students to create a business themselves. They call out transactions and I build a worksheet as they do so. As a result, they understand how accounting captures data without my ever-mentioning debits, credits, or double entry. Thus, they appreciate the logic without having to accept rules. I tell them “In building the worksheet, never get stuck, if you cannot see where to put a balancing entry, just open another column. It can be transferred later when you do find the correct place to enter it in”. Finally, I find that a worksheet (instead of “T” accounts) makes the system much clearer, although it is easy to link the two together as an ultimate step. I taught this way at the London Business School for twenty-five years, and it was very well received.

I have now developed some *YouTube* presentations based on this paper. To see them please type the following into google search:

Pacifortheweb

<https://youtu.be/sYsvFEV65mY>

(It’s one word and this video describes how the accounting system developed)

Pacioli and the merchant

<https://youtu.be/GsWLYaCCNMI>

(Based on the business in ‘*The Merchant of Venice*’, by Shakespeare)

How to succeed in business the Pacioli way

<https://youtu.be/P5zm3UwHx2U>

(Yes, I know that there is a 65 in it which should be 55, but I am only human, after all!)

How to succeed in business the Pacioli way part 2

https://youtu.be/_xNRYjqpHKg

(Based on my book ‘Understand Accounting’, available from Amazon). The model used in the above video can be downloaded from my website:

understandaccounting.com

I hope that students will view these videos as part of their learning experience, particularly the first one. Naturally, I will be producing more, starting with financial analysis and with the production of pro-forma consolidated accounts in take-over situations – all in the “Pacioli Way”, of course. Its reference will be available on my website ‘understandaccounting.com