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Small size does not guarantee simplicity of data processing. This case study of a systems engagement in an upstate New York dairy illustrates some of the problems and rewards of—

AUTOMATION IN A SMALL COMPANY

by Robert M. Smith

Editor

THE LONELY SOUNDS of the milkman's horse's hooves and the sporadic rattle of bottles are still a nostalgic memory to millions of Americans—evoking a past that seems relaxed and peaceful in contrast to the turbulent present.

But, however bucolic and simple the milk business may have seemed years ago, it is anything but that today. Many dairies are still comparatively small, but their business problems are immensely complicated, their selling practices fiercely competitive, and their relations with and payments to their farmer producers strictly controlled by an intricate set of government regulations.

So, in effect, a commercial dairy has both many of the complexities of a very large business and many of

the handicaps of a small concern—small staff, low operating capital, lack of staff specialists.

Complexities

Typical of the situation is the Crowley's Netherland Corp., a dairy in Syracuse, N. Y., which serves both individual customers and retail outlets with milk and milk products. Crowley's manufactures more than 125 milk products and merchandises more than 200 ice cream products. It sells them at standard prices through route drivers, but retail outlets often have special discounts agreed to by the sales department, which must be paid as refunds for cash sales figured in statements on a billing basis. Thus Store B may be

paying standard price for its purchases, but Supermarket B, which buys in much larger quantities, may demand and receive a lower than standard price from the salesman servicing it. The driver who services Supermarket B will charge it the standard price, and the accounting section must then apply the differential to the statement or prepare a refund check if the deliveries were paid for in cash.

No less complicated is the "producer's payroll"—the payments made by the dairy to the supplying farmers. The Department of Agriculture sets a blend price each month for whole milk delivered by farmers to dairies. Each dairy must pay each of its producers this standard blend price but must make an

adjustment according to the butterfat content of the milk for each producer. If his milk has butterfat content more than one-tenth pound above or below standard, the price he is paid must be adjusted.

To cap the climax, as it were, the government-set blend price varies each month according to the use made by each dairy in the country of the total weight of the milk it receives. If various dairy products—butter, cheese, ice cream—are made from the milk, the prorated price is one figure; if it is sold as milk, cream, buttermilk, etc., the price is another figure. The two figures are averaged for each dairy and then averaged for the industry as a whole to get the blend price, which is then applied to all the milk purchases by all the dairies in the state.

So, in effect, the dairy has to submit detailed breakdowns of the quantity of milk it buys and the uses it makes of the milk to the Department of Agriculture (on a strict time schedule) in order eventually to achieve the blend price which it, together with all other dairies, must pay its producers. And then the adjustment must be made for each producer for butterfat content.

These are only two of the more involved data processing problems faced by Crowley's Netherland—as well as by most other dairies in the state.

Handicaps

Two years ago the then Netherlands Company got a new president, Ken Leach. He found that the company's accounting system was antiquated and particularly weak in controls. Management was not getting the information it needed when it needed it. However, there was not enough capital to make sweeping improvements—or even to learn what improvements would prove most helpful.

Then the company was bought as a subsidiary by a larger dairy in Binghamton, N. Y., and its position became even more complicated—but also more hopeful. Up to this point, the Netherlands Company

The image shows three overlapping forms from Crowley's Netherland Corporation, dated 1964. The forms are multi-part and contain detailed product listings. The top form lists products like MILK, GRADE A, and VITAMIN B. The middle form lists products like BUTTER, EGGS, and CHEESE. The bottom form lists products like ICE CREAM, MILK, and YOGURT. Each form has columns for PRODUCT, SIZE, QUANTITY, PRICE, and AMOUNT. The forms are numbered 03782.

Accounts receivable automation is still a headache for Crowley's Netherland. These multi-part forms, which are used to record direct wholesale sales made by drivers, list only a few of the dairy's more than 300 products.

had not marketed ice cream products. By its new affiliation more than 200 ice cream products were added to the sales list. The hopeful note came because now there were new capital and a management sympathetic to systems research and improvement.

A management study was started in the fall of 1962 by Fairbanks Associates, a New York management consulting firm. It culminated this spring in the installation of an NCR 390 computer, which to date has worked beautifully in solving the producers' payroll problem but has been somewhat less successful in handling the equally complicated accounts receivable troubles.

The story of this study is illustrative of a typical systems engagement on a small scale.

Preliminary survey

In Fairbanks' original discussions with management and preliminary survey of administrative operations,

both sides—management and the consultants—agreed that an analysis of accounting and management controls requirements, review of the potential for upgrading clerical methods and procedures, and study of the feasibility of possible changes or additions in these areas might prove most profitable to the company. Principal areas to be covered in the study were outlined as:

1. Accounting systems and procedures
2. Management reports and controls
3. The feasibility of mechanizing part or all of the first two areas
4. The need for more management information.

Objectives

Objectives to be used as a guide for all recommendations arising from the study were defined as:

1. To develop systems and procedures that would enable Crowley's Netherland to utilize its per-

sonnel soundly and to render both accounting statements and management reports on a timely basis

2. To provide for a method of machine accounting to eliminate the current manual work load in various clerical functions

3. To provide for adequate sales reports and control

4. To provide a base for upgrading the current clerical operations in a manner that would create the fewest possible replacement problems as personnel retired

5. To provide management with a system of reports and procedures that would give it flexibility in meeting changes and demands in the milk industry.

Findings

With these guidelines, the consultants carried through the same kind of observation survey outlined in "Cutting Payroll Costs in Manufacturing Staffs" (MS, July-August, 1964, p. 18). Results of the survey indicated:

1. There existed a definite potential for upgrading the systems and procedures of the office operations. The results of such upgrading, according to the consultants, would be better and more comprehensive sales, management, and production reports; lower costs for office operations; complete accounting controls without duplication of work.

2. Crowley's Netherland sales operations were operating with a minimum of sales management tools.

3. Although the quality and operating efficiency of the existing staff seemed very good, the current system spent too many hours in duplication of information, transfer of data, and checking and rechecking of information.

4. Many key personnel were due for imminent retirement, which would multiply the systems problems.

5. Current office facilities in both space and equipment were poor, which contributed to data processing problems.

6. Because of irregular frequency

Smith: Automation in a Small Company and delays in production, current management reports lacked the timeliness to be considered good management tools.

7. Because of the projected personnel turnover and growing demand for information in the milk industry generally, there was an unfulfilled requirement for productivity and cost information in addition to standard operating procedures.

8. Many of the then current forms and procedures had been developed over a period of years and "tacked on" to the system with no attempt to relate them to existing forms and procedures.

Each of these basic criticisms was then set forth in further detail, as far as existing requirements were concerned. To show the thoroughness with which such a management report can be done, both the analysis and the present system of one phase of the entire administrative operations will be followed through in detail.

Producers' payroll

The consultants, analyzing the existing system of handling producers' payroll (payments to individual farmers, which are subject to milk blend prices set by the Department of Agriculture), reported:

"Producers' Payroll—The Producers' Payroll handles over 180 Patrons' Accounts. The accounts, journal, and Market Administrator's (Department of Agriculture official) Report on it are posted manually or by typewriter from work sheets. In outline:

"a) Payroll clerk receives daily milk receipts in pounds.

"b) An average butterfat content is computed from tests taken on the 15th and 30th of each month for each patron.

"c) Payroll clerk converts daily weights of milk received into butterfat pounds by applying the average butterfat test to them for each producer. An electric calculator and an adding machine are used in this work.

"d) After the price of 3.5% butterfat milk is released by the Market

Administrator, the payment for each patron is calculated by:

"1. Applying the differential rate for each producer against his average butterfat test to arrive at his price.

"2. This price is applied to the total butterfat pounds received from the patron.

"3. Check is written after deductions for purchases, insurance, third party orders (bank loan payments), and other such items are made.

"e) This is the work of a single clerk.

"f) The checks must be in patrons' hands by the 25th of the month and are seldom ready before the 23rd."

The producers' payroll was essentially a manual operation, and thus, according to the consultants, slow and subject to considerable risk of human error. It required all the working time of one clerk, as did the report to the Department of Agriculture's Market Administrator (the basis of the blend price paid for milk).

Thus, the producers' payroll is roughly analogous to an employee payroll—there are just as many individually different deductions, although taxes and social security are not withheld. Moreover, the deductions can change more rapidly than they do with the average employee.

Other areas

Other current operations were subjected to the same step-by-step analysis, detailing what was being done, the factors affecting each job, the time in which the job had to be done, etc. Areas scrutinized in detail, besides producers' payroll, were: Wholesale Sales, Container Inventory Control, General Management Reports, including Production Reports, Cooler Board and Sales Reports, Management Expense Reports, Operating Reports, Reports to the Market Administrator, Production Control, Sales, and Records.

It was found that there was a great deal of duplication and repetition of work among the various de-

partments. For example, the company was holding a double audit of invoices and statements, whereas, the consultants pointed out, if daily and weekly control figures were developed from delivery tickets and billing clerks balanced their postings to them, there would be no need for a second audit. Statements and bills were headed by typing rather than the addressing machine which the company already had. Production reports did not show accurately the number of man- or machine-hours expended, so it was impossible to develop standard costs.

Moreover, it was found that gaps in the operating information available to management were handicapping the firm. If daily sales forecasting could be made more accurate, better production scheduling would be possible. There was no analysis of profit by item, and thus no way of telling which items in the sales line should be maintained and which dropped—a particularly serious problem with so many products. There was no analysis of total distribution costs by route.

Chief problems

In summary, the analysts found six main problem areas within the company requiring solution. These were:

“The office organization is over-staffed because of systems which have outlived their usefulness.

“There is inadequate office space and equipment.

“Accounting methods need upgrading.

“There is considerable duplication of effort within the office organization.

“Container inventory needs storage space.

“There is need for management reports which point out operating deficiencies and discrepancies.”

Recommendations

To meet these problems, a series of recommendations were made. These were divided into five main groups:

1. A review of alternative possibilities in system upgrading
2. Basic system recommendation
3. Recommendations for improving sales procedures
4. Recommendations for improving production procedures
5. Additional recommendations.

Alternatives

Four alternatives or combinations of alternatives were considered as methods of system upgrading:

1. Improved manual methods
2. Upgraded bookkeeping machine methods
3. Use of punched card equipment
4. Use of an electronic computer.

Manual methods

It was conceded that many improvements could be made in the current manual methods of processing data, but it was argued that manual methods always entail certain limitations:

1. There is always a degree of human error which is difficult and expensive to detect.
2. Manual methods are not self-checking through feedback of error data to a machine operator. Thus, audits of some degree are always required.
3. When replacement personnel are required, the training is lengthy and expensive.
4. Too much time is spent in checking and balancing figures for the reports produced in such a system.
5. Processing time is long so that production of final reports is slow.
6. The ability to produce by-product information is very limited.

Bookkeeping machines

Handicaps of the second possibility, bookkeeping machines, in such accounting areas as billing, payables, payrolls, and cost distributions were that the machines would not be able to meet all accounting and management control information requirements and could not

There was a great deal of duplication and repetition of work among the various departments. Moreover . . . gaps in the operating information available to management were handicapping production scheduling, profitability analysis, and distribution cost analysis.

provide integrated accounting and management reports, since necessary information would be coming from so many different sources. Moreover, it was pointed out that costs for such equipment would be as much as, if not more than, alternative systems with more capacity, and savings would not be as great as those possible with alternative systems.

Punched cards

The third possibility, punched card equipment, could do the entire job, as it already had done in many other dairies. It would, however, entail ledgerless or unit-type bookkeeping. Furthermore, it was pointed out that:

1. Handling the many small routines and exceptions in dairy office operation is cumbersome and difficult with punched cards because of the many machine steps invariably involved.
2. Punched card equipment would require a complete retraining of clerical and management personnel since methods used with such equipment are entirely different from common business practices.
3. Annual rental costs of a minimum tabulating equipment system would be approximately \$25,000-\$35,000.
4. Punched card equipment would require a staff of approximately nine employees for an eight-hour shift.
5. Experience in other dairies indicated that very often such equipment had to be run for two shifts, so that as many as eighteen employees might be required.

Computer

In terms of electronic computers, four different machines in the \$1500-\$2500 a month rental range were considered. It was pointed out that two of them had good capabilities as far as long and complex data manipulation was concerned but had limited input and output facilities and would employ ledgerless bookkeeping. A third was advised against because of its limited flexi-

bility and slow operating speed. The fourth, an NCR 390, was recommended for the following reasons:

“a. It produces conventional accounting records utilizing ledger cards of ordinary appearance but having magnetic strips on the back to store balances and programs. The uniqueness of these ledger cards is threefold:

“i. There is a complete visual record of all postings to the account.

“ii. The bookkeeper does not have to pick up and prove previous balances before making further postings since the balance is stored on the back of the magnetic strip. The computer picks up the old balance automatically before postings are made.

“iii. Special handling of individual accounts can be done by the computer by storing such information in the magnetic strips of the ledger. This means that discounts and contractual arrangements with individual accounts will be taken care of automatically when any postings are made, with little opportunity for human error.

“b. It operates on a wide variety of input and output media in its operation. In addition to its console, the machine utilizes punched paper tape, punched cards, and the magnetic ledger cards. Punched paper tape can be created by a wide variety of equipment, and information in punched paper tape form can be transmitted quickly via teletype as well as by mail. For example, if Oswego (Crowley's Netherland has a subsidiary dairy at Oswego, N. Y.) bottling operations ceased, it would be easy to create drivers' orders on punched paper tape in Oswego and transmit them to Syracuse, where they would be included in the daily production schedule for delivery in Oswego early the next morning.

“c. The NCR 390 produces output in these three forms in addition to readable hard copy. Punched paper tape and punched cards produced by it can be used by other equipment systems in other locations.

“d. It produces hard copy with electronic capabilities, combining features of both these systems.

“e. In operation, it uses accounting procedures similar to the accounting experience of the present staff. This means that it would not be necessary to retrain the entire management and clerical staff in their working habits. Information required by management from time to time at random is readily available on standard ledger cards, and not hidden piecemeal in punched cards or invisibly on magnetic tape.

“f. It has the ability to produce large quantities of by-product information for management control purposes from normal accounting routines.

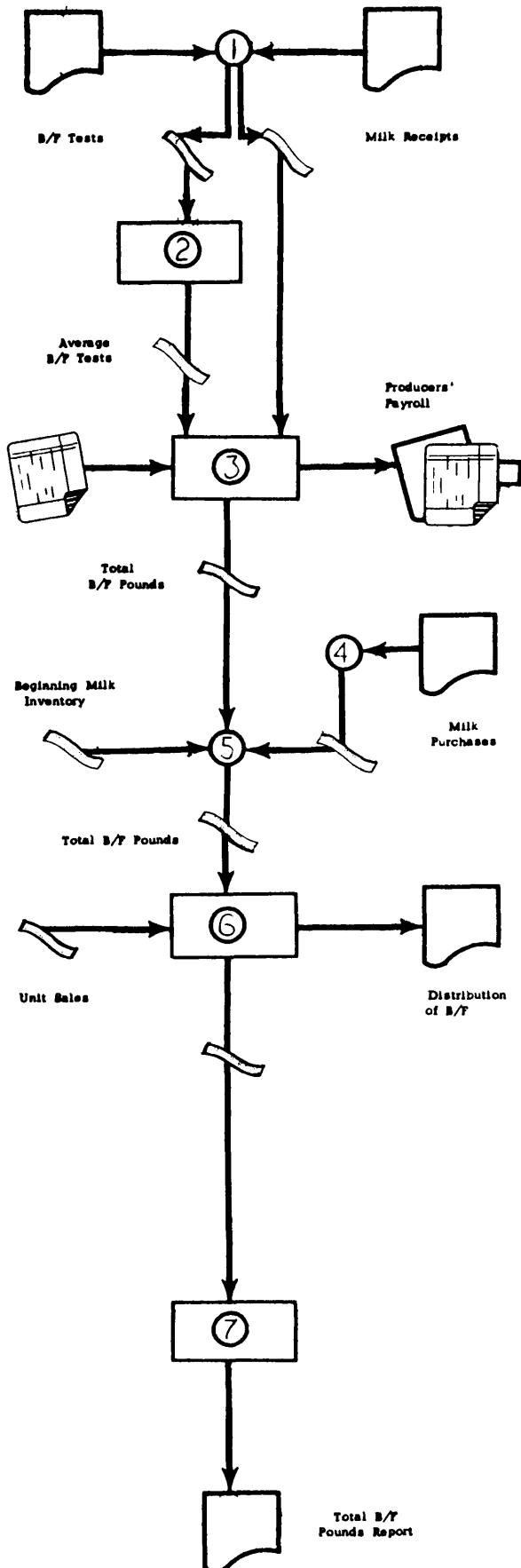
“g. In relation to other computer systems, its programming techniques are simple to learn. This is important when it becomes necessary to make small changes in programs to provide different information from that previously required by management. One important feature in this area is the feasibility of using the magnetic cards to introduce quick changes into a program already in the computer.

“We therefore recommend the NCR 390 computer system as the solution for the needs of Crowley's Netherland.”

Snags

The company accepted the recommendation, and the 390 was ordered. Three people from the accounting department were sent to programming school, and at this point the first snag developed. They could not be sent simultaneously, since each had responsibilities in the office and had to cover a portion of the regular work of the person attending programming school. As a result, the last of the trio finished school only one week before the installation of the machine. Another snag arose from the way in which the machine was first applied. Oswego operations are necessarily much more limited than those of the Syracuse dairy, and it seemed wise to try the computer techniques at first only on Oswego records. However, there are significant differences between the Oswego op-

PRODUCERS' PAYROLL AND MARKET ADMINISTRATOR'S REPORT



1. The butterfat tests and milk receiving tickets are sorted by producers. At the end of the month they are punched into paper tape for computer processing.

2. The butterfat tests are processed by the computer to get the average butterfat test by producer.

3. Using the average butterfat test tape and the total pounds tape, the 390 makes all of the computations and prints the necessary records for the Producers' Payroll. A butterfat tape is punched to be used in preparing the Market Administrator's Report.

4. Milk purchases from other dairies are listed on the adding machine, and punched into paper tape.

5. The milk purchases tape is spliced to the total butterfat pounds tape. The combined tape is processed with the beginning milk inventory, and results in the total butterfat pounds available for the month.

6. The total butterfat pounds are processed with the unit sales, and are distributed against the products.

7. The total butterfat pounds tape is processed to print the total butterfat pounds report.

This flow chart shows how the computer handles the accounting for the producers' payroll (payments to farmers).

erations and the Syracuse operations. The result: Programs prepared for Oswego could not be used in Syracuse operations, and when the Syracuse operations were eventually put on the computer, parallel runs were necessary—having the staff perform all operations according to the old manual system simultaneously with the computer processing so that there would be no breakdown if anything were to go wrong in the computer program.

However, these difficulties disappeared in a relatively short time. (The computer was installed in May, is already handling the complete producers' payroll as well as several other operations, and is scheduled to take over accounts receivable accounting in the near future.)

Procedure

Since producers' payroll and the Market Administrator's Report—indicating the payments made to the farmers who provide the milk—is perhaps the most complicated procedure currently being handled by the computer, let's review the steps by which the machine handles this routine.

Each month, the butterfat tests for each producer's product and the total quantity of milk he has delivered to the company are punched into paper tape from the laboratory and dairy reports. Since butterfat tests are based on two checks a month, they are averaged within the computer for each producer.

The butterfat tests are then punched into a paper tape for use in preparing the Market Administrator's Report, which, of course, will determine, when taken together with reports from the other dairies in the state, the blend price that must be paid to all the milk producers.

When the blend price is received from the Department of Agriculture's Market Administrator, the producers' payroll is run off by the machine on a visible ledger card. This means the machine must apply

the blend price to the total quantity of milk supplied by the producer, making an adjustment for each one-tenth of a pound of butterfat that his milk has departed from the standard. If his butterfat content has been below average, he will receive a blend price lower than standard; if butterfat content has exceeded standard, he will receive an additional payment. But this does not complete the payroll problem. There are several other factors that must be taken into account.

Many dairy farmers belong to farmers' organizations in which their monthly dues are based on their production. These dues are usually deducted at the dairy and sent directly to the organization. So the machine must calculate, in terms of the producer's production, just what payment is owed to the organization. Furthermore, the dairy often advances money to its producers. This must be taken into account. Then there are third party agreements. These are arrangements made by a farmer with a bank or other lending agency, in which money is advanced on the understanding that payments will be made directly by the dairy to the lending organization. These deductions, too, must be made.

Audit

Furthermore, the producers' payroll is subject to a more frequent outside check than any employee payroll. The milk Market Administrator sends in auditors frequently—to check on the accuracy of the milk weight figures and the payments made to producers. The basic units are quantity of milk and butterfat content per producer, rather than dollars, but the audit procedure is just as rigorous as any financial examination.

All of these data are produced on a ledger card by the unit's printing mechanism as are a statement to the producer, a check for the amount due to him, and a report to the Department of Agriculture showing what was paid to the farmer and

what deductions were made. The ledger card has magnetic strips on the back so that all standing information about the producer, the organization he belongs to and its dues arrangement, his bank loans if any, and the amount to be repaid monthly, etc., are stored in coded form on the magnetic strips. This information is fed into the computer as the payroll is being processed and so does not have to be punched into the individual producer's tape.

Personnel

Of the more than 40 people working in the administrative offices of the Netherlands Company, approximately 20 remained after the systems revision. Nor was there any mass displacement of personnel. The Netherlands Company had no pension plan or compulsory retirement age. Crowley's offered pensions and had a mandatory retirement age of 65. When Crowley's absorbed Netherlands, one of the stipulations of the purchase was that a certain amount of the price would be set aside to permit pensions for Netherlands workers already past 65, with a two-year period during which they could leave the company. This accounted for 12 of the 20 displaced workers. Normal attrition took care of the remaining eight without dismissals.

Problems

What disadvantages has the EDP system shown?

A certain amount of trouble is anticipated in processing accounts receivable on the equipment because input and output units are relatively slow in comparison with the speed of the NCR 390's central computing unit.

However, new developments in off-line printing units will make it possible for the dairy to process its accounts receivable off the computer's present output unit. The new equipment has been ordered, and should be installed early next year.