

IMPLEMENTATION OF A TOTAL MANUFACTURING AND SALES SYSTEM IN A MULTI-DIVISION APPAREL MANUFACTURER

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Introduction

Until recently, most of the companies in the apparel industry concentrated their systems efforts towards order management and distribution problems. Other major system areas such as engineering standards, bills of material, and time phased material requirements planning have been addressed in standalone, batch systems.

Today, with increasing competition, both domestic and off-shore, and higher raw material and labour costs, many companies are evaluating the type of closed-loop, integrated MRP systems that have been successfully implemented in many different types of discrete manufacturing companies. The basic functions that have traditionally been included in closed-loop MRP systems, are present in apparel manufacturing. Some apparel industry characteristics different from other types of traditional manufacturing include:

- Two raw material planning cycles
 - Long range (greige goods)
 - Short range (colour)
- Alternate routings
- Material substitutions

Despite these types of differences, apparel manufacturers still need the same systems capabilities as hard goods manufacturers. The following is a case study of how the requirement definition, software selection, and implementation of a total closed-loop system was addressed in a large, multi-division company. The subject of this presentation is a large apparel manufacturer with multiple divisions, each with several plants. This company produces a full range of apparel and other cut and sewn products. The problems that make this case of interest centre around the techniques that were employed to define requirements for multiple divisions in order to select a common software package to be used by all divisions.

In June of 1982, the environment within the company made a coordinated systems effort impossible. The following were all impacting the situation:

- The company was employing a decentralized approach to management.
- Since many different small companies were joined to form a large company, many different styles of management producing varying results were in place.
- All divisions viewed themselves as unique businesses with unique sets of

problems and requirements.

- No structure or plan for information systems was in place – divisions each had their own uncoordinated efforts underway to improve their systems capability.
- No top management direction, commitment or involvement was in place for information systems.
- Dramatic changes had taken place in the business environment including:
 - foreign competition
 - loss of market share
 - change in customer demand
 - new marketing thrusts
- Systems in place were 10 – 15 years old and could not respond to changes in the business environment.

Top management decided to take action. All systems projects in the divisions were halted. A corporate steering committee was established with a charter to achieve systems commonality. Reporting to the steering committee were user project directors from all divisions and a project team appointed to define the companywide requirements, and determine if it would be feasible to pursue common systems. The user project directors were chartered with the responsibility for:

- Assuring that division management was appropriately involved and informed with regard to the project.
- Determining the appropriate level of staffing and involvement of division managers necessary to assure that all division requirements were addressed.
- Reporting user progress to the steering committee and signing-off on the interim work products throughout the requirements definition phase.

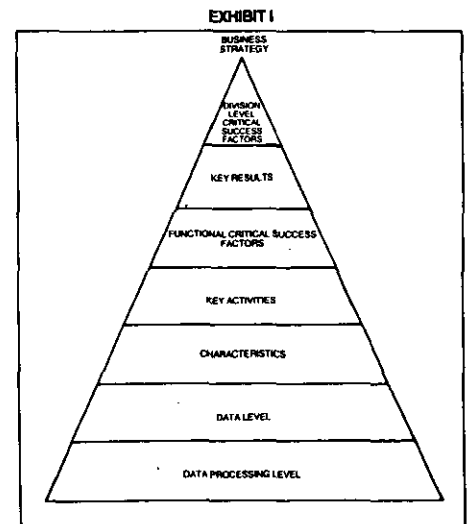
Requirements Definition

The requirements definition phase consisted of four different parts:

- Initial visits to the divisions
- Detailed interviews
- Follow-up visits
- Final consolidated report

Initial visits were made to each of the divisions to prepare the users for the requirements definition discussion sessions, and to gather documentation on current systems and methodologies. After reviewing available documentation on each division, week long visits to the divisions took place. During these visits, detailed interviews were held with the managers of all the functional areas within the divisions.

After the interviews, the project team documented the findings, and developed a report on the features and functions needed by the division to run



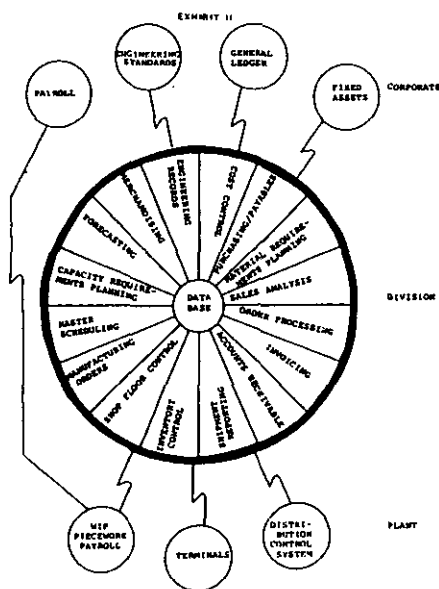
their business. These system "characteristics" were put into a matrix comparing requirements in each functional area across divisions. This matrix was reorganized in a top down, structured approach with four different levels of detail. The matrix format was utilized to illustrate the level of commonality that actually existed in the features and functions desired by the divisions. These characteristics were reviewed by division management in follow-up visits for accuracy and completeness. Techniques were utilized to tie the features and functions described by the users to the strategy of the business unit (see Exhibit I). Factors critical to the success of the division were identified, including the key factors that should be measured to evaluate performance toward attaining division goals.

The functions required to produce the key results were also identified. Key activities necessary to perform the functional critical success factors were identified and evaluated with regard to the characteristics (features and functions). This level of detail, the features and functions needed to meet the requirements of the divisions, was used to evaluate software packages. A final consolidated report which documented the results of the requirements definition phase was published and approved by all divisions. The findings illustrated that a large percentage of common requirements existed, however important differences were present. Even though many of the requirements were the same, the priorities varied greatly based upon external factors

such as competition, relative material and labour costs, lead times of raw materials, etc. Many of the differences that existed had evolved over the years, and were not demanded by the business. Different uses of data, and varying levels of discipline existed in many different functional areas. It was found that many excellent methods and techniques were currently in place somewhere in the various divisions. All of these "best methods" would be incorporated into the new common system.

It was agreed that the scope of the new system would include all of the sixteen functions present at the division level which included:

- Merchandising
- Forecasting
- Capacity Requirements Planning
- Master Scheduling
- Manufacturing Orders
- Shop Floor Control
- Inventory Control
- Purchasing/Payables
- Engineering Records
- Cost Control
- Material Requirements Planning
- Sales Analysis
- Order Processing
- Shipment Reporting
- Invoicing
- Accounts Receivable



These functions were managed at the division level for all of the plants. At the plant level, the proposed division operating system would interface with systems for work-in-process tracking, piecework payroll, and distribution control. This new division operating system would also interface with corporate accounting and engineering standards systems which were already in place on a corporate mainframe. In addition to the business requirements, technical requirements were also addressed. This reflected the fact that

the company ran their business at the division level, with production and shipment reporting taking place in the plants, and consolidation and standardization occurring at the corporate level (see Exhibit II).

In addition to the business requirements, technical requirements were also addressed. Major problems with the current systems centred around the fact that they were old, batch systems, with no interfaces between them. For example, one of the systems was a batch MRP system which included raw material inventory, however, finished goods inventory was kept in a batch order processing system. Production had to be entered into both systems manually, resulting in the systems never balancing. As a result, management demanded that the new system be integrated and probably include data base capability. Because of the changing business environment, management wanted a flexible, on-line system. Management also desired a system that would utilize as much of the current equipment in place as possible, and require the least amount of training of MIS personnel. With these constraints in mind, a project was commissioned to select software to meet the requirements defined and approved by the divisions.

Software Selection

The software evaluation was broken into a technical assessment and a cost evaluation. The technical assessment was considered to be twice as important as the cost evaluation. All of the possible software alternatives available were assembled. Sources included:

- Brochures from the International APICS Conference in Boston.
- Brochures from the Atlanta Bobbin Show (for the Apparel Industry).
- Experienced Price Waterhouse consultants.
- Additional sources within the company.

These sources were reviewed and an initial list of twenty-five possible software vendors identified. A visit was made to the exhibition floor of the International APICS Conference in Chicago to investigate the available candidates. This exercise, plus meetings and phone calls with prospective vendors allowed the list to be reduced to ten, and eventually five that would be evaluated in detail. Visits to vendor headquarters for demonstrations were scheduled for the five finalists.

A traditional decision analysis approach was taken to evaluate the capabilities of the software. The criteria that was used for the software

evaluation included the following three categories:

- Degree of fit of the prioritized characteristics – 50%
- Vendor appraisals – 25%
- Technical assessment – 25%

A numerical rating for each package's degree of fit was assigned to each module. The features and functions in the system characteristics were assigned a ranking based upon the associated priority. The characteristics were classified as a "must" or a "want". The "musts" were defined as major features that are required by the divisions to operate in their environment and produce the desired results. Within the modules a value of twenty points was assigned to all of the "musts". The "wants" all were assigned a value between zero and ten, based upon relative importance.

Only vendors considered to be viable alternatives were rated. The evaluation was scored at the module level for vendors who would commit to meeting all of the "musts" and "wants" in the modules. The characteristics level was used for vendors who would not commit to all of the "wants". Vendors who would not commit to all of the "musts" were not considered as a viable alternative.

The numerical rating for each package's ability to meet requirements for each module was multiplied by the weight assigned for each module. All of these totals were added to produce an aggregate numerical value for each software package evaluated. The package with the highest number was given up to five hundred points. All other packages were given a corresponding number of points, based upon their relative capability.

In addition to the degree of fit, a vendor appraisal was accomplished resulting in the assignment of a numerical rating worth up to two hundred and fifty points. Points were assigned based upon the vendor's rating in the following areas:

- Stability, which includes having sufficient level of staff with experience in previous installations, similar in size.
- Assessment of the vendor's understanding of requirements, and the level of commitment to fulfilling those requirements.
- Education offerings and training aids included in the package price, and
- Receptiveness to providing modifications.

Lastly, up to two hundred and fifty points were assigned based upon a technical assessment of each vendor's software and the associated capabilities included in various technical

considerations such as: the operating system, database, programming language, teleprocessing and report writing capabilities required. In addition, the life expectancy and processing flexibility were assessed. As part of the technical assessment, up to one hundred points were assigned to each vendor based upon the quality and quantity of documentation that would be furnished.

These three numbers (degree of fit, vendor appraisal and technical assessment) were totalled to produce a final rating for each software package, based upon a scale of 1 – 1000.

In addition to the software rating, cost considerations were documented for each viable software alternative. In order to determine the comparable cost of each approach, costs were developed for all of the following areas:

- Package licence fees
- Modification costs
- Professional fees
- Hardware/software costs
- Documentation costs

Major differences were identified in the on-going cost of operation of the various alternatives. Special costs associated with any of the alternatives were documented including:

- Database/data communications software
- Report writers

After the documentation of vendor-associated cost considerations, an aggregate cost of each viable alternative was compiled. The lowest cost was assigned five hundred points, and the other alternatives were given a lesser number of points corresponding to the percentage that they were higher than the lowest cost.

The total number of points awarded in the software evaluation (out of 1000 possible) were added to the number of points scored in the cost consideration (out of 500 possible). This produced the final numerical rating for each alternative. The rationale used for assigning values, and the final totals were presented to the corporate steering committee. Subsequent to this presentation, any new questions/requests for clarification were resolved. Representatives from all major functional areas in all of the divisions attended a presentation of the findings. This was followed by a visit to the proposed vendor for an all day demonstration. User acceptance was conveyed during and subsequent to the meeting. The steering committee then presented a preliminary recommendation to management for approval.

Management Approval

Although top management was

involved throughout the process, an overall evaluation was necessary for management to review and understand the total commitment necessary in order to proceed with the entire project. Therefore, top management authorised the project team to prepare a detailed package documenting the total cost/benefit to be used as a vehicle for approval of the entire project. A software package to be used as the baseline had been selected, however, it was not known how feasible and cost effective it would be to include all of the capabilities documented in the requirements definition. A three month effort was begun to bring together representatives from the divisions to discuss all of the capabilities not present in the baseline in order to verify the criticality of these functions, the extent of the modifications involved, and to reach a consensus as to how major functions would be handled. The purpose of this phase was to educate the software vendor and allow users to review the capabilities and approaches of the proposed software.

At the end of this phase, a four hundred page document was developed outlining the capabilities that would be included (at a minimum) in the final delivered software package. Included in this document were lists of on-line processing functions, and descriptions of how the system would be used including which capabilities would be handled on-line, batch, manually, etc.

The general implementation schedule was developed which included the proposed installation sequence by module and division. From this document, an estimate of time and cost was developed for the following items:

- Detailed specifications incorporating required modifications to be developed by the company for all divisions
- Final delivered code from the vendor which would meet the requirements defined in each module of the detailed specifications.
- The hardware, terminals, printers and communications lines necessary to support the use of this on-line system in all locations.
- The operating software, data base and telecommunications software, and other specialised software necessary to support the application.
- Consulting assistance, education and training, and
- The organisation structure necessary to support the:
 - Development of detailed specifications
 - Programming of batch programs, conversion programs and maintenance of the on-line system
 - Methods improvements to bring the

divisions up to the level of control and knowledge necessary to implement the system

- Installation of the system including documentation of policies and procedures, and training

Potential benefits from the implementation of the system were identified and dollarized companywide including areas such as:

- Improved inventory turns
- Improved cost of purchasing raw materials
- Reduced cost of obsolescence
- Reduced administrative costs
- Improved accounts receivable turns

In addition, non-quantifiable benefits were identified including:

- Reduced transportation cost
- Improved customer service
- Improved utilization of capacity
- Improved management control
- Flexibility to handle new and varied types of business

In order to confirm the potential benefits developed companywide, input from the divisions was solicited. In May of 1983, the total budget to implement the system in all divisions over the next four years was approved.

Implementation

Work on the implementation phase began in June, 1983, subsequent to the approval of the four year budget to complete the detail design, programming, testing and installation of the system in all of the plants. A system blueprint was developed to be used as the vehicle to break the system down into manageable parts. Initially, the sixteen functions documented in the requirements definition phase were grouped into three major subsystems:

- Sales Order Processing and Accounts Receivable
- Manufacturing
- Purchasing and Accounts Payable

These subsystems contained a total of nineteen modules. The modules in each respective subsystem were broken down. (see page 26)

Each of the modules were broken down further into multiple functions. For example, the Engineering Records module of the Manufacturing subsystem contained the following functions:

- Item Master Maintenance
 - Item Master Inquiry
 - Plant Master Maintenance
 - Plant Master Inquiry
 - BOM Note Maintenance
 - Engineering Note Maintenance
 - Material Control Data Maintenance
 - Material Control Data Inquiry
 - Single or Indented BOM Inquiry
 - Single or Indented Where-Used Inquiry
 - Work Centre Maintenance
 - Work Centre Inquiry
 - Work Centre, Where-Used Inquiry
- (continued on page 26)

<u>Sales Order Processing</u>	<u>Manufacturing</u>	<u>Purchasing/Accounts Payables</u>
- Data Base Maintenance	- Engineering Records	- Vendor Master
- Contract Management	- Cost Control	- Purchasing
- Order Management	- Inventory Control	- Receiving
- Finished Goods Management	- Manufacturing Orders	- Accounts Payables
- Accounts Receivable	- Master Scheduling	
- Sales Analysis and Management Reporting	- Shop Floor Control	
	- Material Requirements Planning	
	- Capacity Requirements Planning	
	- Forecasting/ Merchandising	

- Routing Note Maintenance
- Routing Note Inquiry
- Text Maintenance
- Text Inquiry

All of the functions for each module were discussed in the course of a four or five day meeting per module. Specifications were developed at the functional level to handle all of the requirements that all divisions need to run their businesses. It was the responsibility of the design team to insure that these requirements were incorporated into the specifications delivered to the appropriate programming staff. The software vendor provided consulting assistance throughout the design phase and was better able to communicate with their programming staff and interpret the detailed specifications.

The approach that was utilized was developed to insure that the users defined the requirements, and that the demands on their time were minimized.

The following steps were taken in some form for all of the modules of each subsystem.

1. MIS Project Managers thoroughly reviewed the vendor supplied "starter" specifications for each module. Obvious additions and deletions were made, and topics for discussion within each function defined.
2. These topics were forwarded to the designated users to prepare themselves to represent their division in discussion sessions. Part of their preparation included assembling data representative of the requirements of their division to be used in the development of test data. These users were delegated the authority to speak for their respective divisions and make decisions on the topics scheduled for discussion.
3. These topics were thoroughly discussed in joint meetings. The users returned to their divisions, and the Project Managers documented the agreed upon requirements.
4. For each function, the required screens and reports were identified. The

information necessary for the identified screens and reports was documented. Screen and report layouts were designed. A description of the practices and techniques required was developed encompassing the companywide "Best Methods".

5. All of this documentation was forwarded to the designated users to review for completeness, and to present to their respective Division Steering Committees for review and comment. This review process was scheduled to be completed within one week to avoid project delays.
6. The Project Manager developed logic sheets to enable the vendor and company programmers to code programs. In addition, the Project Manager developed a testing plan which included both test data and acceptance criteria for each module to insure that the programs would conform to the total company requirements.
7. After approvals for all of the functions in the module were secured, and any final changes made, the completed specifications were turned over to the appropriate programming staff.
8. When the initial programming and testing was completed, the completed programs were turned back over to the appropriate Project Manager. At that time, the steps outlined in the test plan were executed for unit testing, stream testing, and user acceptance testing. Discrepancies against specifications were documented and turned over to the appropriate programmers until all elements of the acceptance criteria had been satisfied.
9. The Project Manager then completed the system documentation including the operational instructions and guidelines to be used by the Installation Team in addressing education, training and the development of user manuals.
10. A method and procedures document was developed which included the policies required to effectively use the system. At this time, meetings were held with the programmers to finalize the conversion plan, and with the respective Installation Manager to finalize a workplan for implementation at the first site.

The approach was slightly different for each subsystem, but all of the above steps were included. A detailed workplan for all three subsystems was always maintained at least three months out to facilitate the scheduling of users in to headquarters for design sessions.

The effective utilization of resources throughout this process requires the overlap of several modules, at all times, in various stages. Since the design team is often waiting for another group (either users or programmers) to complete a task before they become involved again, management of all of the items on the critical paths is key to the success of the project. In addition, accurate information on any schedule slippage must always be readily available in order to facilitate the rescheduling of dependent activities.

This approach will produce results only if the right, knowledgeable division users are available at the required times. They must have delegated to them the authority to represent and commit the division in the key meetings that determine what and how the system will function. Planning in detail, several months out was a necessity, to allow the key users to plan on being free from their everyday duties, to attend joint design meetings.

This project was difficult because the user included many divisions, each managing several plants, that were producing different types of products. Different styles of management existed, however, one common system had to be the solution. The project was successful due to the fact that the users designed the system. Even though the project was run by corporate data processing, and the users were dispersed throughout the country, the logistical problems were overcome through successful planning.

An approach was developed to insure appropriate user representation at critical stages, and total, open, communication between MIS and the users. The primary purpose of this presentation, was to review this process.

About the Author:

Alex A. Martignago is a Senior Manager in the St. Louis Management Advisory Services practice of Price Waterhouse. He assists manufacturing clients with requirements definition, software selection, design, implementation support and project management of information systems, along with over 60 other Price Waterhouse consultants in the St. Louis area.

Mr. Martignago has ten years of experience which includes consulting with sixteen Fortune 500 manufacturing clients. Prior to entering the consulting field, he worked on a shop floor for a four year period. Mr. Martignago holds a Masters Degree in Business Administration from the University of Illinois, and is a member of the St. Louis Chapter of APICS.