CHAPTER 4

MRP DEVELOPMENT METHOD

4. MRP System Development

This chapter addresses the development procedure for the MRP system within the company, from the planning stage, through the process of collecting all relevant data, programme design, and finally the programming and testing stage.

4.1. Planning

As with any project, the planning stage is an important one. The first step of the planning stage was to establish a project team. This team would meet on a weekly basis to keep each other informed of progress or of any problems. The team planned the project together, which included the steps of development, setting milestones, assignment of team roles, and making arrangements in terms of resources.

The management's expectations of the system were discussed during the planning stage, which is important because the system development should be aligned to any strategies that may have been applied to the company and to the TKM Department. Also, this was a good opportunity to gain top management support for the project. Having the production manager of the TKM department as part of the project team made this task easier. It also made the task of maintaining top management support easier, because of the production manager's participation in the scheduled weekly meetings.

4.1.1. Project Team and Roles

During the planning stage, the opportunity was taken to set up a project team. The team consisted of a group of people, which included a member of staff from the IT department, and the production manager for the TKM Department, and a full-time project leader. The team then established a project time line with clear milestones.

The team agreed to meet on a weekly basis to discuss the progress of the project, any issues with the MRP system and to review milestone achievement. Figure 4.1 shows the Gantt chart detailing the steps of the development project.

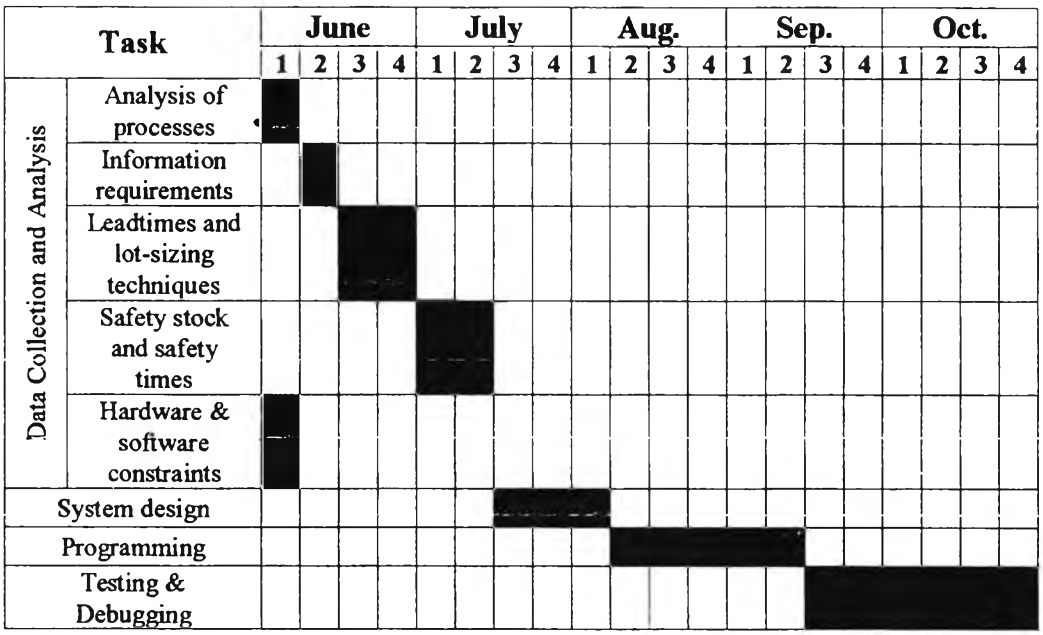

Figure 4.1 Gantt chart for MRP development project. †

As full-time project leader, it was my responsibility to oversee every aspect of the development project, to ensure that the project was on schedule, to liaise between the various departments and staff involved in the development project, and to design and programme the system with the help of the IT department. The production manager was part of the team to offer support for the project and to be kept informed of progress and events. The member of staff from the IT department was there to offer advice on technical aspects of the development project, as well as keep the team informed on the department's progress with the programming and testing aspect of development. Figure 4.2 shows a summary of the roles and responsibilities of the members of the project team.

† Figure 4.1 refers to the latter half of the 2nd, the 3rd, the 4th and the 5th stages of the proposed methodology in section 1.5. There are differences between this chart and Figure 1, but these are superficial and the tasks have merely been broken down into more detail for the benefit of task management. However, the tasks are essentially the same and cover exactly the same time spans.

Team Member	Roles and Responsibilities
Full Time Project Leader	• To oversee every aspect of the whole project. • To liaise between the various departments and staff involved in the project. • To design and programme the system with the help of the IT Department.
Member of IT Department	• To give technical advice on the MRP system design. • To help programme the system.
Project Manager	• To give top management support to the project.

Figure 4.2 Project Team members and their roles and responsibilities

4.2. Data Collection and Analysis

After the initial planning of the project, data collection could begin. The areas of data collection covered the following subjects:

- Analysis of existing processes
- User requirements and information needs
- Hardware and software constraints
- Leadtimes and Lot-sizing
- Safety stocks and safety leadtimes

The methods of data collection initially consisted of meetings and interviews with staff and management. These interviews were prepared in advance in order to try and obtain all the information from the interviewee in one interview. This was done to minimise the amount of people's time taken. An appointment would be arranged with the interviewee and they would be informed of the nature of the interview beforehand so they would be able to prepare themselves. If the right information

could not be obtained during the interview, then alternative source for this information would be discussed.

4.2.1. Analysis of Existing Processes

The TKM Department lacks formal production planning and inventory control procedures. This made the task of finding information on any existing processes a difficult task, because there was very little documentation. Most of the information that was obtained came from interviews with the TKM Department's production manager, because he was the most knowledgeable. Any information that was obtained about existing processes was analysed using activity modelling techniques, examples of which can be seen in Chapter 6.

4.2.2. User Requirements and Information Needs

The user requirements were identified by interviewing the production manager and members of the stock department. The interview were conducted to find out what the users wanted on the interfaces, and what information they would like to be included in the system reports.

Other sources of information included existing production schedules and material requests. Information from these sources were important, because they detailed the minimum information that is required by the users using the old system, and too much change from the old system may cause too much disruption as the users get used to new terminology or differences in the information included in the output reports.

4.2.3. Leadtimes and Lot-sizing

Meetings with ABC subsidiary's production manager were needed in order to find a way to obtain the leadtimes for the components produced for the TKM Department, and also to discuss suitable lot-sizing techniques that would suit both ABC and the TKM Department.

Obtaining accurate leadtime information was not a straight forward task, since this type of information had never been recorded. Measuring the leadtimes for all the components was not a practical solution due to the time constraints of the project, so it was suggested that estimates should be made based on the average time difference between order placement and component receipt. Order placement information and component receipt information was obtained from the purchasing department. From these two sources of data, an estimate could be obtained, although it would be an overestimate, since the company was having problems keeping deliveries on time (internally and externally).

Overestimates in leadtimes are considered acceptable, but as the system goes online they will need to be continually adjusted as the system is stabilised. The danger occurs when the data is an underestimate, and it is impossible for production to meet the stated leadtimes.

4.2.4. Safety Stock

Determining the appropriate level of safety stock for the components produced by ABC subsidiary, required meetings with the production manager of ABC, the production manager of the TKM Department, as well as members from the stock department.

Safety stocks have been used since the setup of the TKM department's new computerised to help cope with demand uncertainty, and it was discussed whether to alter them in light of the new MRP system, which would vastly improve materials planning. Although the system would help ensure that the right number of components was ordered at the right time, there was a certain level of production uncertainty within ABC subsidiary. This meant that leadtimes were only over estimates and that it would be necessary for the safety stocks to remain in place. It was decided that the safety stocks could be altered at a later date (i.e. at the system stabilisation phase during the implementation of the system).

4.2.5. Hardware & Software Constraints

The hardware and software constraints were obtained from the IT department. The type of information required included:

- Available hardware for the MRP system
- Available development tools
- Layout of any existing databases
- Type of any existing databases

The information obtained at this stage will help determine the limits of what the system is capable of.

4.3. Overall System Design Specification Document

From the data gathering and analysis in the previous stage, an overall system design specification document was produced. Basically, this is a summary of the analysis, so everyone working on the project is aware of the requirements and constraints of the system. The overall system specification document is important, since it is a guide for the designers of the programme. Without this document, the resulting MRP system may not fulfil the intended requirements, because design changes are likely to over the period of development.

4.4. System Design

After the overall system design specification was drafted, the task of designing the MRP system was able to commence. The task of designing the system fell to the full-time project leader with the help of the IT department. The IT department were involved because they were more knowledgeable in the technical aspects programme design. The IT department was in constant communication with the project leader, and the production manager through weekly scheduled meetings. These meetings were especially important for clarification of certain aspects of the overall system

specification, for the design of the reports, and also for the design of the user interfaces.

Although the following aspects of the system design have been arranged into subsections, it should be noted that they were not independent of each other. Alterations to the design of one aspect would influence the design of another, so the different parts of the system design would often be carried out simultaneously, and in an iterative manner.

4.4.1. Programme Design

The programme design stage was concerned with how the system would interact with database and the actual logic of the programme, so the system would be able to provide the right data outputs. Along with deciding how the programme would operate, the development tools were chosen that would best suit rapid development according to the programme design.

It was decided that the system would be split into two parts; one part of the system would allow the MPS data to be input into the database, and the other part of the system would deal with the computational aspect of the MRP system. To aid rapid development, it was decided that the MPS data input would be developed in Visual Basic 6 (VB6), and the MRP computation would be carried out in Microsoft Excel, using Visual Basic for Application (VBA) to automate the processes required to calculate the material requirements plan. The reason for using VB6 for the MPS data input is that it is possible to create user interfaces quickly and simply, also it has a wide variety of database tools. Excel is used for the computations, because data can be imported from the TKM Department's inventory database using a SQL query, and with the use of VBA, the various calculations can be performed and then arranged into a suitable format automatically. An important factor for using these tools was the fact that they were readily available within the company.

4.4.2. Database and SQL Query Design

The existing database required some modification before it could be used as part of the MRP system. There were already tables that contained all the necessary BOM and inventory information, but the database still needed a table to store the MPS data. The new table needed to contain all the information that would have been put on the old paper version of the production schedule (Figure 4.3), with the addition of the weekly time buckets, where the weekly amount of each end item to be produced would be entered. Some of the information that needed to be contained in the MPS table was not needed by the MRP system, and was included so the database could substitute the old paper version. Information vital to the MRP system's operation are the component codes, and the quantities that are stored in the time buckets.

Production Schedule for _____

No.	Description	Order ID	Quantity	Man Hour	Start Date	End Date

Signature _____ Date _____

Figure 4.3 Old paper version of the production schedule

Structured Query Language (SQL) was used to collect the information from the database that was required for the MRP calculations. Excel uses Microsoft Query to obtain the data from the databases, as shown in Figure 4.4. When creating a new query in Microsoft Query, the user is asked to make a connection to the database, and the columns that need to be included in the query output are specified. Once this has been completed, some editing of the query must be done, such as specifying the relationships between the tables. From this, Microsoft office is able generate most of the SQL statement automatically, but it will need to be checked using a test run to see if all is as expected. If not, the statement can be modified manually.

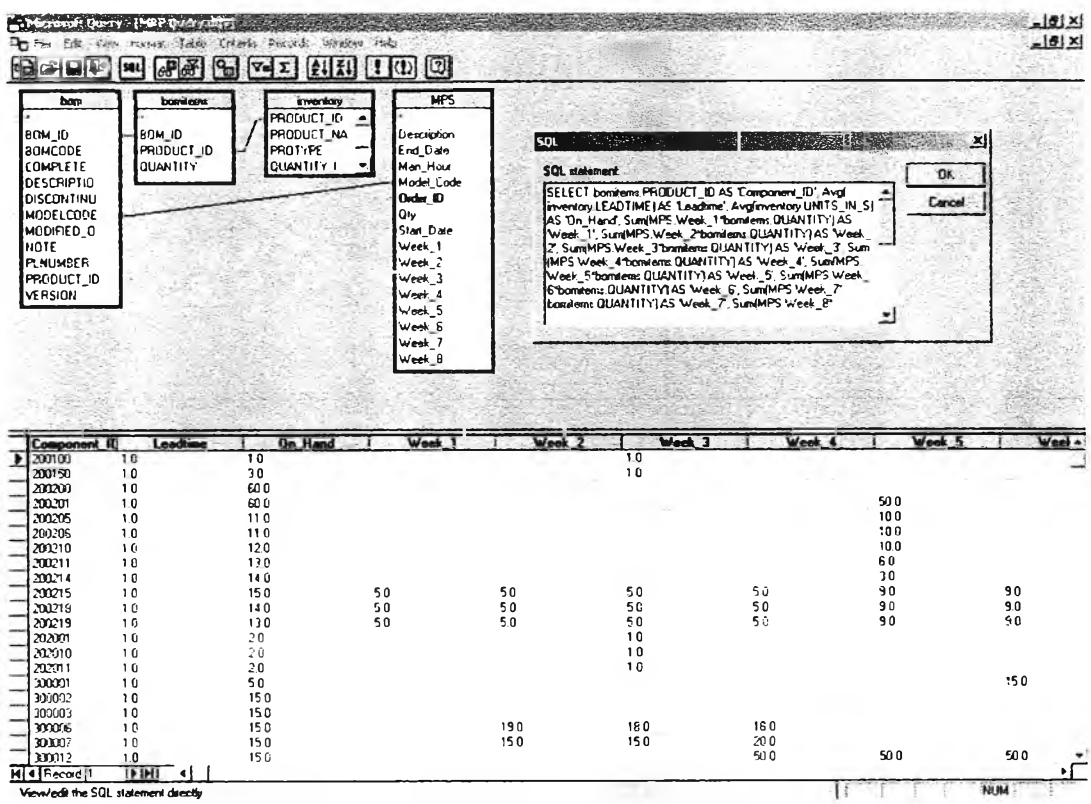

Figure 4.4 SQL query design in Microsoft Query

4.4.3. User Interfaces

The design of the user interfaces required a great deal of care. They had to be simple enough for people with limited computer experience to use easily, be small enough

to fit on a screen with relatively low resolution (800x600), and yet be functional at the same time. The MPS data input was only going to be used by the production manager, but the MRP programme needed to be used by the employees of the stock department as well as the production manager. Ideas for proposed user interface layouts were shown to the prospective users to gauge what they thought of them. Figure 4.5 is an example of a layout sketch for the MPS data input interface.

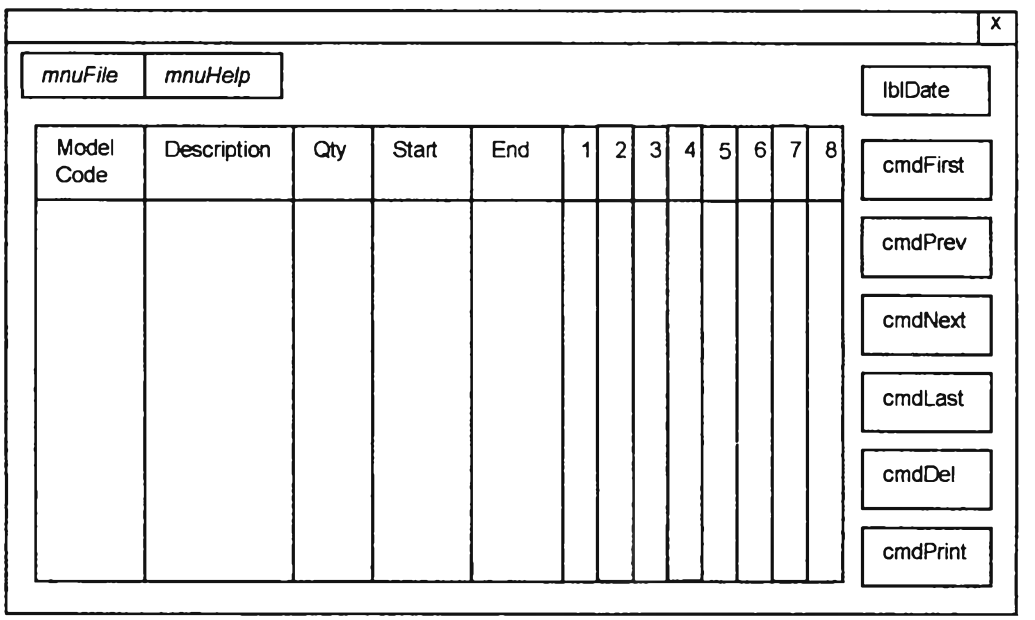

Figure 4.5 An example of a preliminary layout sketch

4.4.4. Outputs of the System

Three outputs had to be designed for the system; one was the MPS, another was the component order schedule, and the final output was the component order list for the current time period. The design requirements for the outputs were that they should contain all the information that was specified in the Overall System Specification in a simple and clear format, and that they could be printed out on to A4 paper using a laser printer.

4.5. Programming, Testing & Debugging

The programming, testing and debugging segment of development was done with the help of the IT department, as they had all the knowledge and skills required to carry this out effectively. Testing and debugging was facilitated by the development tools employed. The modular nature of VB6 and VBA programmes, and the host of tools that come with the development packages, enabled problems to be quickly identified and aided the programmer in fixing any bugs.

Once the MRP system had been completed, it was required to go through a final test run. This was done using a snapshot of the database in case the real database was damaged. The test run was carried out over the course of two days, to ensure that the stored procedures for updating the MPS were working correctly. Refer to the Appendix for the outputs of the final test run.