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Milling Order Entry: A Case in Business Process Reengineering

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Organisations need to align their information technology with the organisation's business strategy in order to attain competitive advantage. The development and implementation of a generic sales order system are described. The system is based on a series of Organisation Units, each adding to the products' value chain. Each organisation can either take orders or place them with another organisation for manufacturing and despatch. These subsystems allowed for stream-lined data entry of information specific to each Organisation Unit's operation.

These data were then summarised monthly and sales analysis programs could run against either the individual transactions or the summarised data. This technique meant that the analysis programs did not need to be changed to analyse information under new categories. The system development methodology was based on Information Engineering and Screenflow Programming.

1 Introduction

Most organisations need reengineering in order to take advantage of new technology and networks, streamlined procedures, elimination of redundancy and bureaucracy and to empower the employees to add more value. BPR is the most important function of information system departments (Martin, 1993). To redesign the value chain of an enterprise, the chain needs to be modelled.

1.1 Background

New Zealand generally competes in structurally unattractive industries (eg wool, sheep-meat, butter) where the profit potential is low and where it is difficult for firms to shape the environment in their favour (Crocombe, Enright and Porter 1991). Increase in production volumes have only managed to counteract steadily declining real prices for agricultural commodities. Improvements in production (measured in volume) that do not result in improvements in productivity (measured in value) do not increase income, they merely keep it from falling. The value chain was proposed as a mechanism for adding value to a product at each stage of its production cycle (Porter 1985).

As part of the drive towards establishing an operating framework for world-class manufacturing, organisations are changing their performance measurement systems to encourage manufacturing excellence (Giffi, Roth and Seal 1990). Performance measurement systems need to be tailored to a company's strategic action programs.

Due to the preponderance in New Zealand of processes based on primary industries (eg farming, forestry) most indigenous manufacturing is batch-based and governed by seasonal factors, by necessity forcing make-to-stock situations (Paynter 1993). Other situations can be classified as make-to-order. Yet most packages available in the marketplace are based on one or other. Order Entry systems and Sales Analysis packages can be classified into "made-to-order" or "off-the-shelf". They can also be classified as "general purpose" or "industry-specific".

The Milling Order Entry system was designed primarily for batch manufacturing and to ensure that value was added at each of the Organisation Units in the production chain. It replaced the traditional cost accounting systems with a performance management system based on production and marketing factors directly under the control of the Business Units concerned.

It was built around the time of the world-wide share market crash of 1987, which adversely affected many New Zealand companies. The years that followed this, saw great changes in the management structure, philosophy and the very existence of a cross section of New Zealand organisations. The feed milling and flour industry was no exception to this. During this period the substantial flour milling interests of the Goodman and Wattie groups of companies merged. The project therefore needed to be able to cope with the changing and uncertain management structure. This project was designed to logically survive the reorganisation of the companies.

1.2 System Overview

The system was originally developed specifically to meet Wattie Industries Ltd requirements for the Northern Roller Mills (NRM) Feed Mills and Flour Mills. Their requirements aim to meet far reaching changes in their business environment where there is a need to improve the management of costs, the utilisation of resources and managerial decision making. The ever increasing competition in the market place required more emphasis on product marketing and subsequently sales analysis.

During 1988 enhancements were made to satisfy the additional requirements of the Goodman New Zealand Cereal Foods Ltd (NZCF). Where there has been a conflict between the two sets of requirements separate sales methods were created in the software. The control of these was table-driven so the method selected by any one organisation (and their relationships with other organisations) could be changed without changing the software programs. In this way the organisations' IT was aligned to the requirements of the organisation by allowing decentralised/centralised decision making. This alignment is fundamental to the effective implementation of IT (McKersie and Walton, 1991).

Both the Flour Milling and Feed Milling business units believe for their operation to be more effective, they required improved information on the sales and market place factors. This information was required separately by both the selling (marketing) business units and the manufacturing business units.

The Milling Order Entry system is to cover the total production environment from marketing through to distribution. It is based on dividing the organisation into different Organisational Units which could operate either together or in concert. Organisations can thus be designated marketing business units or manufacturing business units, or they could do both roles (ie act independently). A marketing unit has a list of organisations which it delegates the manufacturing to.

2 System Design

The system design is based on the Screenflow Systems Development method (Snow and Paynter 1992). This provides an effective and efficient means of creating applications in a shared relational database environment.

Screenflow applications all use a standard screen panel format. The resulting uniformity of style promotes ease of learning for both developers and users. It allows template panels and programs to be used for application development in the interests of system quality, maintainability and productivity.

As previously stated, during the project the company and the group that it was part of underwent rapid changes in both the business structure and the interrelationships between the businesses. Initially each business was taking its own orders, producing to them and selling and recording the debt (ie each business acting as a stand-alone entity). A customer however could order from more than one branch, therefore there was a need to share customers.

The business was then restructured. A separate business takes the orders, allocates them to the different mills either entirely or in part (effectively creating production orders), who then despatch the products to the customer directly. The original business invoices the customers. Following this scenario then, at different times the operation could be either stand-alone or act in concert with the other businesses in its dealing with customers. This aspect was controlled by a flag in the organisation's parameter table. Hence the design followed was one of an organisation maintaining the customer information, but one or more organisations could then be nominated to deal with the customer. This design saw the creation of the Org-Customer and Org-Item entities, in which, each organisation maintains information about those Customer and Items specific to it. An organisation picks up customer and item information maintained by organisations who share data with it under the control of a table specifying which organisations share which tables with which other organisations.

2.1 Sales Analysis

A reporting subsystem was set up to give daily, monthly and sundry reports on the order process. It is worth discussing the philosophy behind the design of the analysis mechanism further in this regard.

If one was to look at typical packages as sold by vendors, one would see two approaches to providing for any analysis of say sales information by customer. One approach would see a finite number of fields or characters left at the end of the customer record. The user then fills these in, to categorise the customers in a variety of ways. When running a report, the user would specify which columns or fields to report on. There are two disadvantages to this approach: the first is that it involves an investment in coding structure which may not be able to handle complex relationships and which tends to breakdown over time; and the second, that the meaning of the data is not recorded in the data dictionary - an anathema to the data design bigot. The alternative approach gets around the second of these problems by creating a new attribute in the customer table each time the users request an analysis by some new categorisation. The drawback of this approach is that the customer maintenance program has to be changed each time a new analysis method is constructed with the resultant database change. A new report also has to be written.

When one considers what is actually being analysed a different philosophy is invoked. Sales are actually being analysed by customer-group and not by customer-attribute. If customers are then placed in groups (which themselves might be part of larger groups) then no program or database maintenance is required. Generic batch report (and indeed on-line analysis) programs can then be written so that a single report program can produce analyses based on any particular grouping. The user simply enters the customer-group-type to be reported on and (optionally) the group whose sales are to be decomposed. The report will produce an analysis for that group (or all groups) with sub-totals for all sub-groups making up the group and to any level of nesting. This nesting is an advance over other systems in which there is a set number of levels of analysis (usually three or four). This later approach causes two types of problems: in the simpler, the users have to create artificial intermediate levels of analysis where no real ones exist, simply to satisfy the needs of the reporting program. In the other the users may exhaust the number of levels available. This may occur, for example, if there is a split of customer territories into smaller geographical sub-regions.) The users then have to resort to a complex coding structure in order to achieve the breakdown.

2.2 Order Processing

From the description of the system objectives it can be seen that the different stages of the order processing cycle represent different states of the order. Thus it is possible to build a transition graph (Meyer 1988) of the process and to represent this as a screenflow (Paynter 1993). Treating these orders, despatches, credits and debits as a type of *movement* simplified the system design (Paynter, 1992b). This made the data changes, from one type of selling operation to the other, trivial.

3. Results

Milling Order Entry was used by the two different industries (Feed Milling and Flour Milling) in five factories (one handling both feed and flour) throughout the country.

There are 15 subsystems and 150-200 individual on-line programs (aside from the associated organisation, location, personnel and security maintenance programs). In addition there are over thirty reports and four batch update programs. A full description of the system is given in the systems manual (GFW Information Services 1988).

4 Discussion

Milling Order Entry has fulfilled all of the stated objectives. There were several factors which contributed to the success of the MOE concept and the software which facilitates it:

There is a commitment from top management down through the Branches to the concept. As importantly, the principals and the discipline and commitment were adopted by the individuals in the Organisations whose enthusiasm is crucial to its implementation.

The system was designed top-down based on fundamental concepts (Martin and Finkelstein, 1982). At no stage in the development and implementation did the basic design need to be reworked. The design achieved a flexibility and stability to withstand the apparently conflicting requirements of the two different production philosophies of NRM Feeds and NZCF. In addition the core model of the Movement, Movement-Line and Discount data design allowed enhancements such as the inclusion of NZCF's requirements. This was done without disrupting the integrity of the process, nor did it require the downstream reports and programs to be reworked.

The Screenflow method allows Rapid Application Development. The development method encourages a high degree of module re-use. As all the modern Wattie computer applications were designed in the same way, the interfaces between the different applications were seamless. Hence there was only a need for a single item database to be shared by manufacturing and sales and distribution. The worker details required for applications were directly related to the personnel records. Changes required when NZCF and NRM merged took place with no changes to the database and only changes to the order entry and pricing programs. Both stand-alone (eg Feed Milling) and related organisations (eg Flour Milling/Marketing) could run the same applications, at the same time aligning the IT structures to the decision making requirements .

5 Conclusion

This case shows the benefits of using modern information system techniques such as information engineering and object-oriented modelling to describe the way in which organisations operate. These models should reflect the business policies and rules and the information technology should allow these to be translated into operational systems as automatically as possible. When the business structures or policies change (which happens regularly), the business systems should be regenerated quickly to reflect the change.

These factors are in agreement with the reports from academic research into Business Process Reengineering. Senior Management and Commitment and Sponsorship, Empowered and Collaborative Workers, Shared Vision, Sound Management Processes, and Appropriate People Participating Full-Time, are listed as positive preconditions to BPR success (Bashein and Marcus, 1994; Bashein, Marcus and Riley, 1994).

It has been asserted that information technology can be exploited to remove the barriers surrounding the way that organisations organise their work (Hammer and Champy, 1993). One such an example of a barrier given, is the need for organisations to choose between centralisation and decentralisation. This case shows how business processes can be redesigned and advanced telecommunications networks used as part of information technology to circumvent such barriers.

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