

MIS Case Study.

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Overview of Case Study of Company Y.

The case will look at the problems that a chemical company (Company Y) experienced when it decided to implement MRP II in its plants and put forward some possible solutions to them. The case study is based on five interviews with:

- Mr Dave Rantor, production director.
- Mr Mike Trainer, purchasing director.
- Dr Brian Church, operations director.
- Mr Ken Smith, senior MIS manager.
- Mr Bill Jones, senior warehouse manager.

Some Background to Company Y.

Company Y produces over £40 million worth of organic chemicals a year for the pharmaceutical and agricultural industries. 75% of its production is exported to over 100 countries throughout the world. It employs approximately 600 people on two sites in the North East of England. It has four plants on these two sites. Site one has a single plant on it that produces only one pharmaceutical product. This site contains the first production unit (Unit one) built by the company when it was founded in the early 1960's. Unit one on site one does not play any part in this case study. The other site, Site two, was purpose built in 1969 and contains the remaining three production units, units' two, three and four, as well as laboratories, engineering services and head offices of the company. Unit two produces the same product as Unit one, Unit three produces a variety of chemical intermediates for the pharmaceutical industry and Unit four produces a variety of chemical intermediates for the agricultural industry.

The original American parent company was taken over by another American multinational in 1988 to integrate the selling of their own range of chemicals with those produced by Company Y. The current American parent company also has interests in a range of companies that produce pharmaceutical products. There is no sales department as all sales are dealt with elsewhere in the group. At present the three most senior managers at Company Y are

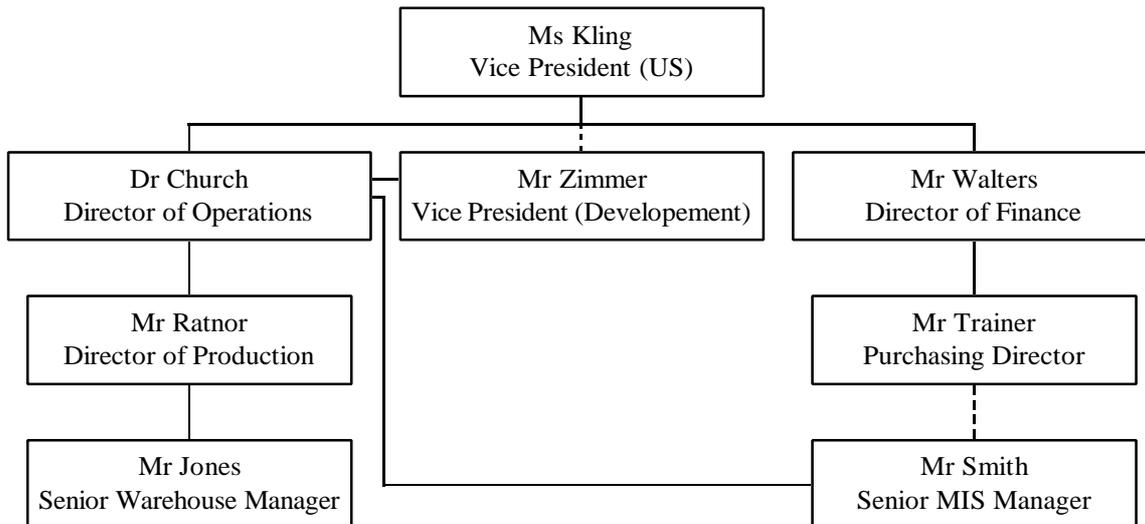
- 1: The operations director, Dr Church, who is responsible for engineering, production, personnel, health and safety, QC, the operations function.
- 2: The vice president of development, Mr Zimmer who is responsible for R&D but also liaises with customers. Mr Zimmer took day to day responsibility for the implementation of the new MRP II system.
- 3: The financial director Mr Waters who is responsible for the accounting function.

Dr Church and Mr Waters, report directly to the vice president of the parent company, Ms Kling. Mr Zimmer, also reports to Ms Kling but indirectly through Dr Church. In addition to the above there is also Mr Rantor, the Production Director, Mr Trainer, the Purchasing Director, Mr Smith the MIS manager and Mr Jones the warehouse manager.

Mr Rantor reports directly to Dr Church and has Mr Jones reporting to him. Mr Trainer reports directly to Mr Waters. In the past, Mr Smith reported to Mr Trainer but since the implementation of MRP II, Mr Smith reports directly to Dr Church.

Dr Church and Mr Rantor were earliest and the strongest advocates of MRP II at board level.

Company Structure



The choice of the Software.

Company Y has always had a “progressive” view on the use of Information Technology. The first department to use a computer was the accounts department who used them to automate repetitive manual processes such as Payroll, Accounts Payable, General Ledger, Financial Modelling and Standard Costing. From there Company Y developed a Plant Inventory Control System that was essentially a computer based Warehouse System to replace the classic card based warehouse stock system. At that time, an American sister company supported all software developments on the site. There were no programmers on the site and only two operators. In November 1983, an MIS department was formed which initially was only responsible for installing software produced by the American Parent company. In 1985 it began to employ its own programmers and began to make improvements to the existing software by adding modules for purchasing and distribution: all of which were produced in-house. The MRP project was launched in May 1987.

A project team consisting of a director, Mr Zimmer, two full time members of staff and 12 part time members of staff was set up. The American parent company had a bulk Purchase Agreement with IBM and IBM supplied almost all of Company Y's hardware and software. The American parent company informed Company Y that MAPICS II, an IBM product, should be included in the evaluation process as “interfaces with other divisions must be considered”. By September 1987, a short-list of Software had been agreed upon which consisted of three products - MAPICS II, DATA3 and BPCS. In November 1987, after visits to other users of MRP II, the majority of the project team selected BPCS as the preferred software. The only dissenting voice at this time was the MIS dept who felt that a better system could have been written in-house. The choice of BPCS was not acceptable to the US parent company who asked Company Y to look at MAPICS II again. The feeling in Company Y was that although MAPICS II was perfectly adequate for most of the businesses in the parent company (essentially manufacturers of Pharmaceuticals) it was not suited to their operations (i.e. “jobbing chemical manufacture”).

The timetable for implementation..

7/7/87	First meeting of Project team.
7/9/87	Short-list of software drawn up.
21/9/87	Final short-list - MAPICS II, DATA3, BPCS.
16/11/87	BPCS selected as first choice.
25/12/87	Project brief returned from corporate HQ with a request to focus on MAPICS II.
8/2/88	Consultant A commissioned by directors.
23/2/88	Consultant B commissioned by Corporate MIS.
20/4/88	Implementation stage announced assuming that capital asset request for BPCS would be approved.
17/5/88	Consultant A concludes MAPICS II is not a viable solution and recommends BPCS.
7/6/88	Operator training begins.
18/7/88	Consultant B concludes BPCS is not a viable solution. Advised to expect three month delay in approval of capital asset request by corporate HQ.
30/8/88	Directors to visit US to see demonstration of DATA VIEW software
12/9/88	Demonstration of DATA VIEW arranged for project team.
4/10/88	Project team concludes DATA VIEW provides "reasonable fit" but insists that certain important issues need further review.
23/1/89	Capital asset request approved.
6/6/89	DATA VIEW purchased.
16/10/89	20/8/90 set for cutover date.

Your Task.

The whole class should first split into groups of five. Then:

1. As individuals.

Each member of the group should read **one** of the following interviews and note down both the original aims behind the introduction of MRP II and the problems that Company Y is now experiencing. Decide among yourselves who will read what. Note: each interview only contains part of the whole picture.

2. As a group

When you have each read one interview discuss, as a group, the problems faced by the company as a whole. You should produce a list of problems that you all agree face the company. This list will form the basis of the next stage of the exercise.

3. As individuals.

Using the material that has been covered in the lectures so far, analyse the agreed list of problems and prepare notes on:

- a) Were Company Y successful, or unsuccessful, in the introduction of MRP II?
- b) Did Company Y identify all of the factors relevant to the introduction of a new system at the outset and, if not, what did they miss?
- c) What were the organisational impacts of the MRP II and how well were they managed?

4. As a group

Reform in groups and briefly discuss each others report and attempt to produce an agreed statement on each of the above points.

1. Interview with Mr Dave Rantor, Production Director.

This interview with Dave Rantor was held shortly before the new MRP II system went live. In it, he explains what his expectations about the impact of the system are. These views were shared by all of the senior management of Company Y.

Q: Can you tell me a bit more about the role of the MRP II system in the production area, what sort of uses will you be making of it?

A: Well, I suppose it's better to talk about the reason we felt that we wanted to put an MRP II system in to start with. It started about 4 years ago I suppose we first started grappling with the problem of how to become more efficient and more effective in the future. I suppose that there were two driving forces.

The first one was the need to contain costs and to make better use of the resources that we had. There was a shortfall in capacity. We have enough people, we have enough management resources and we give out warehouse space. It was actually the manufacturing capacity that was defective. So there were options there. We could either build a new plant which could have cost us about £200 million, or, we could not take the business, or, we could better optimise the utilisation of our existing capacity. It was apparent that we would not be able to justify huge sums of capital for additional equipment in the future when we still had some of our existing resource unutilised. The problem was to make better use of our existing resources to free up that spare time so that we could bring in new business, and, to make better use of the people who weren't fully utilised.

We needed something that was going to help us to plan our resources more effectively and when we looked at MRP II that seemed as though it was going to do just that. MRP II was going to ensure that we only manufactured that which we needed, it was going to reduce our inventory, it's got potential for planning our materials right the way through the whole of the manufacturing process. It was also going to enable us to plan the utilisation of our people much better. The obvious result of using our resources in a more effective and more efficient way was that we would bring our unit cost down and that should make us more competitive. The other beauty is that we'd be able to bring in more business without having to go to the corporation and ask for more capital. So it seemed to fulfil a number of problems that we were grappling with.

I guess the other area that caused us a lot of concern was that, over the years, different departments were working with different pieces of data. It was becoming increasingly apparent that much of the time was being spent in trying to defend the different pieces of data against all the other data that was around. There was no common database from which the company operated. There was a lot of different information, and all that did was to confuse people because, depending upon who you asked, you got a different answer. It was also leading to much unnecessary work here just trying to figure out which numbers were correct, if any of them was correct, and what the basis of those numbers was. We saw an enormous advantage if we could bring in one common database across the company that was available to everyone and was being constantly updated. So, once again, MRP II was an obvious way of tackling that problem.

So, that's where we started from. We started by saying these are the problems we've got and MRP II appeared to be a solution to these problems. Then we began to see a number of other benefits that were going to come from having MRP II, that was to do with changing our culture, for want of a better expression. Our feeling was that responsibility was not being taken at the appropriate level in the organisation. There was a need to force responsibility and accountability down the management line to the place where the accountability should rest. It varied throughout the organisation but in general we felt the accountability was one or maybe two layers above where it ought to be. We saw that MRP II was going to help us because everyone was going to be part of the same system.

I guess the second big advantage we saw in the culture change was to do with the way we wanted to implement MRP - we wanted to implement it company wide. It was going to have an effect on everyone within the company and it was going to give us an opportunity to do a lot of team building and to encourage team work, to focus people's attention on common objectives. There was going to be a need to do a lot of training, training if done within the right groups, could do a great deal to enhance the feeling of teamwork amongst the various departments and also within departments.

So, it started off with two particular problems that we wanted to solve but, as we got more into MRP II, we realised that this was an opportunity to bring about some more fundamental changes in some areas that we didn't even contemplate right at the very beginning. I think what we said is, well here's a system that depends upon people, and the advantage of this system is that it's got a computer that's going to enable us to ensure that our data is accurate. We will be able to pull information out of that computer a lot easier than we can get hold of the information at the moment. However, it's only going to work for us if people accept that the computer is merely something that's going to play with the numbers and that it's the people that are still going to make the decisions. It's the people that are going to determine how successfully we make use of that computer system. That's something that we've been hammering right from day one, that it's not MRP II that's going to change the way in which we operate, it's going to be the way the people handle MRP II. The way that people make decisions when they've got the better information that's going to make the system work.

Q: So is it a way of enabling you to reach organisational goals? Something that's allowed you to restructure the organisation and redefine people's roles?

A: Yes. We felt that we'd got too many people in the middle. We still have. So we've not yet seen all those benefits. We didn't expect to see them immediately but I'm looking, over the next 18 months, to see some significant reductions in the levels of middle management. Now, whether I'm talking of the supervisor or the level just above him I'm not too sure, but somewhere in there we've got more people than we're going to need. This is one message that we've been saying right the way through so it's not going to come as a surprise to people. We've already got some skeleton plans together which we've talked with our people about as to where we're going to start thinking about reductions in numbers of people who are in the management line.

In the past a lot of work that's needed has been done at the level of plant manager and supervisor. Like for instance manpower planning, production, planning, the numbers of batches that they're going to do, making sure the materials are going to be there, ensuring that the engineering modifications are done at the right time and, most importantly, that the whole thing is scheduled together. I can see that the planning work is eventually going to be taken away from those people. At least the data acquisition and the playing with the numbers that they had to do, is no longer going to be manual. They're still the people who are going to have to make decisions about changes on the plant but they're not going to be chasing around for 90% of the time trying to pull the information together. So that's going to reduce their workload considerably.

I think the second area where we've spent a lot of our time is in reporting performance. In the past it's been expected that people in the plant have to report on various aspects of plant performance at regular intervals. It's been a lot of pain in getting all the information together and putting it into the right form for it to be meaningful. Often when it's meaningful it's also been historic so really it's not been all that valuable. It's been meaningful in as much as it's told you what's happened but it's not much use in telling you what you're going to happen and how to avoid problems in the future. That whole reporting system will change because the information is going to be readily accessible and you can pull it out of the system in whatever form you want as long as you decide what that form is in advance. Better than that, you're not going to have to wait until the end of the month, or whatever period it is you normally write your report in, but you can have the machine monitoring certain things for you. So you can be looking at trends and

you can get warnings of impending horror stories before they become horror stories. You can do something about it beforehand - you're going to be spending your time on preventative things rather than curative things. I see that this is going to free an enormous amount of time and the result of that is that we don't need as many people to do the same thing as we've been doing in the past.

Q: So is MRP II about reducing the number of managers?

A: Not really. Its possible that some people might go because they can't come to terms with this sort of technology but the reason that we went this way was that it was a cheap way of creating more capacity. OK, we want more production capacity. One way is to put in more plant, and that's bloody expensive, so we need to use it more efficiently. If we have a better information system, an MRP II system, we can use our equipment and our people - the plant and the whole structure - more efficiently. We've got a lot of equipment and we see MRP II as away of using it more efficiently. No, we don't see it as a way of losing jobs, we don't see it creating any more jobs or any less, we want to use the people we've got, through training and retraining, more efficiently.

Q: OK, to recap then, you think MRP II will allow to make better use of your capacity, to restructure the organisation and redistribute responsibility?

A: It is not MRP II that is going to change the way in which we operate, it's going to be the way that people handle MRP II and the way that people make decisions when they have got the better information that is going to be available from that system.

2. Interview with Mr Mike Trainer, Purchasing Director.

This interview was held with Mr Trainer some 14 months after the system went live. Mr Trainer had shared the views of the other directors (as contained in the interview with Dave Rantor) about the impact the system was expected to have.

Q: I remember you said last time that in the past managers have spent a lot of time, especially middle managers, chasing around after information, you know trying to drag it together from various sources. Now you anticipated that would be one of the benefits of the system would be that the system would provide the information you wanted and that would release time for managers to do other things. Has that happened so far and, if it has, how has it worked out?

A: I would say yes but not to the extent that we hoped because, I think, it's the classic situation with any new thing. You cut over and you look for all of the advantages, you don't naturally anticipate that you're going to have too many difficulties and we have had a lot of difficulties.

To start with the machine response time was very, very slow to start with, it's still not particularly good at the moment, but that was a major stumbling block at the beginning. We also had a way of doing things, in terms of allocating material from the warehouse to the plants, that was overly complicated. That got us into a problem with stock accuracy and hence our stock and our inventory balances weren't accurate. The information we're getting out is crap, if you excuse my French, and we spend a lot of time second guessing the system.

Q: Have you lost any people in purchasing?

A: No.

Q: Have there been any reductions within the company as a whole would you say? I mean are any anticipated, perhaps at middle management level?

A: No. The system wasn't designed, or at least wasn't justified, on the basis of losing people. It was really to make us more efficient, which I think in the long term it will. So no people haven't been displaced by the system. There was another aspect to this which was about changing people and being able to live in this new environment. I guess that has not worked out as expected either. I think out on the plant maybe there are some people who are less keyboard able than others and I suspect that some people just trust to other people to do it for them.

Q: When I first visited and talked to people here about the new system there was talk of 'forcing responsibility and accountability down the management line', 'changing the culture' and 'redistributing power'. Has that happened?

A: I recognise that, that will be Dave (the production director). Dave's view was 'I'm going to take power from those accountants, I'm going to stop them hiding stuff in the bottom draw and all that'. This has always been one of Dave's things 'we are really going to stop you having things up your sleeves'. I think Dave hoped it would dissolve some of the mystique around the work that is done by accounts. I think that has happened, but I don't think anybody has come out it with any greater power.

Q: You mentioned at the start of this discussion that there have been problems and I suppose that's not particularly surprising given the scale of change involved. What, in your view, is at the root of the problems?

A: I think we have a great difficulty forming teams and teamwork. You know we've put a lot of effort as a company into this but we haven't got there yet. We went through a very good spot when the project was first rolling. I think there was a lot of anticipation and people were trying to be tolerant but I think what we've got now is a situation where people have begun to say well this bloody system is rubbish, and maybe their patience has run out but the finger pointing is starting. You know the barbed memos, the really pointed things, the naming of names, slugging out of

context. For example the warehouse and our Unit 3 production area are verging on fisticuffs. I mean basically the warehouse manager, Bill Jones, is saying that production at Unit 3 are shit. On that particular issue I think the Bill is out of line, from the memos I've seen from him of late he seems to be suggesting that every other area in the company isn't working properly.

I think our problems are classic - even though we did a fair amount of discussion, a fair amount of forward planning trying to anticipate some of the problems - they're still classic. This may sound like pointing fingers at other people but it's not, I don't think we really addressed the training issues for the people on the plant. Not the operators but the managers, we didn't really get the managers on board when we cut over. I don't think they really appreciated the importance of transaction accuracy and timely transactions. I don't think they appreciated that what other people did, especially people say in purchasing were totally dependent on the accuracy of the electronic stocks they entered. We've had a lot of examples, some fairly recently, where their lack of appreciation of this has put us into a major problem - electronically we've had stocks of things but they don't exist.

Q: So what is at the root of the problem: teamwork, the training?

A: Training, discipline and an appreciation by the guys out there that if they don't do it in a timely fashion they're cocking purchasing up. I think there are sufficient people around still thinking in the old way to cause those sorts of problems. I think in the last couple of months we've got that point across but again it takes time to change people. I mean you're talking about plant managers, they're very busy people they've got a lot on, their supervisors have got a lot on, and it hasn't been their number one priority. That has been a major difficulty, getting them to get it up to number one priority something has to be done at the end of every shift.

Q: What has been their priority then?

A: Production. That is their number one priority production but longer term if you don't do the transactions timely and accurately you don't do any production because you haven't got any bloody raw materials. People don't think like that you see, guys out there they think as far as the end of the shift and that's as far as they think. In purchasing we think 3 months or 6 months hence, we assume what we ordered to come in today is going to come in, you know, we take that as given. We're thinking forward all the time, if something goes wrong down the line we need to know about it. That has been one of the big stumbling blocks. I don't think we're alone in this, I mean, I know a lot of people in MRP II type situations and it is quite common, quite common.

3. Interview with Dr Brian Church, Operations Director.

This interview was held with Dr Brian Church some 14 months after the system went live. Dr Church was one of the people who were behind the original decision to move toward an MRP II system and is one of the few directors who makes extensive use of IT.

Q: Could you tell me how you use the system in your job?

A: I'm responsible among other things for inventory levels in the company, setting inventory budget, for achievement inventory budget, for monitoring all aspects of inventory, age of inventory, for setting policy stock levels, and all those sort of aspects. So the main things I use it for are for inventory management - to understand what inventory we have, where we have it. I tend not to use the system itself directly. Most of the reports it generates have got far too much information and are far too general. There are one or two that I use. They're never in the format I want so what I usually do is I run a query, which I write myself, which extracts the information I want. Some of those print reports directly, the majority of them don't print reports, they write to other files which I then download into the PC. I have macro set up there in a spreadsheet so that each month I can run the macro on the file and print it out whenever I want, in the format I want and in the order that I want it in. It used to take me 3½ hours to produce that report, instead it takes me 40 minutes. It's more accurate, it's in a better form, it's altogether quicker, easier and better.

That's just on that specific example. The main area where I'm benefiting is that I can get the information I want. Previously there wasn't one set of numbers, if you wanted to know what item there was in stock you could go into the old computer database, it was probably only about 70% accurate anyway, and you would get different answers. Now there is one set of numbers, we know the main inventory database is in the mid-nineties in terms of accuracy because we check that regularly. So there's one set of numbers, I can go into it, I can extract whatever data I want. The data's there, it's sat on my desk effectively and everybody's using the same data, that's the biggest step forward.

Yes, I think the key is that the company is now running on one set of numbers. Previously the accounts people had their set of numbers which they regarded as right, anybody else's numbers were wrong. Of course account numbers are far from being right because they have top drawers, bottom drawers, middle drawers and provisions all over the place to hedge their bets, as it were, they take a view as to what they think is going to happen and they make allowances for that. The production people on the other hand, they tend to work much more on reality, they've either got the kilos or they haven't got the kilos. We used to have all sorts of numbers and you'd spend half the time trying to decide what was the right one to use.

Q: We have come to a question on your assessment of the drawbacks, weaknesses and tensions that have emerged in the 14 months or so since you cut over. What has emerged as the significant tensions in your view associated with MRP II so far.

A: With hindsight, I'm beginning to think that a part of our implementation was probably done incorrectly. What we did was we took the way we used to plan manually and computerised it. Now in doing that it's much more accurate, it's much more reliable, we can look at many more options, so it's better. The information is much more recent and so the constraints we've put on the production people are much more rigid.

It appears to me, and I'm not at the sharp end, I'm detached from it so what I say tends to be coloured by what my people tell me, the problem is in production area. There's no question about that. My feeling is that, at the grass roots level, not at the senior level, that the production people are not signed on to what we were doing. They are not committed to it, they don't see it as theirs, they feel it is something that has been forced on them. They've been grudgingly forced along the path and some of them have literally stepped off the path. They don't understand what the sys-

tem is about, they don't understand what we want to do with the system. Because of that it isn't working in that area, and that's causing problems at the interface with other departments.

Q: What level do you think the problem starts at in production. You use the term grass roots level, what level?

A: The main problem I think is at the supervisor and manager level. We didn't bring people at the lower levels on board enough. When we had training sessions they didn't turn up for a lot of them. We had to round them up and herd them in, and really, the signs were there at that stage. Everybody told us that whatever training you do you won't do enough. The thing they didn't tell us was that you've got to do the right sort of training. I don't know whether we did it wrong or the timing was wrong, but people don't understand even the most basic concepts. They just don't understand what we're trying to do, what the system is meant to achieve. Because of that, if they get a transaction wrong, they don't understand that it's going to come back and cause them a problem later. So, in two days time they start pointing a finger at someone else because they haven't got raw material. The reason they haven't got raw material is because two days earlier they didn't key something in - the system doesn't know it exists - but they're pointing at the warehouse saying where's my raw material for the next batch.

Q: What in your view explains this problem with production?

A: History, culture. They've always been a law unto themselves. They have been cowboys, they were out there making the chemicals, everybody else was a hanger-on. They could do what they liked. All that mattered was getting the kilos out at the end of the day. Just banging the kilos out. It's just production culture. It's history. It's different now. If it's not in the forecast, if it's not in the plan, we don't want it. That's very difficult to get across to a production man who for all his life, for twenty years, his whole philosophy is to make as many batches as he can. Just churn it out, churn it out, and what we're saying to them now is no don't. If you've made what we've asked you to make stop. Do nothing. That's a difficult thing for them to grasp. It comes down to the people and the change, the management of the change again. I don't think we did very well. Despite recognising it and thinking we were doing a lot of it.

Q: Any other problem areas?

A: Well, I only took MIS over this year so I can't say what happened before. At the beginning of the project, we said this is not an MIS project, it's a people project. So their involvement in the project was the same as any other department. Their manager was on the project team. It was no more, it was no less than anybody else. They were involved in the decision of which package we took, the same as any other department, but they felt that they were not properly involved in the project. Since I took them over, I said to them, you were involved as much as any other department. Why should you be involved more?

Most of the MIS people we have are programmers, if you like it's like comparing a process engineer with a maintenance engineer, they like building things, they don't like painting them after they're built. At the end of the day we bought a package. It was a corporate decision to buy a package, we all agreed to it. The package is not perfect and we've made some changes to it. Our policy is, and as far as I'm concerned will continue to be, that we want that package to continue to be capable of being upgraded as new releases come along. That restricts how much work we can do on it, whether it's perfect or not.

Their attitude is we can write you something that gives you exactly what you want across the board. Yes, sure they can. It might take them 5 years it might take them 10 years - 8 people can't write a system like that with in any sensible time. So what they want to do is take chunks of it away and rewrite them. If we do that, we can't take the upgrade. So that is not an option. Now they don't agree with that because they like doing what they like doing, and what they like doing is writing programs. I'm sorry but they have two options. They either stay with us and do the job that needs doing in MIS. If they don't like that, they can go somewhere else and find a

company that does and we'll hire a different sort of person that'll do that job. I've said that to them, I would be very sorry to see them go but at the end of the day their job has changed.

I've had several discussions with them. I've almost had to discipline on one of them, because I won't tolerate them talking to users and saying what a lousy package this is and how they could do better, that's just undermining the whole thing. I've told one of them, Ken Smith, and I've told him in writing, if it happens again he's going to be disciplined. They can have any discussions they like within MIS about the quality of the package, they can have any discussion with me they like. What they can't do is criticise the package to the users. The example I used was that they are the crew of an aircraft that is going down the runway and everybody else in the company are the passengers. They're going down the runway and just coming to the take-off point and Ken makes an announcement, "Good afternoon ladies and gentlemen, we'd like to welcome you to this flight and tell you we're just approaching the take-off point. We'd like to inform passengers that this aircraft is widely used by airlines throughout the of the world, however, we don't feel it's very good. We're particularly worried about the right hand engine and the flight control systems. We feel these could be greatly improved but the airline won't let us to change them. We're sure that we will get you to your destination but just felt you ought to know. Have a pleasant flight." That's exactly what they've been doing.

I get people coming in to me and saying, MIS say they can give me exactly what I want in two weeks. Well, they can't. They think they can but they can't. First of all they don't know exactly what you want. They think they do. We don't have any systems analysts, in my opinion. They say they're analyst programmers, they are not. They're programmers. There is no such person as an analyst/programmer. You're either one or the other. What they do is they'll sit down with the user and they'll ask a question. As soon as they've got the answer to the question they will then tell him how to solve it. They don't understand the problem, but they're thinking of ideas all the time, because that's what programmers are. And as soon as they've got an idea they throw it at people. Without actually keeping asking questions.

MIS respond to different department's requirements without seeing the impact on the whole. Somebody will come along and say "I'd like to be able to do so and so" they say "Right okay you want do that, we'll give you the functionality". "I'd like to go into so and so and write off stock in the site 2 production area", "Right here you are here's the functionality". What they don't see is the guy now has the ability to look into the warehouse and write off stock in the warehouse as well. Maybe I wasn't in close enough or maybe I didn't apply enough control to stop a bit of a Frankenstein being born. We need to get MIS under control, pull the reins in on some of the work that's going on in there. That's another problem I have.

4. Interview with Mr Ken Smith, senior MIS manager.

This interview was held with a senior MIS manager 6 months after the system went live.

Q: First does Company Y have a policy towards the use of information technology in general?

A: No. Only in that it will support the business objectives of making chemicals for our customers at high quality and low cost. I don't think chemical manufacturing is a hi-tech operation. It is a very basic bread and butter sort of operation.

Q: So could you tell me something about the way in which the use of information technology is developed in the company.

A: The first department to take it on was the accounts' department who used computers to automate repetitive manual processes. A classic illustration. Payroll, accounts payable, general ledger, financial modelling, standard costing, all these things that you can do much more easily on a computer than you can with people. From there we moved into plant inventory control, so it's a warehouse stock system if you like. At that time this site was supported by our American sister division and we had no programmers, just myself and two operators. We took their software and applied it on our site.

Q: That was back in when?

A: 1983 was the time that the MIS department was formed in November 1983. Again that was really a system to put on computer what we did on paper. So it was replacing the classic card based warehouse stock system. We didn't really start programming ourselves until 1985. We made improvements by adding modules to purchasing, distribution which are all in-house produced but the major advance in the adoption of IT to support the business objectives overall were the current project that was launched in May 1987. It was seen that we should be integrating the various islands of information. There were a number of them that were all good in their own right but they were all influenced the owners own opinion. We used to have meetings where people were constantly arguing about the figures before they even got down to the meeting, which is now a very uncommon situation.

Q: Yes. I talked to Dr Church, I think it was probably in 1988. You have had a very long gestation period before it all got off the ground haven't you?

A: Yes. That reflects our political environment rather than the will of the site. We were committed to it from the word go, we'd already pulled off a director as project leader and two full time staff and then there were 12 part time staff of which I was one, just for this project. It was well resourced from the beginning and we proposed to spend £1 million so it was intended to do it right. We had problems in persuading our American parent that the software choice that they required us to pursue wasn't suitable for this site. It was the perception of the American department that they knew best what we should have on this site that was just completely wrong. So we were held back 18 months for political considerations.

Q: And is that because they are different, are the parent company in a different business?

A: I think that has some bearing because there are only 3 chemical plants in Company Y, the others are pharmaceutical plants, and there is a big difference in the logistical operations of those places. Pharmaceuticals are much easier in terms of systems, it's more like engineering you have a bit of material and you know you've always got the right parts for the right component. Organic chemistry is a very imperfect science. Like cooking. So they were applying their rationale that they'd put in on the pharmaceutical plants to our chemical side that was wholly unjustified.

Q: So what, they were specifying a software that wasn't flexible enough for your needs?

- A: Yes. They did a world-wide evaluation of software on IBM equipment, the system 34/36/38 environment, and concluded that MAPICS II was the best. That was done in 1983 and that was the policy they were following throughout 1984, 1985, 1986 and 1987 and that's when we banged heads with them.
- Q: Yes, I can imagine that MAPICS II was in a way a political decision itself because that must have been pushed very heavily by IBM.
- A: We have IBM mainframes, IBM minis, IBM terminals, we have discount agreements with IBM. So anything to do with IBM is safe - not very visionary but safe.
- Q: You mentioned that the MIS department only really came into existence in 1985. What role does it play in the he company now?
- A: It's a service department of all the other departments. We're required to produce systems according to the requirements of other departments.
- Q: So you're still in the business of producing in-house software even though you've bought in an MRP system?
- A: No. Our policy is to buy packages where we can. There are occasions where packages don't do the job or they do part of the job or we need to enhance them, somebody to write bits and pieces around packages.
- Q: So you are in the business of customising other peoples' software as well then?
- A: Yes. We try to avoid going into the code and try to work around the periphery so we don't add to the maintenance burden. But yes, we enhance the systems around a package product to support our needs.
- Q: Quite a common problem with altering bought in software is that you cut yourself off from any changes that the supplier makes. Is that a problem here?
- A: We try to avoid doing that. We know the programs that we've had to alter some to make them work in our environment so when we get a release update we can go back and modify them and write them again. I think with all packaged software they have a life cycle and you will in time modify more and more and more and there will come a point in time when maintenance of that software is not viable and you will cut it off. Some companies do that. Some companies buy a package as a database product, just like buying in a resource, then they modify it to suit their environment and they never do any maintenance. Mind you need a fairly competent department to do that. We could do that here.
- Q: How big is the department?
- A: We've got 9 people, including me, 4 in development, 3 in operations and 1, who is in support.
- Q: What kind of input did you have in the decision to buy Data View?
- A: Well, I was part of the project team. Every departmental head was part of the team. Everybody, except engineering, was on the project team. We saw demonstrations, we did evaluations to see what product was appropriate. We started on the premise that we would have to be on IBM hardware. That's possibly the wrong way to go about things but as part of a large group that choice wasn't open to us. That cut down the choices anyway to 4 or 5 products that we could run MRP system on that hardware. So we looked at them. Our corporate people came up with Data View as well, that was a very late contender in our short list. It was the last in but that was the final choice at the end of the day.
- Q: Because the software was compatible?

- A: Because it was a packaged product and it was a user driven project from top to bottom and the MIS department is only a service department. I don't agree with that personally but that's the way the project was set up.
- Q: I guess that's also reflected in the support role that you play that you're now playing second fiddle to Data View in a support way?
- A: That's true but I think probably the benefit of the department's been crystallised in the last 12 months because Data View wouldn't have worked without this department developing it and making it work. We had to replace some programs that didn't work at all, we had to replace programs that were just so inefficient that they just locked the processor stone dead. So we did have to use our technical skills. I'm lucky, I've got a very skilled department and a very stable department. There's no staff turnover here, no-one's ever left here. No-one's every left yet. Touch wood.
- Q: It's surprising that, you've got skills not being used and yet people not leaving?
- A: Yes. Well, there's a degree of frustration. Certainly the technical skills at the keyboard are being used. I mean our program designs and our program execution is a very high quality and in fact our senior programmer has been over to the states to advise them on how to do it right. We have examples where we've copied their program function and improved on it by a factor of 46. So we've got a lot of skills here at the keyboard level, at the coding level to produce software, to produce an end product.
- Q: Tell me, how well do you think the implementation and the planning of the system handled?
- A: I don't think we did it very well. I think they made a good job out of a bad start. It's working now, the business is not going bankrupt but we could have done a lot better in my personal opinion. We didn't do enough requirements analysis, we didn't do enough systems analysis. We took a package and presumed the package would do the job. So we had a very, very broad outline requirement but we didn't do it in the correct amount of detail. It wasn't done by MIS at all it was done by a user and they didn't do any systems analysis. You're surprised, I'm surprised.
- Q: The other side of it. You've made quite a large effort on training people, I don't know whether you personally but Company Y as a whole put a very large effort into training. Do you think that that was done well?
- A: No. I think it was very ineffective. I don't doubt that they didn't try to do the right thing but with hindsight it would not affect it because it isn't being used. People now 13 months on don't understand what they're supposed to be doing.
- Q: Where did it go wrong in that?
- A: It went wrong, in my opinion, and this is all personal opinion you have to understand, in that we assumed that the supervisor on the shop floor would be able to do everything and manage everything. We didn't give enough training (a) on the concept of the system and (b) on the sheer practicalities of how to use it on the shop floor.
- Q: So if you were going to give advice to, if I was a manager from another company coming along and saying I was thinking of installing MRP, what would be the advice you would give to me then about how to go about setting the training?
- A: I would say you would need to persuade them of the conceptual basis of what you're doing which isn't difficult although we do seem to find it very difficult. Having done that you need to impress upon them that this thing is a closed loop. So if you don't do things down there properly they come back and they hit you later and you create a perpetual loop of problems. I would explain the impact of the things you did incorrectly on other people and things that they did incorrectly and their impact on you.

Q: I would just like to come back if I may to a point that you raised about half way through about the sorts of problems that have arisen. Have you found you've had people coming to you and saying we can't use this, can you help us out?

A: Yes, yes. The classic situation there was a part of Data View called reservations that is the picking mechanism whereby you initiate a batch of chemicals and that will send a message to the system that reserves material in the warehouse for that particular batch. It was unworkable, it was flawed in logic and flawed in program so it wasn't going to work. We tried to work it, despite our warnings for many months that it would not. In the end we had to replace it. At that time my senior programmer was the project leader. By talking to the people on the plant, people in planning and the people in the warehouse, he was able to deduce exactly what was required, what the problems were and we coded a very good system that works perfectly.

Q: It's OK now?

A: The system now works OK, there are still problems with how it's used, but the software works perfectly. This department warned very strongly before we cut-over that the system would never work on a technical basis, it just wasn't capable of working, the thing it would fall down and it did but the culture here is that if it's in the package then it'll work. That's a very naive belief that if it's in a package sold to you for a lot of money that it's good. It isn't true. If you analyse the usage of our programs we only use 8% of all the software programs in the system. The others aren't used at all.

Q: Well, why was it done then?

A: Because people who know best say buy a package. I think I know better.

Q: Why do you think that they thought it was the best thing to do?

A: Because they're told by Corporate Headquarters the package is the best. You can get things installed quicker that way. Corporate MIS have it written in their policy manual that says "thou shalt import packages where thou canst, thou shalt not right software if thou canst avoid it". On the mainframe end they've had their fingers burnt many, many times. The AS400 is an architecture that is extraordinarily advanced, very, very productive and if you design your systems properly, the proper organisation rules, you can produce things very very quickly. There is no-one in Company Y who understands that. This is the most advanced IBM AS400 site in Company Y world-wide. People who are defining policy don't even know how to turn it on. So there's a very real information knowledge gap there in the corporate hierarchy.

5. Interview with Mr Bill Jones, senior warehouse manager.

This interview was conducted with Bill Jones 15 Months after the system went live. Bill is unusual in Company Y in that he is somebody who has been brought in from outside. Most people in Company Y have worked there for some time and have been promoted internally.

Q: How has the new system changed the role of the warehouse?

A: It's changed the role of the warehouse fundamentally. It used to be said that production was king at Company Y. Everything was geared to supporting production's demands. That's not the case any longer. Instead of the warehouse department being a servant of production it's almost the other way round now. Obviously production at the end of the day is what makes the pennies for Company Y, but whereas engineering and warehouse used to be slaves to production we are now on an equal footing with them.

I think the role of the warehouse has been elevated somewhat - it had become something of a dumping ground. The less able, the less healthy, the older people and perhaps even the less intelligent people within the company tended to migrate to the warehouse department. That role has changed and you know some of the people that have worked in the warehouse department have had to change with it or they've had to move on to other areas. It's changed us from a reactive to a proactive department. It wasn't a dynamic department before, it simply responded. I think that now, to a large extent, that the warehouse has become the hub of the operation. Everything is driven down through to the warehouse and outwards into the production areas. By the same token the distribution and the sales function impacts onto the warehouse and it's our response to their needs, their requirements that makes the whole thing work. It's a different philosophy.

Q: From what you said before it seems that in the warehouse you're operating the system according to its design specification, but in other parts of the organisation it's not always being operated properly for one reason or another.

A: That's right. We are dependent upon the plants keeping their stocks right for us to do the correct transactions for them. They'll come to one of my lads and they'll say "we need such and such because we haven't got any" and he'll say "well why haven't you got it? Look there's the system, it says you've got it, if you haven't got it why hasn't somebody gone in and cleared it?" and the bloke from production will just say "it's not my job". Our lad's view is "it's not my job either, I'm just here to give you what the machine says you need". I always say to production "if somebody at your end isn't doing his job properly we'll never be able to supply you with the correct quantities because we're relying on you keeping your stocks right". I'll tell them "if one of us gets it wrong everybody gets it wrong because the machine only knows what people tell it."

Q: Quite a lot seems to be directed towards keeping production in step then?

A: Yes. The production supervisors find it very hard to operate the system because in the past they had a free hand. They could phone at any time of the day or night and ask for any material they wanted and you would just give them it. You might then find that you already had drums of it standing all over the plant. You might have 3 or 4 half drums of material and they want another full drum. In the past you had to give them a new drum and they would use it - but why weren't they using the 4 half drums that were sitting there? It just meant that somebody had to do a stock check to round these drums up and say use those 2 half empty drums first.

Now I have to make sure they're putting the correct quantities into the system and they're getting rid of what they've already got before they get any more and they're finding it very hard. I overheard a conversation between a couple of people outside production saying that a particular chemical is a lot easier to pour down the drain than recycle - the operators can go to the tea-room quicker. For me it's just a case of sitting down and saying "right I'm going to spend the next

hour looking through the system and making sure that my stock is up to date” - that sort of thing. For them it’s making them discipline themselves - it is a difficult system for them to get used to.

I’m not be very popular with production right now, but, you know, I’ve got a responsibility. If I see a waste of money then I’ll try and highlight it to see if it’s true or not. With the new system you can look at a transaction and, quite easily, see who’s actually entered it. You can go straight to that person and say ‘Why did you do this, did you have the authorisation?’ and sometimes they haven’t. It is a lot easier to track down who’s been responsible for doing something.

Q: You seem to have a pretty good understanding of how the system works. What sort of training did you have?

A: I was lucky in so much I was given 6 months at the beginning to actually sit down and look at the system before the system was introduced. Now I know for a fact that most of the production supervisors didn’t have half that amount of training. I think they at the most had maybe 2 or 3 weeks to sit down. That was mainly before the system was introduced and then after that it was just self taught you know learn as you go along. I felt personally that the production management let down the supervising staff on the plants. Even today after a year and 3 months there’s quite a lot of supervisors who still don’t understand the system fully, they’ve got a basic idea but they don’t understand fully

Q: I mean it sounds like from what you’re saying it’s made production supervisors' job more difficult.

A: That’s right. I think the managers on the plants tend to let them get on with it unless there’s a major problem. You see before the plant supervisors never had to worry about how much stock they had, they have to now because the system works that way. The system needs to know what they’re using, how much they use, when they use it so they can tell us what to give them. They’ve never been used to keeping their stocks and they are finding that sort of thing very difficult.

Q: And trying to get on top of the technicalities of system as well I guess?

A: That’s right. Although, I mean it’s an awful thing to say, but I’ve just started to realise that sometimes they actually delay schedule one day but then during the night they’ll come with a message to the warehouse “can I have this material because I’m ahead of myself”. Then the next morning they’ll go and send a message to planning saying “can you bring that schedule back 12 hours”. They’ve delayed it the first day but they’re bringing it back on-line the second day. What they’ve done is they’ve covered themselves in case anything goes wrong. They’ve created a delay but, if they can get the materials and carry on, it shows on the system as if they’re actually catching up on time. They can gladly say to planning “we’re 12 hours ahead of ourselves, can you bring our schedule 12 hours forward”.

Q: What’s the point of that then?

A: Well, to keep to a plan they’ve got to produce so many batches a week and, if they think they’re not going to produce that number of batches, they can put a delay time in and that gives them extra time to produce the batches. If you’ve got to produce 7 batches a week and you say at the end of Thursday “I’ve got a 24 hour delay”, they’ve now got 8 days to produce 7 batches. If they can then produce them within the 7 days they’re laughing, but, if by any chance anything goes wrong, they’ve got an extra day. It’s a cover in case anything goes wrong. I’m not saying they do it very often but they’re gradually getting to know how the system works and they can help themselves.

Q: That’s interesting. So what you’re saying is on the one hand there is a group of people who are still a bit at sea about even the basics of the system and yet, at the same time, there are others who not only have a good grasp, they’re actually starting to work round it, to use it to their own advantage?

A: I don't want to labour the point, but there are a group, particularly in production, where there are the older die-hards that remember the way the plant was run before MRP and they'll bloody well still run it that way and never mind what the box says.

Q: You have talked about your problems with production, how have you found the support from other areas of the company?

A: MIS are very helpful, very, very bright lads. They got quite a shock when they looked at the warehouse. They looked at it after they'd changed the system, what they should have done was looked at it and then designed the system. That came as a shock to me. And I think it came as a shock to them because I think it was, forgive the French, arse about face. First they should have looked at the warehouse, then they should have looked at production and then they should have designed the system, not made changes and then looked at production and then looked at warehouse which is what they did. They didn't even have a mental picture of what their system was doing to our facility and stock and items within the department. They had some very strange understandings of what a warehouse did, and what a production department did, we obviously had to re-educate them.

They still operate on too higher level. We can go to MIS with a problem and yes they can put it right electronically but there's still a sort of a fundamental gap in their understanding of what we do and what the system does. We've tried very hard to close it but I don't think we've closed it enough. It still happens on a daily basis, "Oh, is that what you do in the warehouse department?", which is a bit unnerving. As far as an MIS guy is concerned it is all down to developing, rewriting and making a super new system.

Q: You said MIS were very helpful and very bright lads, that doesn't sound too bright?

A: Well, they have had a lot of tensions in the MIS because, at first, they wanted to develop something entirely on their own. Some of my people used to lunch with some of the MIS people and the MIS people were very down about the fact they were picking up a package and that was starting to knock on to my people. They were coming back to me and saying 'well MIS says this and MIS says that'. Brian (the director of logistics) is tackling the problem but there is still some undermining of the new system. They're always wanting to replace part of the system and saying 'OK if you can't get it that way we'll replace that part of it'. The minute you run into a problem rather than analysing the problem and looking at the options the first thing that always comes up is always replacing it.

I think that part of the de-motivation in the company immediately after cut over was due to MIS in the sense that MIS said 'well we could have done it better or quicker and you wouldn't have had these problems', and so, whatever problems there were got are exaggerated. You have to remember that at that time (shortly after cut over) we were having deadlines imposed on us from the states, so there was a lot of friction.

Materials Requirements Planning (MRP) and Manufacturing Resources Planning (MRP II)

NOTE. To simplify the discussion we will use the term MRP to describe both Materials Requirements Planning (MRP) and Manufacturing Resources Planning (MRP II) except when highlighting any differences between the two.

1) Introduction.

“Simplistically, MRP is a technique designed to determine what to produce, how much to produce and when to produce it ... MRP II is an enhancement of MRP” (1)

MRP was originally developed as a purchase order scheduling system in the late 1960's from the modification of planning packages and files containing costing information. By the late 1970's, MRP had developed into a manufacturing information system utilising detailed production requirements, a master production schedule, a bill of materials, lead times, batch sizes and included feed back from the “shop floor”.

The earliest packages were known as Materials Requirements Planning (MRP) packages and focused only on material inventories and the purchasing function. The later, more sophisticated packages, were known as Manufacturing Resources Planning (MRP II) packages and incorporated capacity planning and the scheduling of production operations. Essentially MRP aids the planning and control of materials whereas MRP II integrates the planning and control of men, materials and machines in one comprehensive computer based system.

MRP II systems are much closer to the ideal of Computer Integrated Manufacturing (CIM) as they integrate many of the businesses' functions through the medium of computer technology. A MRP II system:

“... impacts on all corporate departments ... and ties them together via computers. For a complete organisational system to function properly, a common database and a formal information system are essential” (1)

Both MRP and MRP II are “demand-push” systems in that an initial production forecast is created and then a manufacturing plan and purchase and/or work orders are developed to meet its requirements. Thus forecast demand “pushes” the manufacturing of products through the generation of work orders. MRP is sometimes described in terms of computer based communication network. For example,

“... in it's simplest form, it is a communication system for the factory. It plans and schedules operations, compares manufacturing alternatives, updates data, allows operations to be monitored against plan and allows operating resources to be projected” (2)

Although others describe MRP as:

“A management philosophy supported by numerous planning and control techniques” (3)

2) The operation of a MRP system.

MRP systems are a computerised database of parts, components, finished goods, Work In Progress, batch sizes and lead times. They contain a set of relationships between parts in the form of a Bill Of Materials (BOM) and a set of relationships between batches in the form of a Master Production Schedule (MPS).

All materials and/or resource requirements are derived from the MPS which is a statement of the end item requirements by date and quantity.

“The MPS is a vital link ... it is the key activity where management agrees the input to the full MRP II system ... the MPS should be the single input to the entire manufacturing

system. It is the point of control for ensuring that the “due dates” and job priorities are maintained accurately throughout the system”. (4)

Step 1 - business planning.

A MRP system is ultimately driven from a master business plan that establishes a sales forecast of what a company will sell and when.

Step 2 - sales planning.

This business plan will be reviewed on a regular basis, using data derived from the MRP system, in sales planning meetings.

Step 3 - Master scheduling.

The MRP system then uses the MPS as a base point for calculating net demands, both in terms of materials and times, for each item of inventory.

The system generates a series of recommendations suggesting what should be produced and when. These recommendations will then be examined to look for any anomalies and to ensure that the recommendations are achievable and reflect agreed production plans. The status of key items can also be monitored very closely by the scheduler during this stage.

Step 4 - Materials planning.

The requirements from the MPS are “exploded back” through the BOM files that break down a product into its constituent parts. The net requirements are then generated by deducting available inventory from gross requirements. Vendor lead times are incorporated and any purchase orders scheduled to meet the material requirements.

Step 5 - (MRP II ONLY) Capacity planning.

MRP II systems may also have a capacity planning module that can help to ensure that production is balanced and capacity is not exceeded.

Step 6 - (MRP II ONLY) Execute capacity plans

The system will generate the work orders required to fulfil the schedule. As orders are fulfilled and capacity becomes free the associated databases are updated so that the system can maintain an up to date picture of the state of production.

Step 7 - Execute material plans

Finally the system will generate the purchase orders required to fulfil the schedule. As the orders are fulfilled and material used the associated databases are once again updated.

We can see from the above that MRP systems are iterative closed loop systems. The information that they generate is fed to the “real world” and the changes that have been made are then fed back into the system to act as the starting point for the next iteration of the processing loop to ensure that the plan it generates will remain accurate.

Finally it should be noted that, although a MPS should be stable, is not static. The MPS might combine demand forecasts, business plans, capacity information and actual performance data - all of which may change over time and with changing circumstances. Also, as MRP systems are closed loops, it must be expected that the MPS will change as a part of the normal functioning of the system.

3) MRP and computer technology.

MRP suites are large, complex systems that require huge amounts of storage and immense processing power. They are run, almost exclusively, on powerful and expensive Mainframe computers. Many aspects of a MRP environment are very heavily computerised, in fact MRP is often criticised as “comput-

erising everything but changing nothing". MRP systems deal with vast quantities of data and can often interface directly with existing accounting information systems. Although there is nothing magical about what a MRP system does in practice MRP systems are

“... made possible only by the power of the computer, as, in most businesses, there is just too much data to do the work by hand” (5)

MRP systems are in effect elaborate, dynamic, computer based models of the manufacturing environment that can be used to plan and forecast demand for various product groupings. They are usually built up from a number of modules of compatible software into models of the resource flow over time within the factory. This has the advantage that a MRP system can develop and change to meet changing circumstances.

“MRP systems have gone through a dramatic growth in functionality in the last 10 years. They started out very simply with materials and capacity requirements planning. Today they include additional modules for order entry processing, forecasting, distribution resource planning ... resource requirements planning, shop floor control, purchasing and cost accounting. But this is not all; more factors will be added” (2)

5) MRP and databases.

As we can see from the above discussion a central feature of all MRP systems is their use of computer technology for the collection, storage and manipulation of data. Although the trend is toward a single central database MRP systems may require access to at least four distinct data sources.

5.1) The engineering (product) database.

The main engineering database used by MRP systems is the bill of materials. The bill of materials (BOM) reflects the way in which the product is assembled. However production engineers frequently assemble products differently from design engineers therefore some systems also need to maintain product structure details from a design as well as a manufacturing viewpoint.

5.2) The inventory (stock) database.

Inventory control embraces the maintenance of relatively static data such as stocking and re-ordering policy as well as dynamic data such as stock movements. The inventory database is used for planning and simulation and will include details of safety stock levels, lead times, lot sizes and scrap levels that may be used to control overall inventory levels.

5.3) The orders database.

The orders database contains the details of purchase orders, sales orders, prices and due dates. These are used in the costing of a job, to assign a priority to a job and to inform management when re-scheduling must take place. MRP may also be required to support purchasing in the release or expediting of purchase orders, the maintenance of open purchase orders, procurement analysis and in an analysis of supplier performance.

5.4) The manufacturing (plant) database. (MRP II ONLY)

This contains information needed for the planning, scheduling and releasing of work orders, the management of production capacity, the expedition of work orders, the monitoring, evaluation and scheduling of work in progress and the costing of a job.

6) MRP and Managers.

MRP systems are, above all else, models for forecasting and the planning and control of a business. MRP provides an unparalleled ability to perform accurate “what if” analyses when evaluating the ef-

facts of following alternative business strategies. Apart from MRP's usefulness as a long range planning tool it can also provide several more immediate benefits.

MRP can reduce stock levels by giving management the information they need to purchase only the materials that they require to be delivered only at the moment they require them. The continuous availability of accurate information on raw materials inventory and scheduled delivery times can also allow very precise planning of production so as to make the most efficient use of existing productive capacity and reduce the need for unplanned overtime working. Similarly standard cost and variances can be quickly and easily calculated using the data available in the system.

The purchasing department can monitor the status of outstanding orders and take prompt corrective action if things appear to be going wrong. In addition they have accurate and up to date information on the prices and performance of vendors that should allow them to source more effectively. Similarly accounts payable personnel can continuously monitor the status of accounts to ensure that the prices are correct and that any adjustments are made promptly.

Budgeting is both simplified and made more accurate by the use of MRP. With MRP cash flows can be treated in the same way as material flows. The MPS is exploded through the BOM into its constituent parts and the resultant orders can be converted into cash outflows using unit cost data. The normal delays in paying bills can also be built into the model and a prediction made of the future cash outflow by expenditure category or departmental unit for up to a year ahead. Similarly cash inflows can be calculated. The MPS will contain data on when goods will be manufactured and data on the past performance of accounts receivable will be held in the orders database. By combining these together a MRP system can then be used to predict the inflow of cash from goods sold.

Although MRP systems do not by themselves imply any change in traditional western accounting practices the wealth of accurate and detailed data that becomes available in a MRP environment provides several opportunities to take a new approach to old problems.

Because a MRP system tracks materials and activities as a matter of course it becomes possible to identify and calculate the direct costs of a product at the various stages of its manufacture with a far greater degree of accuracy. This can obviously have knock on effects for cost allocation within the company - with more costs being direct costs there are fewer indirect costs to allocate. However with MRP there is also potential for changing the ways in which costs are allocated. Because both materials and activities are tracked as a matter of course it becomes possible to develop new bases for allocating costs that more accurately reflect the relationship between some activity and cost incurrence. This same data can be also used to develop new non-financial performance and incentive measures based on, for example, due date performance, quality or schedule adherence.

Finally MRP systems allow a company to make far more efficient use of its existing resources (releasing >30% of existing capacity in some cases). Thus, although MRP suites and their associated hardware can be very expensive and involve considerable organisational upheaval, they can sometimes be viewed as alternatives to new plant.

7) MRP and cultural change.

Although MRP has been presented as simply "the computerisation of the status quo" this is not strictly true. The successful implementation of JIT does involve a substantial cultural shift. MRP involves the development of a common database that is available to everyone and which is being constantly up-dated in real time. This alone has knock on implications for this distribution of power and responsibility within the organisation.

MRP tends to force responsibility and accountability down the management line. Because everyone is part of one system visibility is enhanced "electronically". This enables the responsibility for a particular outcome to be more accurately attributed; "accountability", in a general sense, is enhanced by MRP.

Considerable resources need to be put into planning the changes that will take place and preparing the workforce for them through an extensive training programme. Because MRP systems rely on the accurate input of data from several sources a lot of team building needs to take place to focus people's attention on common objectives between and within the various departments of the organisation. Ultimately however it is not MRP II that changes the way in which a company operates it is the way that people use MRP II and the decisions that people make with the information that is available from the system.

The introduction of an MRP system can be used to change a company's organisational structure. The middle management levels of the organisation, such as management accountants, can expect significant reductions. The view is that fewer people will be needed at these levels is based on the improved quality, speed of availability and accessibility of the information needed to manage the business. At the plant level for example, a lot of the data required by management and supervisory levels (e.g. for the planning of production, making sure materials are available, ensuring that engineering modifications are done at the right time, etc) is available directly from the system. Similarly data that was previously collected manually for monitoring various aspects of plant performance of the can now be pulled quickly from the system by senior managers whenever and wherever it is needed. The "end of the month" collection of data for monitoring of performance gives way to monitoring as an ongoing process. Because the people who run the plant are much more accountable for what is happening they will only report to senior managers in exceptional cases.

MRP also enables greater co-ordination between the areas of a plant without the direct involvement of senior managers. Managers of the various departments should have more time to communicate with one another and leave senior managers with more of an overall co-ordinating role. When a problem does arise a senior manager should be able to access the specific pieces of information needed at will from the machine.

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