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Archival investigation of a late 19th century accounting information system: The use of decision aids in the American printing Industry

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AN ARCHIVAL INVESTIGATION OF A LATE 19TH CENTURY ACCOUNTING INFORMATION SYSTEM: THE USE OF DECISION AIDS IN THE AMERICAN PRINTING INDUSTRY

Abstract: This study investigates management's use of decision aids within the context of an accounting information system of a late 19th century American printing firm. Our findings suggest that the use of decision aids by management transformed traditional accounting techniques and the cost accounting system into an intricate accounting information system by 1880. These decision aids allowed managers to manipulate accounting information to support decisions involving pricing, cost allocation and estimation, profitability assessment, management of receivables, and inventory control. The findings shed new light on the early work of Alexander Hamilton Church on the issue of idle time accounting and raises questions about the uniform costing movement in the American printing industry.

The press, indeed, was the dynamic force of the 1820's, setting the pace of political change in all the advanced societies. It was associated with the latest technology, a process begun in 1813 when John Walter of the London Times bought the first two double presses worked by steam.

Paul Johnson
The Birth of the Modern [1991]

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INTRODUCTION

Extant historical research has examined accounting information systems within the printing industry [DeRoover, 1932; Edler, 1937; Garner, 1954; Daniels and Plunkett, 1994; Walker and Mitchell, 1996]. These studies provide insights into the emergence of relatively sophisticated accounting systems within that industry by the 16th century, the evolution of these systems during the industrial revolution, and the use of such systems to support price collusion and control labor costs during the early part of the 20th century.

This paper expands the work of Daniels and Plunkett [1994] by examining specific managerial decision aids inherent in the accounting information system of the American printing firm, Walker Evans & Cogswell (WE&C) during the late 19th century. The present study provides evidence that WE&C used relatively sophisticated accounting-based decision aids to facilitate decision making. To date, no empirical study has addressed the use of such decision aids within the context of an accounting information system for the printing industry during this period.

19TH CENTURY ACCOUNTING SYSTEMS

The notion of accounting as an information system emerged as a logical result of the industrial revolution. Littleton [1933, p. 320] implied that the advent of the factory system and the inherent issues of mass production resulted in accounting phenomena being transformed into an intricate system to manage and control the firm:

> . . . when the factory system began to displace the domestic system, production fell under the direction of enterprisers who paid wages, bought materials and supervised the process of producing goods for profit . . . They had a motive for records, therefore, which the family or the solitary producer had not. The latter, making no money outlay for wages, counted his return (above materials) as his own wage; the former could not gage his degree of success or intelligently set his prices without some more or less systematic apposition of his returns and his several outlays.

Sophisticated cost accounting systems developed across industries during the 19th century. Chandler [1977] examined the emergence of such systems among railroads. These early

systems allowed for the management and control of geographically dispersed and capital-intensive operations. Railroads were among the first entities to produce detailed information concerning returns on invested capital. By the early 1900's uniform systems of accounting had emerged in that industry. The use of cost accounting information in the railroad industry to assess managerial performance through the use of an operating ratio was studied by Johnson and Kaplan [1987].

The accounting records of Lyman Mills provide evidence that elaborate cost accounting records were maintained to support management's estimation of product costs during the period [Porter, 1980]. Tyson [1988, 1992] found that 19th century cost accounting systems in conjunction with a managerial component supported a broad scope of decisions in the manufacturing and textile industries.

Fleischman and Tyson [1998, p. 92] examined managerial decision-making and control as the primary use of accounting information during the industrial revolution in the United States and the United Kingdom. Their study highlighted the inherent problems and criticisms of traditional standard costing systems. They concluded:

> The use of predetermined, norm-based standard costs has come under fire recently for not providing appropriate strategic signals in an era of global competition, continuous improvement, and perpetual cost reduction. In response, many companies appear to have abandoned the use of standard costing for control purposes. This is seen as the beginning of an evolution back to earlier days when standards were deployed primarily for decision-making purposes.

Garke and Fells [1878, p. 3] described the inherent relationship of the factory system and systems of regulating the intricate affairs pertaining to a factory. Their work identified management's need for the accurate and detailed information necessary to control raw materials and wage expense, and cost estimation including the allocation of overhead to production. The inherent relationship of accounting and the human element is described in the following excerpt from the 1878 edition of *Factory Accounts* [pp. 6-7]:

> There is little doubt also that under a well-organized system of factory accounts, each employé feels that he is contributing to the attainment of accurate records of costs; and that it is necessary that his account of the

> time he spends, and the material he uses, should be adequate and precise. This begets general confidence in the manner in which the accounts are kept, and on occasion of strikes or reduction of wages, or resort to the sliding scale, employés have less hesitation in accepting the results shown by the books as correct and based on fair principles.

Kaplan and Johnson [1987, p. 57] credited Alexander Hamilton Church with perfecting product cost accounting systems in the early 1900s which facilitated the tracking of overall company profits to individual products. These systems were different in nature from the early conversion cost systems as the earlier systems gathered information to help managers evaluate and control the efficiency of internal processes, not to link performance in each process with the firm's overall profitability.

In his *Production Factors in Cost Accounting and Works Management,* Church [1919] discussed the concept of accounting for idle machine time. He argued for the inclusion of idle time in estimating production costs. It was suggested that a charge for idle time be separately identified and aggregated with other elements of waste and allocated to the cost of production. He stated that records of waste must be tied to the general accounting system. Throughout much of his work on estimating production costs, Church advocated the use of decision aids (specifically, visual aids) in making meaning of accounting data [Vangermeersch, 1988]. With respect to idle time accounting, Church [1919] stressed the need for an idle time chart for machinery.

ACCOUNTING SYSTEMS IN THE PRINTING INDUSTRY

Expanding on the work of DeRoover [1932], Edler [1937] conducted an in-depth study of the Plantin printing establishment of Antwerp and established that relatively sophisticated accounting information systems were present as early as the 16th century.

By the 1820's, the printing industry was characterized by the need for information relating to labor and capital investment [Johnson, 1991]. Labor groups resisted the introduction of the steam presses fearing job displacement. Many newspaper publishers refused to make the capital outlays to acquire steam presses arguing that the life of the machine would not produce sufficient output to yield a profit [ibid.]. Despite this early resistance to technological innovation, the printing industry

flourished as a result of increased demand for books, newspapers, magazines, stationery and other printed material during the industrial revolution. By the 1870's, relatively sophisticated cost accounting systems had emerged to support managerial decision-making and control.

Daniels and Plunkett [1994] examined management accounting in the printing firm of Walker Evans and Cogswell (WE&C) during the American *New South Movement* of the late 19th century: a period of dramatic social and economic change. That study found that managerial accounting aided the economic transformation of the American South following the Civil War. The records of WE&C provided evidence that the accounting information system supplied critical information concerning liquidity and cash flow, sales, and product costs. The management of WE&C relied upon the accounting information system to produce comparative reports for planning and control purposes.

Price Control in the Printing Industry: There is evidence that established American printers may have engaged in collusion to control the price of printed materials, papers, ink and supplies during the 18th and 19th centuries. In *The History of Printing in America*, Isiah Thomas [1810] refers to price collusion as early as 1742 among the booksellers of Boston. *The Printers' Price List* published by Theodore DeVinne [1871] was particularly influential in establishing prices within the industry. DeVinne proposed, "[n]o printer can make prices to suit himself, in complete disregard of his competitors. Whoever makes charges for ordinary work in ignorance of current prices, must make many mistakes, quite as much as his own injury as to that of his competitors" [ibid., 1871, p. 6].

Tichenor [1980] provided conclusive evidence that printers engaged in collusive schemes aimed at reducing price variation. Collusion among established printers influenced price through the control of raw materials and retail goods including inks, papers, forms, account books and printing supplies.

While there were many firms within the printing industry, prices appear to have been heavily influenced by a few large firms. Printing firms faced rigid wholesale prices in acquiring raw materials as well as rigid retail price structures for the goods they sold to consumers. This may have led to the development of techniques resembling *target-type* cost accounting systems as the need emerged to strictly control costs internally

to meet rigid prices in the market.[1] Because the cost of raw inputs as well as the price that the firm could charge consumers was essentially preset by prepared price lists, each printer was forced to strictly control the cost of production and profit margins so as to comply with cartel mandates. Thus, internal cost structures were implemented so that the individual printer could meet the established *target price* set by the cartel. Collusive agreements could be enforced by retaliation against non-complying cartel members through their elimination from the supply chain [Shughart, 1990].

Garner [1954] noted that uniform systems of accounting in the printing industry emerged around 1914 in the U.K. In the U.S., the printing industry was among the first to adopt uniform systems of accounting. The *Standard Accounting System for Printers* was an industry-wide effort in the U.S. to "make the practices of the industry as regards cost finding, estimating, selling and general accounting uniform and stable" [Jackson, 1919, p. 358]. However, there is evidence that uniform accounting systems for printers may have begun in the U.S. during the late 19th century. For example, *Kellogg's Auxiliary Handbook*, which was published in 1878, outlined the basic accounting books and forms for a printer as well as techniques for properly recording transactions in the day-book and ledger. The *Handbook* also provided guidance in marking-up inventory to retail as well as pricing of printing jobs. This work appears to be the earliest indicator of the American uniform costing movement within printing industry.

WE&C'S DECISION ENVIRONMENT

According to *A History of the Walker Evans & Cogswell Company* [WE&C, 1921], its operations began in 1821. Founded in Charleston, South Carolina, the firm depended initially on small orders of stationery. By 1850, WE&C had expanded its business to other regions in the U.S. Vertical integration had occurred by 1870 and the company was competing in the retail market for printing supplies, ink, paper and capital goods such as printing presses, binding and cutting equipment. By 1890, the annual sales revenue of WE&C was approximately

[1] Variation in price may have resulted from breakdowns in collusive schemes. Shughart [1990] observes, [o]ligopolists have a powerful incentive to collude; they have an equally powerful incentive to cheat (compete).

$500,000, with net profit of around $275,000. Net assets of the firm exceeded $600,000 by the end of the 1890's. The firm employed approximately 125 persons in 1875. By 1890, that number had increased to 155.

The firm was seized by the confederate government during the American Civil War and became responsible for printing the South's currency and bonds. WE&C's monogram is often seen on much of the currency and bonds printed and issued by the Confederacy. The firm managed to survive the war and re-emerged as a viable business during the period of reconstruction. There is evidence in the WE&C archive that the firm provided economic support for Henry W. Grady, renowned *Spokesman of the New South* and managing editor of the *Atlanta Constitution*, the South's leading newspaper of the period. This assistance was made through the extension of credits for the purchase of printing presses, equipment, paper, inks, and supplies.

Prior to its expansion into other geographical printing markets and entry into retail business, accounting at WE&C was relatively non-problematic. The system of record keeping consisted mainly of a day book and ledger. The volume and complexities of commerce in the early years of the firm did not demand the use of sophisticated accounting schemes. However, with the advent of increasing sales outlets in the 1850's and the entry into the retail markets in the 1860's, the information requirements of WE&C management increased dramatically. The firm implemented a standard costing system which evolved into a broad scope accounting information system.

By 1875, WE&C's accounting information system consisted of a relatively sophisticated standard costing component and a system of accounts which, through specific decision aides, facilitated decision making for owner/managers in various functional areas. The *President's Memorandum Book* (PMB), kept from around 1870 until the end of the decade, provides much detail concerning the decision making activities of management. It appears to have served as a mechanism of control for integrating the various functional elements of the information system to produce detailed reports for managing and controlling operations. For example, the transfer of inventory from the Printing Office and Bindery (PO&B) to the retail division, in addition to the complexities introduced by vertical integration, resulted in the need for comparative information and detailed inventory reports. The exhibits presented in this paper illustrate the contents of the PMB.

Managerial Decisions at WE&C: A broad scope of decision making was supported by accounting information at WE&C's during the later 19th century. Accounting data was manipulated and analyzed via the various decision aids employed by management. The presence of these decision aids transformed the standard costing system and traditional accounting techniques into a more comprehensive information system which supported decisions involving pricing, cost estimation, cost allocation, profitability assessment, management of receivables, and inventory control.

Pricing: The decision aid, *Profits on Discounts* [Exhibit One] allowed pricing alternatives to be evaluated from a contribution margin perspective. This schedule, developed and used by 1871, allowed management to determine gross margin on sales based upon discounts given by WE&C's suppliers and the discounts WE&C granted to customers. This aid was used in conjunction with DeVinne's published price lists which provided baseline prices for wholesale and retail goods. In other words, the aid facilitated the calculation of gross profit on sales in light of discounts afforded to the firm and discounts subsequently granted to customers.

Through the use of discounts on profits, management was able to determine the price of goods sold to customers. This technique was a profit maximization endeavor in which discounts were granted based upon management's estimation of future cash flows from individual customers. Cash customers

EXHIBIT ONE
WE&C *Profits on Discounts*
1871

Discounts to WE&C	***Discounts Given By WE&C***								
	0%	***5%***	***10%***	***15%***	***20%***	***25%***	***30%***	***40%***	***45%***
50%	100	90	80	70	60	50	40	20	10
40%	66	58	50	41	33	25	16		
35%	54	46	38	30	23	15	07		
25%+10%	48	40	33	25	17	11			
30%	43	35	28	21	14	07			
25%	33	26	20	13	06				
20%	25	18	12	06					
10%+5%	17	11	05						
10%	11	05							

generally received the highest discount rate while accounts receivable customers received discounts based upon management's assessment of their relative long-term cash flow potential. The PMB contains entries indicating that the assessment of the cash flow potential and desirability of customers was perpetual. Customers were evaluated on the timeliness of payments, volume of purchases and, in a few cases, standing in the community.

As an example of how the decision aid, *Profits on Discounts* was used, if WE&C suppliers allowed a 30% discount on inventory purchased, and WE&C subsequently gave its customers a 20% discount, the profit on discount (or gross margin on sales) for the firm would be 14%. Of course, the discounts given to WE&C by its suppliers were fixed for each calculation, so management could find the discount to be given to customers by determining the desired gross margin for the transaction. With the use of this particular decision aid the firm would adjust its selling prices through discounts granted while controlling the profit margins on goods sold. This technique may have also facilitated the maximization of the value of individual customer accounts. It appears that more favorable discounts were granted to those customers who demonstrated creditworthiness and made relatively significant purchases.

Using this technique in conjunction with an established acceptable rate of return on the investment in inventory, WE&C was able to manipulate the discount feature to maximize profit. Once the required return on inventory was set, discounts on customer purchases could be used to manipulate net sales to achieve the necessary gross margins. Granting favorable discounts to certain customers appears to have established long-term business relationships. Thus, through the use of pricing data and decision aides, management was able to maximize both profitability and future cash flows from individual accounts receivable.

Cost Allocation and Estimation: By 1880, WE&C's cost accounting system allowed costs to be allocated to work according to a predetermined rate for each specific type of machine used and each category of labor employed. Once labor and machine costs were identified for a particular job, an additional cost component representing overhead was allocated to the job. Exhibit Two illustrates the costs associated with each production activity.

EXHIBIT TWO
1880 Cost of Work[2]

Press Room	*Gordon Press*	*40 cts per hour*
	Cylinders	*80 cts per hour*
	Dble Med.	*100 cts per hour*
Composing Room	*Journeyman time*	*60 cts per hour*
	Apprentices	*25 cts per hour*
Bindery	*Piece work*	*70 cts per hour*
	Finishing	*70 cts per hour*
	Forwarding	*55 cts per hour*
Ruling Room	*..ils*	*15 cts per hour*
	Monogram	*15 cts per hour*
	Paging	*20 cts per hour*
	Cutting	*40 cts per hour*
	Ruling- Journeymen	*60 cts per hour*
	Ruling- Apprentices	*50 cts per hour*

Production costs were identified by specific machine. As shown in Exhibit Three, the cost of production relating to machine usage and labor included the cost of idle time. This schedule permitted managers to effectively bid on jobs, control costs, and evaluate the efficiency of printing operations.

EXHIBIT THREE
1880 Production Cost Schedule

Machine	*Cost of Machine per hour*	*Cost of Labor per hour*	*Total Cost per hour*	*Remarks*
Monogram Press	*03.*	*12.*	*15.*	*Allowing ½ idle time*
Paging	*4.*	*8.*	*12.*	*Allowing ¼ idle time*
Cutting	*25.*	*15.*	*40.*	*Allowing ½ idle time*
Ruling-Journeymen	*8.*	*43.*	*51.*	*Allowing ⅓ idle time*
Ruling-Apprentice	*8.*	*19.*	*27.*	*Allowing ⅓ idle time*

While a full discussion of WE&C's standard costing system is outside the scope of this study, Exhibits Two and Three illustrate the capabilities of the system to provide cost data relating to each activity for each division of the PO&B. By 1880 the standard cost system had the capability to assign overhead to production.

[2] These costs are titled *Cost of Work* in the PMB and include a 15% overhead rate.

An interesting and important element of WE&C's standard cost system is provided in Exhibit Three. This illustrates how the cost of each type of machine and each category of labor was calculated on an hourly rate. Of particular significance is the fact that by 1880, WE&C had identified and quantified the cost of idle time for both man and machine on a per-hour of production basis. Church, in his writings during the early 1900's, discussed the treatment of idle time and is credited by Vangermeersch with conceptualizing this element of cost. The data provided in Exhibit Three suggests that Church was not the first to recognize the importance of identifying, quantifying, and recording the cost associated with the "waste" of idle machine hours.

Profitability Assessment: The *Comparative Analysis of Expenses and Sales* [Exhibit Four], undertaken in 1871, represents a decision aid used to evaluate the profitability of the retail division of WE&C. The retail division was evaluated separately from the printing or manufacturing operations. Inter-departmental transactions between the retail division and the printing division were not eliminated. Expenses were identified by cost of goods sold ("Merchandise Expenses") and by Store Expenses.

EXHIBIT FOUR
Comparative Analysis of Expenses and Sales
1869-70 and 1870-71

Exclusive of Printing Office and Bindery
In Merchandise Expense is including expenses upon all stock which was used in PO&B.
No deduction for salaries is made for labor performed in Store for PO&B
No allowance is made for Store work done in PO&B
Salaries or profits of partners are not included in Expenses.

	1869-70	1870-71
Store Expenses including rent, insurance & salaries	*$ 8,031*	*$ 8,716*
Merchandise Expenses including merchandise insurance	*3,743*	*3,297*
Total Expenses	*11,774*	*12,013*
Credit Sales	*81,885*	*73,088*
Cash Sales	*13,234*	*12,888*
Total Sales	*$95,119*	*$85,976*
Percentage of Expenses on Sales	*12.4%*	*14%*
Percentage of Partners Salaries on Sales	*24.4%*	*27.3%*

The *Comparative Analysis* indicates that the accounting system was capable of producing information for each division and tracking inventory transfers from the Printing Operation and Bindery to the retail division. This analysis shows that the complexities were reduced by transferring inventory at cost rather than at markup. Cash flow data permitted both intra- and inter-period comparisons of the proportion of credit to cash sales.

The use of sales and expense data to calculate return on investment to owner/managers was demonstrated in the analysis. Owner's salaries were not included in salaries expense and this allowed for a more accurate assessment of return for investors. From the PMB it appears that WE&C used this technique to measure returns for each division. Notations in the PMB indicate that profitability projections among the divisions drove internal resource allocation decisions. As profit margins for the retail division became more lucrative, additional capital outlays were made to increase the capacity for retail business [WE&C 1921]. Hence, this particular decision aid was important in the capital budgeting process at WE&C.

Management of Receivables: Accounts receivable represented a significant portion of WE&C's net assets and credit sales represented nearly 75% of the firm's revenues during the 1870's. Each credit customer was evaluated. Credit terms and price charged for goods were set based upon this analysis. The granting of discounts to customers appears to have been a function of management's assessment of the potential cash flow from each credit customer.

The PMB contains extensive analysis of the credit worthiness and sales volume for significant customers. Notations relating to WE&C's relationship with Barret and Brown of Montgomery, Alabama, for example, indicate that the accounts receivable general ledger was studied to establish specific sales discounts based upon past sales volume and payment history. Notes on the customer were written into the PMB.

Uncollectible accounts were analyzed by division. Bad debt schedules were produced from the Day Books. Debt collection efforts were based upon these schedules and managed centrally in the accounting department. Bad debts were proportionally allocated to the Retail Business, Wholesale, and PO&B. These proportions were compared to the revenues generated by each division and matched with sales generated during a 31 month period ending June 6, 1870. Exhibit Five illustrates this point. It

EXHIBIT FIVE
Analysis of Uncollectible Accounts
June 6, 1870

Total Sales for 31 months		*$240,000*
On June 6th these assumed uncollectible		*$2,555*
Percentage of Loss	*.0107*	
Divided as follows		
Retail Business	*20%*	
Wholesale	*33%*	
PO&B	*47%*	
Proportion of Business Done		
Retail	*$120,000*	
Wholesale	*50,000*	
P0&B	*70,000*	

appears that WE&C used many such decision aids to maximize profits and control losses associated with credit sales.

Inventory Control: Inventory management techniques were employed by WE&C to control the investment in raw materials for the retail division and Printing Operations and Bindery (PO&B). The *Inventory Management Schedule* [Exhibit Six] illustrates management's tracking of a particular paper inventory item in 1872. This decision aid was used for raw material inventory and facilitated the determination of average monthly requirements.

These inventory management schedules permitted budgeting of raw material expenditures and minimized the risk of stock-outs by identifying seasonal variation in demand. Also, the notations in the schedule assisted management in identifying anomalies in demand due to large or non-recurring customer orders. While this schedule enabled the forecasting of inventory requirements, significant levels of safety stock were necessary due to the limitations of contemporary systems of transportation and communication.

Vertical integration resulted in commonality of inventory items between the PO&B and retail division. The size/weight inventory in Exhibit Six had many uses in the manufacture of printed goods and was sold through the retail division as well. This type of decision aid was also used for inks that were transferred from large containers in the PO&B and placed in bottles to be sold to retail customers.

EXHIBIT SIX
Inventory Management Schedule
WE&C 1872

Size/Weight	*1872 Jan-July*	*1872 July-Dec*	*1872*	*Avg./ month*	*Remarks*
14x17- 14	*64*	*164*	*228*	*19*	
16	*168*	*109*	*277*	*23*	*Spring of 1872 we printed stock of Alabama blanks*
18	*24*	*52*	*76*	*6*	
16x20- 16	*23*	*26*	*49*	*4*	
20	*334*	*197*	*531*	*44*	
24		*74*	*74*	*6*	*24lb used for SCRR-lists after July & thereafter will be used principally for store blank books.*
16x21- 28	*16*	*32*	*48*	*4*	
17x22- 16		*26*	*26*	*2*	
20	*22*	*86*	*108*	*9*	
24	*18*	*34*	*52*	*4*	
16x26- 24	*54*	*36*	*80*	*7*	
26	*44*	*35*	*79*	*7*	*Used principally for store blank books*
17x28 28	*16*	*32*	*48*	*4*	
32	*28*		*28*	*2*	*Used for check books*
36	*12*	*12*	*24*	*2*	
18x23 36	*12*		*12*	*1*	*Used for store checks*
17x24 20		*41*	*41*	*4*	

Inventory was initially allocated to the two divisions at cost. For bidding and cost estimation purposes, inventory placed in production in the PO&B was accounted for at cost. The price of jobs to customers was determined by calculating labor, materials, and an overhead component. These amounts were subsequently marked-up to the price charged to customers based upon management's required rate of return.

DISCUSSION OF FINDINGS

The evidence presented in this study suggests that an intricate accounting information system had evolved at WE&C by 1880. It appears that the decision aids utilized by this firm provided the foundation of an accounting information system that supported decisions involving pricing, cost allocation and estimation, profitability assessment, management of receivables, and inventory control. These decision aids allowed managers to convert accounting data into useful information to manage and control the activities of the vertically integrated operations of WE&C.

The inherent complexities of coordinating resources to maximize profit in a vertically integrated printing firm during

the 1870's likely provided economic motivation for the development of decision aids to manage and control operations. Additionally, attempts by the printing industry cartel to control market prices, likely created the need for broad-based accounting systems capable of producing information to control costs and support managerial decision making.

WE&C implemented decision aids designed to maximize the utility of its accounting data. Using the decision aids described in this study, management was able to integrate the system of journals, ledgers, and inventory control books to create a comprehensive accounting information system. This system allowed management to price goods, estimate and allocate costs, assess profits, manage receivables, and control inventory.

The evidence suggests that the traditional accounting techniques and standard costing system of this 19th century printer evolved into an intricate accounting information system as the need for more sophisticated methods of controlling costs and managing the increasingly complex operations emerged. This broader scope of decision support differentiates WE&C's intricate accounting information system from the traditional cost accounting system.

Future research is needed to determine whether the types of decision aids used by WE&C were industry-wide phenomena or unique to this particular firm. In addition, relatively little is known about the uniform costing movement of the late 19th century American printing industry and whether such decision aids were inherent in the movement. Determination as to industry-wide use of such decision aids and their relationship to uniform costing could provide valuable insights into late 19th century managerial accounting.

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