CIM AND MANUFACTURING INDUSTRY IN THE NORTH EAST OF ENGLAND: A SURVEY OF SOME CURRENT ISSUES.

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SUMMARY

To meet the challenge of the 1990's and beyond there is a need to adopt advanced manufacturing technologies and new manufacturing techniques. In particular, there is a growing recognition of the need to develop a more holistic approach to the organisation of the business and the computer technologies it uses. One label often applied to this approach is CIM (Computer Integrated Manufacturing). This paper presents some preliminary results of a survey of nearly 40 manufacturers in the North East of England showing how they perceive CIM and how they are attempting to implement it. In particular it describes the views of senior executives about why they are attempting to implement CIM, what problems they encountered in doing so and what impact they believe this will have on working practices. The paper examines some of the contrasting views and opinions about CIM held by "real world" industrialists, academics and other particular interest groups.

1 INTRODUCTION

The need to revitalise manufacturing industry to meet the highly competitive needs of today's world markets could not be greater than in the North East of England where manufacturing has traditionally been based around declining industries such as Steel and

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Shipbuilding. This paper presents the results of one attempt to discover to what extent industry in the region was taking up this challenge; it draws upon results of the first phase of a 3-year research project at Newcastle Polytechnic. This phase of the research was broadly investigative, the aim being to gather a wide range of views from the whole spectrum of manufacturing industry.

The data was gathered from telephone interviews of a representative sample of companies employing 50 or more people in all sectors of manufacturing industry in the region. The majority of the interviews were with senior management; quantitative data was coded at the time for later analysis and the interviews recorded for later transcription.

1.1 Some characteristics of our sample

Before going on to the views expressed and the issues raised in our survey, we will briefly look at some of the characteristics of the companies in our sample.

Literature searches suggest that certain clearly defined islands of computerisation and manufacturing philosophies or techniques would form part of any potential CIM system. We identified 11 such potential CIM sub systems or CIM components for inclusion in our survey. The table below summarises the nature and extent of the use of these CIM subsystems in our sample. For the purposes of comparison, the responses from those companies that claimed to be planning for or attempting to implement CIM are shown separately from those who said they were not.

Table 1 here

Some additional characteristics of "CIM as a target" companies are summarised below.

1. Over 1/2 (58%) of the companies used at least 6 of the above subsystems.
2. The companies were larger than their counterparts both in terms of the number employed and in their annual turnover.
3. The companies manufactured a greater proportion of their output to order than the remaining companies.
4. A clear majority placed some manufacturing philosophy such as MRP/MRP II at the hub of a CIM system although CAD-CAM was seen by a significant minority as the focus of a CIM system.
5. Some form of CAM and CAPP/CAPE featured strongly in CIM activities; CAPP was generally seen as a subset of MRP/MRP II.
6. There was a strong tendency towards the use of centralised databases although a small number of firms stated that they were moving towards distributed PC based database.
7. A relatively large proportion of JIT users was found in this group with many JIT users also using the principles of GT.

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2 CIM RELATED ISSUES: A PRACTITIONERS' VIEWPOINT

The practical aspects of attempting to implement CIM often tend to be ignored or presented in some idealised form in many publications. To the authors' knowledge, this survey provides a unique opportunity to examine the views put forward by a representative sample of managers who are responsible for putting CIM applications into practice. A few of the more important issues that were raised are briefly summarised below.

2.1 What is CIM?

A large number of definitions of CIM can be found when reading publications associated with CIM. For example, Boaden and Dale (ref 1) identified 10 different themes to published definitions of CIM. However, the executives in our survey saw CIM as essentially a means of integrating all aspects of the business through some co-ordinating "philosophy" such as MRP or via a central database.

> *"Well my concept of it is that the various functions within the plant are computer based and essentially are all integrated ... with as near possible a common database so that a change of data ... is implemented in all the systems in the various departments" (a)*

or

> *"My understanding of it is a MRP II or similarly comprehensive data system linked to shop floor data collection equipment ... possibly linked to actual process control computers" (b)*

This view was particularly prevalent in those industries where computer controlled production is not the central issue; instead the overall planning and co-ordination of production is seen as the major problem area. It was only in a very few cases that the executives in our survey saw CIM as a production based issue i.e. producing goods with the minimum of human intervention or CIM as essentially CAD-CAM.

> *"A full computer integrated manufacturing system is one that would, or could, originate from design through to some sort of CAM; that would set the machine, set batch sizes if you like and organise the tooling automatically" (c)*

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2.2 Why CIM?

The companies in our survey that were attempting to implement CIM appear to have done so largely because of the external pressures of highly competitive international markets which have required them to make general improvements to their levels of productivity e.g..

> *"We operate in competitive world markets, very competitive; prices are going down and down all the time... so if we want to remain competitive and still make a profit... we cannot stop improving our efficiency" (d)*

Additionally this external pressure resulted in some companies viewing CIM as a means of providing a specific competitive edge or of competing in markets that would have otherwise been closed.

Some saw CIM providing a way to overcome their own internal manufacturing problems. These problems ranged from wanting to improve control over current, sometimes manual, practices or perceived inadequacies of current systems e.g..

> *"Our current data systems are stretched beyond breaking point at the moment, we don't feel that they will be able to cope with the increased data that will result in the next few years so we need to replace them with something that will cope" (b)*

2.3 Problems of implementing CIM

Our respondents who had recent experience of implementing CIM had experienced a whole range of problems although few were seen as being specifically technical in nature. Several found difficulties associated with the planning process itself. A common problem arose from trying to make a decision in a climate of constant change.

> *"things are happening so quickly and it takes so long for your plans to come to fruition (that) it is very very difficult to co ordinate it into one master plan." (e)*

Lack of information on the current "state of the art" was often cited as a problem for those outside the engineering sector.

> *" it's making the right decision in terms of hardware and software ... it's not obvious. Our type of industry is not like the engineering industry where you can go (and see) plenty of places where they have MRP II systems up and running." (b)*

Finding a basis for the financial justification of a system was seen by some executives

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as a problem. This was highlighted as a particular problem by satellite companies whose head offices were not in this region.

> *"I think the problems are justifying certain aspects of it from the financial point of view ... justifying that a certain package will integrate" (a)*

By far the most common stumbling block when attempting to implement CIM however was insufficient or inadequate training on how to use computer systems and a failure to take account of the need to change peoples' attitudes through a programme of education .

> *"it's a manageable problem but its training. Training and re-training, there's a huge job to be done" (d)*

or

> *"I think the whole thing hangs about a lot of education, I think we probably underestimated that. There's no end to the amount of education you need" (f)*

The cost and disruption of education and training was also identified as an issue by some.

> *"we set up a training programme which seemed quite adequate and went comparatively smoothly, but, during that training period we still had to do business ... basically we had to manage with temporary staff." (a)*

"CIM companies" rely heavily upon computers for their continued operation. The need to have a high level of support services to maintain the operation of computer controlled systems was seen by some as a problem area.

> *"Very high production rates mean very high loss rates when the equipment is standing. It means we have to have, on tap, some very highly skilled maintenance people. I'm afraid without them the use of sophisticated machinery is useless." (g)*

CIM is undoubtedly a high-risk strategy and requires a corresponding commitment at the highest level. Several companies who made the highest use of CIM subsystems (at least 7) also stated that they had a M.D. who took an active role through the chairing of frequent and regular meetings of some form of CIM committee.

2.4 Changes in working practices

Most of our experienced CIM practitioners saw radical changes in the size and shape of their organisations and also in their working practices. Many, although not all, saw the

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change as being most significant for the middle managers in a CIM company.

Two main issues were highlighted: one that employees would be required to be more knowledgeable, flexible and take greater responsibility for the tasks they undertook; the other that there would be far fewer of them.

> *" Well, I think the biggest change will be a more flexible type of person, I was going to say more intelligent but that might not be the right word, a more complete person who is able to come to terms with the new technology and be computer literate ... and maybe take more responsibility than at the present time" (a)*

A director of one company summarised many of the issues surrounding the expected impact of CIM on middle managers when he compared their present role to that of "sophisticated post boys" who process data as they pass it around.

> *"Yes I think it's going to have a dramatic change in business, my feeling is that its going to be a bigger change at the senior supervisory /junior management level than elsewhere ... I would look at it and say, Where is the job for a middle manager in 5 years time? ... I see the bottom level of the company reducing in numbers, yes, but I then see a very narrow neck where the middle managers used to be ... I see it as an hour glass shape in the future, with a smaller amount at the bottom than we used to have ... pinching in through a neck at the middle with virtually nobody (there) in the future, and opening out at the top to a wider and flatter plateau with a range of decision makers and people involved with the whole business ... I see the whole shape of the company changing." (f)*

Goldhar (ref 2) and others have labelled these decision makers "professionals", people who have a wider view and who can take decisions on their own without the need to refer them to the next step in the hierarchy. Slautterback (ref 3) suggests that the climate in manufacturing industry in the future will be similar to that which attracted lawyers and doctors to their respective fields in the mid 1900's. The role of the "decision taker" in a CIM company was recognised by one respondent who said:

> *"At the end of the day you have to rely upon your experience, your gut feel if you like ... a decision has to be made and the quality of that decision ... depends upon the data that is available ... the use of the computer is giving you better data quicker ... (however) we get down to the same thing in the end the manager has to make the decision" (a)*

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Some saw similar changes for shop floor personnel. One respondent explained how previously operators

> *"weren't interested in how the parts arrived to them, they just arrived, and if they didn't they just sat and waited until they did arrive" (g)*

But now, through the use of shop floor terminals,

> *"the operator is controlling ... a whole number of chain reactions ... I would say the amount of control which is exercised now by the operators at each stage of assembly is far greater than it ever was" (g)*

However not all the respondents in our survey agreed with this view. One M.D., in answer to the question "how do you think CIM will change working practices?", simply said:

> *"I think we will probably have a lot of bored people on our hands" (h)*

3 DISCUSSION

One of the main conclusions to be drawn from our sample was that the nature of CIM in the organisations we looked at was shaped by the needs and requirements of that organisation. It has almost become a cliché to describe CIM as a competitive weapon; however, it was clear from the interviews that for the vast majority of companies it was competitive pressures that drove them towards CIM. Only for a minority could CIM be seen as an almost natural evolutionary step.

The configuration of CIM subsystems was diverse; there was no single given approach to the problem, nor was there any standard groupings of modules which were used by all companies. However, it appeared in our sample, that two abstract conceptual configurations for CIM did exist. The first was the most common and appears to have some form of co-ordinating "philosophy" such as MRP, JIT or OPT at it's heart; the second conforms to the more common view of CIM as seen in publications: CIM as CAD-CAM. This raises the question of what sort of configuration can legitimately be called CIM? Are both of these configuration variants of CIM which are contingent upon the requirements of the company or are they both intermediate stages that will eventually converge on one "true" CIM?

Mostly our respondents showed, quite clearly, that their major concerns during the implementation stage were with non-technical problems. At the top of that list was the need for adequate training and education to effectively managing change. Underlying many of these problems identified by our respondents is the pace and pressure of change.

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They are the problems associated with managing, and surviving, a revolution that will affect all aspects of work. Statements are sometimes made comparing this to the industrial revolution of the 19th century e.g. Slautterback and Werther (ref 4). As computers have become more affordable and more powerful their abundance and utility has increased by leaps and bounds. Computers provide the means by which data can be manipulated and massaged in an almost endless variety of ways. It is this aspect which makes it "revolutionary" and which was also apparent during our interviews.

For example our respondents expected middle management, the "sophisticated post boys" of manufacturing industry, to feel the greatest impact of CIM because computers can perform their tasks of manipulating and distributing data more quickly and efficiently than human beings could ever do.

Similarly, our respondent's requirements for more flexible decision takers, more "whole" or more rounded managers who can interpret and react to the data provided by computers, can be seen as part of the same phenomenon. As the power of computer systems to provide data increases so the level of skill needed to interpret that data and transform it into useful information must increase correspondingly.

It is clear that the recognition of human issues or human factors will play a crucial role in the successful implementation of CIM. A failure to recognise this may well prove to be the roadblock to successful implementation of CIM for a number of companies.

ACKNOWLEDGEMENTS

This paper is based on the first phase of a 3-year project. The authors would like to thank Newcastle upon Tyne Polytechnic for funding the project, the participating companies for their support and Dr. W. D. Henderson and J. Hannon, who were also part of the project team, for their help and co-operation.

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