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8-25-2005

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Recommended Citation
Libina, Regina, "The Development of Double Entry Bookkeeping and its Relevance in Today's Business Environment" (2005). *Honors College Theses.* Paper 23.
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Development of Double Entry Bookkeeping and its Relevance in Today's Business Environment

Various factors have influenced the evolution of the discipline of accounting. Many civilizations developed accounting theories based on the specific needs in their societies. One of those developments was the double entry bookkeeping system. Some of the factors that contributed to the creation of double entry bookkeeping included techniques in math, the invention of coins and money as a medium of exchange, the introduction of paper, the development of a banking system, and various economic conditions that required a system of proper recording. In this thesis I will analyze the double entry bookkeeping system and its benefits. I will also discuss the differences between the complex capitalistic structure we operate in today with that of the world of Luca Pacioli, the person accredited with disseminating information regarding the practical use of the double entry bookkeeping system, who lived during the Renaissance when this system became pervasive. It will then evaluate how the double entry bookkeeping system described by Luca Pacioli still has relevance in today's world of accounting.

The Development of the Double Entry Bookkeeping System

Michael Chatfield writes, "A study of their evolution suggests that accounting processes are reactive, that they develop mainly in response to business needs at any given time, and that their growth is

relative to economic progress. In general, the higher the level of civilization, the more elaborate the bookkeeping methods" (3).

The earliest surviving business records can be traced back more than 7,000 years ago to the Chaldean-Babylonians, Assyrians, and Sumerians. Their geographic layout between the Tigris and Euphrates River gave them rich farming land. As a result of the farming and irrigation advantages the civilizations had, small businesses were established and "an extensive trade grew up within and outside the Mesopotamian Valley" (Chatfield 5). In fact, the city of Babylon was labeled the "queen of commerce." Because these civilizations had to give a detailed account to their supernatural masters for their fertile land, they had to keep intricate records.

"The predecessor of today's accountant was the scribe" (Chatfield 5). It was the scribe's duty to record the business transactions on commercial tablets. "Scribes recorded the types and quantities of goods as they arrived at storehouses throughout the country, and supervised their segregation for sale, use, or accumulation. Periodically, they prepared inventories of assets on hand and charge-and-discharge type summaries of commodities received and paid out" (Chatfield 6). In many ways, Babylonians were like many modern accountants because of their passion for organization.

> After an agreement had been written and signed, the scribe sometimes took in hand a new piece of clay and […] wrapped it completely around the original tablet. Like a modern envelope, this outer covering might be rewritten and signed again on the outer surface, providing in effect a carbon

> copy. Since the inner and outer messages were supposed to be identical, any tampering with this envelope could immediately be detected by comparing to its original inscription. (Chatfield 6)

Also, while it served the purpose of record keeping, writing on clay was difficult and time consuming.

The development of accounting in Egypt was quite similar to that in Babylonia. In Egypt, however, "the introduction of Papyrus as a writing surface made records less cumbersome and permitted a wider use of supporting documents" (Chatfield 6). Egyptian authorities required that records of transactions be kept by two different scribes, whose records had to agree. This was an example of early internal control procedures. It is important to note that the lack of a medium of exchange slowed the development of these civilizations, thus slowing the development of their accounting methods. "The inability to express all these goods in terms of a single substance made accumulation and summation very difficult, and an integrated accounting system virtually impossible" (Chatfield 7).

In China, accounting was developing slower and over a longer period of time. "During the Chao Dynasty (1122-256 B.C.), government accounting reached a peak of sophistication which was hardly improved on till the introduction of double entry techniques in the nineteenth century" (Chatfield 8) China had a central bank, the Bureau of Currency and Produce Exchange, which made loans and bought up goods that could not be sold in order to stabilize the commodity markets. The Chinese also used their accounting to "evaluate the success of

government programs and the efficiency of personnel" (Chatfield 8). The idea of budgeting may have originated in China. The Chinese may have also introduced timely reports. They used a lunar calendar, "dividing the year into twelve months…and each month into three ten-day periods called hsun. Accordingly, ten-day, monthly, and annual reports were prepared throughout the budget cycle" (Chatfield 9).

Athens in the fifth century B.C. was a city run by its citizens as they "possessed real authority over government finance and the official bureaucracy" (Chatfield 9). There were 10 publicly chosen state accountants, who recorded all revenues as they came into the city and compiled lists of government debtors. The fact that Athens was run by popular sovereignty introduced the idea of financial disclosure for the first time in history. "To ensure maximum publicity, certain accounts were even engraved in stone and placed on public view" (Chatfield 9). Despite this emphasis on transparency of government records, fraud was common, which created a need by citizens for the records of government officials to be examined by government auditors at the expiration of that official's term.

Greeks began issuing coined money in about 630 B.C. Records could now be kept in money form and this medium of exchange also guaranteed consistency. Although they could record business transactions in money terms, there were times when they did not. At times they represented property in physical quantities and monetary assets in money terms. Just think of inventory and cash equivalent assets on the books of any company.

Evidence suggests that banking in Greece was also highly developed. "All bankers kept account books, which might have to be produced as evidence in court. They changed and loaned money, accepted deposits, acted as intermediaries and trustees, and arranged cash transfers for clients through correspondents in distant cities" (Chatfield 10).

In Rome, accounts began "as elaborations of the records traditionally kept by the heads of families" (Chatfield 12). These records included daily entries of household receipts and payments in a day book called an *adversaria*. There were also monthly postings made to a *codex accepti et expensi* which served as a cashbook for the families. The keeping of household accounts was very important because taxpayers were mandated by law to prepare statements of all their property and debts outstanding. Another reason for the compilation of these statements was the dependency of a citizen's civil rights on the amount of property that citizen declared. As in Greece, the Roman banking system was highly developed in that "bankers maintained three books: an adversaria, in which transactions were noted as they occurred; a codex accepti et expensi or cashbook; and a liber rationum, literally personal ledger or book of accounts, where data from the adversaria were classified" (Chatfield 13).

"Double entry bookkeeping came into being with the rise of Mediterranean commerce during and just after the crusades (1096-1291). Besides requiring ships and provisions, the crusaders brought back silks, spices, and other Eastern products, stimulating demand for such items and for the production of European exchange goods" (Chatfield

33). "Genoa and Venice quickly established themselves as intermediaries in trade relations between Europe and the Near East" (Chatfield 33). "Italians not only became the leading merchants of the Middle Ages, but nearly monopolized international banking. They regularly put trade competitors out of business and limited others, such as the English, to a local sphere of influence" (Chatfield 33). Italians had formed superior business organizations. "Operating on a scale never before known, they found that bookkeeping methods which worked in a small company broke down when a merchant began trading through a network of factors and international partnerships" (Chatfield 33).

> Through their North African trade contacts the Italians became the first Europeans to acquire Arabic numerals which, within a generation after their exposition by Leonardo of Pisa (1202), were widely used by Italian Merchants. The existence of a sophisticated money economy and the most stable coinage since Roman times allowed transactions to be reduced to the common denominator necessary for double entry bookkeeping." (Chatfield 33)

It is important to emphasize the introduction of Arabic numerals as a major occurrence in the facilitation of double entry bookkeeping. As stated above, Leonardo of Pisa, known later by his nickname of Fibonacci, introduced Arabic numerals to Europe after studying with Arabs while residing in North Africa. He wrote *Liber Abaci,* which described Arabic numerals and addressed merchants (not academics) about the superiority of this new system. The *Liber Abaci* presented

examples from commerce, such as profit calculations and currency conversions.

The Italians also relied heavily on credit when conducting business, which required written records of amounts owed and owing. All these factors required an involved accounting system. The Italian system was quite different from any system before it. "Each transaction was recorded twice, once as a debit and once a credit, so that total debits had to equal total credits. All accounts were kept in the same monetary unit, and the integration of real and nominal accounts allowed profit and equity figures to emerge as remainders" (Chatfield 34). Real accounts are those accounts that exist from one period to the next, whereas nominal accounts are closed at the end of a specific period. The occurrence of a transaction, which creates a revenue or expense will affect a real and nominal account. These nominal accounts accumulate profits and losses and are closed at the end of the period to reflect the profit or loss for the individual or entity.

Various Italian cities, including Genoa, Venice, and Florence, adopted variations of double entry bookkeeping.

> Yet it was from Venice that double entry bookkeeping went out to the world, and the Venetian style had at least three advantages. (1) Venice was a center of the book trade, the first books on double entry were published there, and the invention of movable type roughly coincided with the perfecting of bilateral accounts. (2) Venetian teachers of bookkeeping had refined the arrangement and wording of

> entries in ways conducive to clarity, cross reference, and easy arithmetic calculation. (3) Though designed for the overseas merchant, venture double entry was extremely flexible and could easily be adapted to show annual operating results for a whole business and even to include a manufacturer's cost accounts." (Chatfield 37)

In Florence, extensive trade had created 80 banks by 1338 and by the end of that century, the number had grown to over a hundred. These banks needed to keep detailed records of the debts owed to them as their business depended on the accuracy of their records. "Three of the most powerful Florentine merchant-banking houses were the Bardi, the Peruzzi, and the Accianinoli" (Chatfield 39). The Peruzzi, for instance, had ledger entries, yet the debits and credits were not yet placed next to each other. "Instead, debits were entered in the front half of a ledger and credits in the rear half" (Chatfield 39). Something may have been inherently wrong with this system, as all three banks went out of business in the 1340s due to default on loans and over reliance on credit. The Medici Bank, founded in 1397, was quite powerful even though it never reached the size of the Bardi or Peruzzi. "The Medici accounts are interesting because of their use of double entry technique for essentially modern purposes-management and control, audit, and even income tax calculation" (Chatfield 40).

The double entry bookkeeping system was developed and functional even before Luca Pacioli's *Summa* was published in 1494. However, before Luca Pacioli, double entry was not being used to its full potential. For instance, very few merchants relied on their regular

accounts, kept up with double entry bookkeeping, to keep track of the accuracy of their capital and profits.

It can be argued that perhaps double entry bookkeeping was much too sophisticated for its time.

> Its comprehensiveness and its focus on the sources of profits and capital made it the first bookkeeping methodology with theoretical potential. The integration of expense and equity accounts provided a means of quantifying the distinction between capital and income. Double entry also promoted the concept of the business firm as a separate entity whose purpose was profit maximization. Finally, it contributed to the doctrine of objectivity by restricting account data to the transactions of the firm and by expressing all transactions in terms of a single monetary unit." (Chatfield 41)

As stated before, Luca Pacioli was not the inventor of double entry bookkeeping. However, he did disseminate information about the practical use of this system, which was not being fully utilized by the tradesmen of his time.

Luca Pacioli was born around 1445 in Borgo San Sapulcro, Tuscany. At the age of twenty he traveled to Venice and became a tutor for three sons of a rich merchant. For six years, while teaching mathematics to them, he gained an understanding and appreciation for commerce and bookkeeping. Perhaps it is this experience that influenced the publication of his fifth book in 1494, *Summa de Arithmetica, Geometria, Proporioni et Proportinalita* (Everything about

Arithmetic Geometry, and Proportion). Undoubtedly, Pacioli's belief in disciplines that exhibited natural harmony and balance influenced his work. He was a true Renaissance man in that not only had he learned bookkeeping in the merchant's house while tutoring his children, he was also a "friar and courtier, administrator and student of military science, the author of mathematics texts and of a book on games. The interests of the commercial man were blended with the talents of a mathematician and a scholar" (Chatfield 45).

It is this ability to look at matters from various perspectives that enabled him to write the *Summa*, a book that could be easily read, understood, and applied by an inexperienced merchant and a beginner to the double entry bookkeeping system. The *Summa* covers the topics of algebra and arithmetic, their application in business, bookkeeping, money, and exchange, and pure and applied geometry. The bookkeeping section consists of thirty six short chapters called "De Computis et Scripturis," meaning "Of Reckonings and Writings." The perspective Pacioli takes on bookkeeping is viewing it "as a mathematical problem that serves to create order in the mass of data" (Have 41).

> Pacioli begins De Computis by saying the successful merchant needs three things: sufficient cash or credit, good bookkeepers, and an accounting system which allows him to view his affairs at a glance. Before starting a business the trader should prepare an inventory comprising all his business and personal assets and debts. Items should be arranged according to their mobility and value, with cash and valuables listed first because they are most

> easily lost. The inventory must be completed in one day and assets should be valued at current market prices. (Chatfield 46)

As he catered to the merchant in his book, he stressed the importance of proper recording. This system is based on three books, which are the memorandum, journal, and ledger. "The memorandum is the book of original entry and as transactions occur they are recorded chronologically with complete details" (Chatfield 46). The memorandum did not need to be kept in a particular form and was simply a source book from which debits and credits of accounts were journalized. While the memorandum is no longer used today, at the height of the Renaissance merchants relied heavily on it.

> To some extent it took the place of printed documents which accompany modern purchases and sales. And, since a number of Italian city-states issued their own money, merchants received many different types of coins. Transactions could be entered in the memorandum in any monetary unit and converted at leisure to the common denominator necessary for double entry bookkeeping. (Chatfield 46)

At the end of the day, entries from the memorandum were recorded in the journal. The original entries were then crossed out from the memorandum.

Merchants were to use the journal as their private book.

> Journal entries consist of a narrative debit (debitore), credit (creditore), and explanation in one continuous paragraph. The date appears at the center of the page

> above each entry; a debit follows preceded by the word 'per'; then two diagonal lines separating debit and credit; then the credit denoted by the word 'a'; finally the explanation, which summarizes the memorandum entry. The amount of each transaction is recorded once on the right side of the page. (Chatfield 46)

"His reasoning is to the effect that an equilibrium is created […] Pacioli states that for maintaining equilibrium one must never post an item in the credit unless there is a debit posting in the same amount" (Have 42). While discussing the journalizing process, Pacioli also makes a point to note that the balance of cash should never be negative.

The most modern of the three books mentioned by Pacioli is the ledger. The entries in Pacioli's ledger are in the form of concise paragraphs, with account names at the top of each page.

> After numbering the pages and entering the year date in Roman numerals at the top right, the bookkeeper posts Cash in Hand as a debit on one page, just as it was entered first in the journal. As ledger postings are made, he draws two diagonal lines through each journal entry, one from left to right when the debit is posted, the other from right to left when the credit is posted. (Chatfield 47)

Just like the journal, the ledger includes posting references. One major distinction between the posting references of the ledger and those of the journal is that the posting references in the journal show the pages of the ledger to which the journal entry was posted.

The ledger references refer to the other half of the ledger entry, instead of back to the journal. This made it difficult to trace a transaction from the ledger back to the journal, leaving the user to only go by the date the transaction occurred.

> Pacioli's accounting cycle ends with the trial balance (summa mummarium). The bookkeeper lists all debit amounts from the old ledger on the left side of a sheet of paper and all credits on the right. If their two 'Grand Totals' are equal, the old ledger is finally considered correct. If they fail to balance 'that would indicate a mistake in your Ledger, which mistake you will have to look for diligently with the industry and intelligence G-d gave you and with the help of what you have learned.' (Chatfield 48)

Benefits of the Double Entry Bookkeeping System

One of the benefits of the double entry bookkeeping system is its error-catching feature. Manipulating income leaves a trace on the financial statements and an auditor can detect the fraud by examining whether the entry is credible. For instance, if a company decides to inflate the cash on its books or if there is simply an error, due to the matching principle of accounting that is inherent in double entry bookkeeping, there is another account, such as Accounts Receivable, that needs to be adjusted. Therefore, there is a greater chance of finding the fraud/error because there is more than one account that is affected by this false/erroneous entry.

Another benefit is its focus on income and capital. When the double entry bookkeeping system came about, it was geared toward the merchant who was evaluating his financial position by the amount of income and capital he had. This is still the focus of double entry bookkeeping. The system integrates real and nominal accounts, which allows transactions to be expressed as the balance of a single profit and loss account. In addition, while there is still subjectivity in accounting when it comes to estimation of certain accounts like bad debt expense, double entry bookkeeping provides a systematic calculation for income. Although the books of a business have become much more complex with new accounts added as well, this aspect of uniformity still applies today.

The system is also enhanced when there is a separation of duties. In addition to the advantage of splitting the work, thus allowing more work to get done, different people can also keep different journals, thus allowing for separation of labor and mitigating the possibility of fraud.

Another benefit is that the double entry bookkeeping system leaves an audit trail. It is an organized process since first an entry is posted to the journal, which then transfers to the ledger, as well as the use of reference numbers in all books, allows for a tracing function.

The Continuing Relevance of Double Entry Bookkeeping in Today's Changed Business Environment

The world we live in today is quite different than the world in which Luca Pacioli lived more than half of a millennium ago. Certainly, the role of the government has changed. Taxes on income of businesses have changed the business arena. Depending on whether you are a sole proprietor, partnership, or a corporation, different taxes apply. The government also exerts control over investor protection. Government agencies that protect investors include the Securities and Exchange Commission and the PCAOB (Public Company Accounting Oversight Board), which regulates the audit and assurance function.

The size and complexity of enterprises has also increased. Accounting books become difficult and time consuming to keep by hand in an enormous corporation. The transactions that we deal with in today's business environment are more complicated. Mergers and consolidations are just a few of those transactions. Another element of the business environment we operate in today is the continuing nature of enterprises. This has brought on the need for periodic reporting, which involves periodic closing of accounts and accountings, something that Pacioli did not consider during his time. Another issue it raises is the valuing of assets. The question of valuing at cost, historic value, or market value arises. Because business entities exist for long periods of time, the value of their assets can change over years, thus requiring the need to value at cost, rather than at market value as Pacioli did. We also have long-term international investments. This requires complicated rules on currency conversion. In addition, complex investments by companies

such as the use of derivatives in hedging transactions make the accounts that flow into the financial statements more obscure.

We now have the corporate form of ownership. In addition, in order to support the capitalistic markets that foster the corporate form, disclosure is required. Since there is widespread ownership of shares of various corporations, the public is now interested in a company's performance creating greater need and pressure for companies to account accurately. With this, in addition to the government's role for both tax and regulatory purposes, there is greater need and pressure for companies to account accurately.

The principal user today is different from the principal user of Pacioli's time. Pacioli geared his theory of double entry bookkeeping toward the merchant's need to evaluate his own financial position. In his time, it was sufficient for the merchant to understand his own finances through his records. Today, stakeholders need to not only understand financial information presented by companies, but also be able to compare that information with other companies. So the chief difference arises from the fact that the merchant is no longer looking at his own financials to note what he does and does not own. Instead, in today's corporate environment the public and other stakeholders evaluate a corporation's books.

Another difference is the advances in technology we have made. As we became more technologically advanced, we now have other forms of recordkeeping, such as databases. Computer languages such as XBRL (EXtensible Business Reporting Language) are making it easier to publish financial information in the XML format and exchange

accounting information and financial statements between companies. Furthermore, the use of databases provides companies with detailed information about the type of transaction, the time it took place, and other specifics that would have been impossible to record by hand with the volume of transactions that occur on a daily basis in those companies.

Then the question becomes, since the world we live in has changed significantly, does the double entry bookkeeping system still bear relevance today? I believe that the system is still quite useful in today's business environment. The way Pacioli explained the form of double entry bookkeeping system is approximately that of its final development today.

> "The theory underlying Pacioli's work is even more contemporary. Though his purpose was practical, he constantly emphasized the proprietor and proprietorship, and the advantages of bilateral accounts, particularly in gathering profit and loss totals. In making explicit the mathematical logic underlying double entry, he touched the roots of modern accounting theory" (Chatfield 49).

Also, in addition to the fact that it was a prerequisite for later developments in accounting and allowed for much flexibility in terms of valuation and the creation of new nontraditional accounts, such as wages payable and marketable securities, the double entry bookkeeping system is a subset of a larger information system. Many modern programs such as Peachtree allow for the journal and ledgers to

be kept on the computer and be referenced easily, when needed, through simple data queries.

Moreover, algebra which contributed to the creation of double entry bookkeeping does not go out of date and still is the underlying basis for why the system works so well. The focus of the system is still on capital and income, especially in major corporations. Because of the ability of the system to derive the income of a company through the various real and nominal accounts, it is still a powerful tool for any business. The system also ensures that accounting is complete because of its complete set of accounts and the dual nature of the transactions and entries. Moreover, double entry bookkeeping allows the user to understand the relationships between accounts as posting is done. As Yuji Ijiri states, "under a double entry system an increase in cash cannot be recorded without first identifying a credit account. This search for a proper account leads the accountant, as well as the manager, to a 'reason' for the increase in cash" (30). Finally, as mentioned before, it is still an antifraud tool today since one account cannot be altered without affecting another.

We live in an age where all transactions are supported by paperwork or some form of data support such as invoices, sales orders, purchase orders, and authorizations. Strong internal controls and auditing practices are needed in order to detect and prevent fraudulent entries and financial statements from going out to the public. Thus placing emphasis on auditing procedures and the testing of internal controls can greatly increase the efficiency and

effectiveness of the capital markets and the corporate environment. In fact, this is exactly what the Sarbanes Oxley Act of 2002 has set out to do. The logical recording system and inherent error-checking features of double entry bookkeeping are valuable as part of a strong internal control system.

The world that Pacioli lived in was quite different from the complex capitalistic structure we have today. However, based on the information presented in this thesis it is indisputable that the double entry bookkeeping system is still relevant today. While, as times change and the world around us becomes more complicated and convoluted, double entry bookkeeping may need some tweaking and building upon, for now the system works quite well in assisting with the record keeping and auditing functions, the latter being at the center of keeping the integrity of our capitalistic markets alive.

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