

WORLD CLASS MANUFACTURING: PART 1

A POLICY AND STRATEGY FOR MANUFACTURING COMPANIES

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In this first of a series of articles, Nick Norton develops a policy and strategy for companies aspiring to world class manufacturing control. He considers that unless companies successfully adopt world class control techniques, then their future will be at stake. The unavailability, until now, of some of the required tools and the disappointments of MRP, are discussed. The series will develop the requirements for, and solutions to, a policy of world class control for manufacturing industry. The companies that are successful in applying those policies will be sure of prosperity and a bright future.

THE CHALLENGE

The business environment of the 1990s is one of increasing global competition in industry. The means to success will be to consistently deliver high levels of customer service.

Successful companies will be those who can continually improve:

- Quality of products and service
- Reliability in delivery dates and lead times
- Unit costs.

Businesses that display and consistently deliver, these features to a high degree of attainment are commonly termed 'world class'.

To survive and grow, manufacturing industry needs to use world class methods of manufacturing control. Companies that have adopted these techniques, have been able to compete in global markets. Often the application of world class methodologies has concentrated on equipment and practices, but have been lacking in serious manufacturing control, usually because the required systems did not exist.

Unless companies are able to become world class, they will wither and die. If industry believes that this will happen, it will need to seek out and implement those methodologies.

There is a wealth of experience of implementing materials requirements planning (MRP). This has often proved disappointing, indeed in many cases totally unsuitable for the needs of industry. Process control and automation have been exploited successfully and few additional benefits are available. Scheduling systems have been applied, but these have tended to be stand-alone and not reflect the real time environment.

This first article introduces a policy and the associated strategy for manufacturing companies in pursuit of world class. The massive ongoing benefits of successful application of world class methodologies in user companies will be used to illustrate the benefits.

OBJECTIVE OF THE SERIES

This feature initiates a series that will develop the detailed requirements necessary in support of a policy and strategy of manufacturing excellence, or world class and provide one practical solution to those requirements. The series will demonstrate the key element provided through control of the shop floor and will show how any manufacturing strategy must be incomplete unless the shop floor has been included.

The technologies described in this series define the requirements for control that lie between management and process

control systems, and propose a solution. The requirements include finite capacity planning, finite capacity scheduling and a shop floor control (execution) system. Together they satisfy the manufacturing control requirements and contain the interface, between process and core business applications, such as ERP/MRP, while allowing the manufacturer to maximise benefit from all of those complementary technologies.

Up to now, many companies have been excluded because this interface was not available and they only had process control, stand-alone scheduling and management systems available. These were difficult to integrate and did not provide solutions to all of their manufacturing control requirements.

The article introduces the tools required for companies to introduce world class manufacturing techniques in pursuit of excellence. Further articles in the series, to be published in Control will cover:

- The detailed business requirements for manufacturing control
- The business requirements for shop floor control
- A solution to the business requirements for manufacturing and shop floor control.

INTRODUCTION TO THE SERIES

This is the first of a series that discuss the business requirements for world class manufacturing control. The successful adoption of the techniques and methodologies described in this series will enable companies to prosper and grow in global markets. World class techniques are neglected at manufacturing industry's peril.

A number of points are relevant that will be explored in the series:

- The shop floor controls a manufacturing business, financially
- Low unit labour costs will be the prime factor necessary to win new business
- MRP is a planning system and offers little help to the shop floor. On its own, it has proved particularly difficult to implement in unit based industries and almost impossible in length and volume based industries. It has failed to live up to its billing
- Users are well served with process control and overall business systems
- Although the information that is required to effect shop floor control exists and this information has not changed since manufacturing began, there are few available systems that offer serious shop floor control, in any industry
- Finite capacity scheduling is a desirable element of a shop floor control system
- Shop floor control provides feedback, enabling planning systems to be aware of the realities of manufacturing
- The input to shop floor control is an external work-to-list or schedule, however derived. Shop floor control manages and executes the work-to-list and ensures that control is maintained, even when urgent and unplanned events occur

- Shop floor data collection (SFDC) is **not** shop floor control. The vast majority of SFDC equipment has never been used seriously by the users, in many cases never even installed
- Executed effectively, controlling the shop floor can increase the productivity of a manufacturing business by 20-100%, without increasing overheads.

OVERVIEW

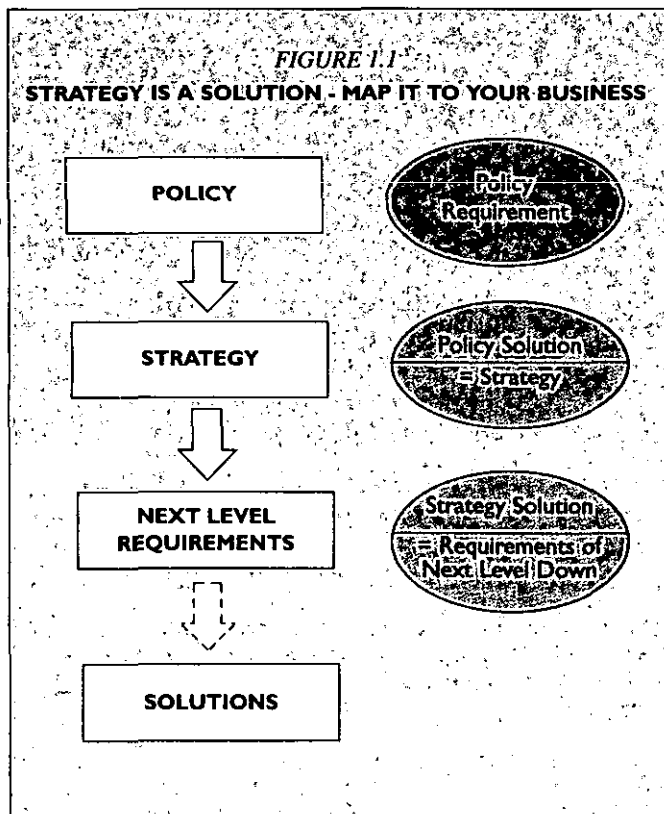
This initial article will develop a policy and supporting strategy in pursuit of world class manufacturing control. It will develop the associated business solutions and these will be specified in depth in the next two articles. One solution to the requirements of world class will be proposed in conclusion.

WHAT ARE POLICY AND STRATEGY?

The policy of a business is typically determined by the directors. Setting of policy must ignore possible solutions. Often, perceived solutions to policy are imposed too early in the process of determining requirements and policy becomes compromised. Requirements arising from policy, must not be confused with solutions.

Policy is a requirement. Strategy is the course of actions to be taken to meet the policy. While strategy is a solution to policy, solving strategy creates its own requirements. These requirements are then answered at the next lower level. Each solution creates requirements at the level below. These expand, by unravelling downwards to the lowest levels and thereby reveal the detailed business solutions. Implementing these lowest level solutions will then result in meeting the specified policy.

By working top-down, it is possible to determine the lowest level actions that are necessary in pursuit of the policy. This is represented simply in Figure 1.1. Each requirement being solved through solutions at the immediate lower level.



Existing business strategies may be in conflict with those determined through the above process. 'Strategies' may exist without policy, express or implied. Any solutions already

proposed by the business must be mapped bottom-up and rejected if they do not provide a solution to a higher level requirement. By mapping top-down and bottom-up and rejecting anything that the company is doing, or planning to do, that does not meet a requirement, a business can ensure that strategy and actions meet the defined policy.

Policy is a requirement, strategy is a solution; now map it to your business. This distinction is often confused. Work out the requirements first and then determine the solutions.

This article outlines the business solutions to a policy of world class control for manufacturing industry.

A POLICY FOR MANUFACTURING INDUSTRY

To meet the industry challenge manufacturers will need to provide excellence in both products and service, at progressively lower costs.

The challenge can be stated in terms of:

- Quality of the product
- Quality of service and meeting and exceeding customer expectations
- Meeting delivery requirements
- Reducing lead times and providing faster delivery
- All at minimum cost.

The above are all laudable examples of policy for companies in industry. Businesses that can deliver these policies are commonly termed world class. The following sections determine the strategies necessary to meet these policies. There are other elements of the solution, not least the role of people and education, which is covered in a later article.

A STRATEGY TO MEET THE POLICY

Figures 1.2, 1.3 and 1.4 show the process of determining a strategy to meet the following three major policy objectives:

- Faster delivery
- Reliable delivery dates
- Reduced costs.

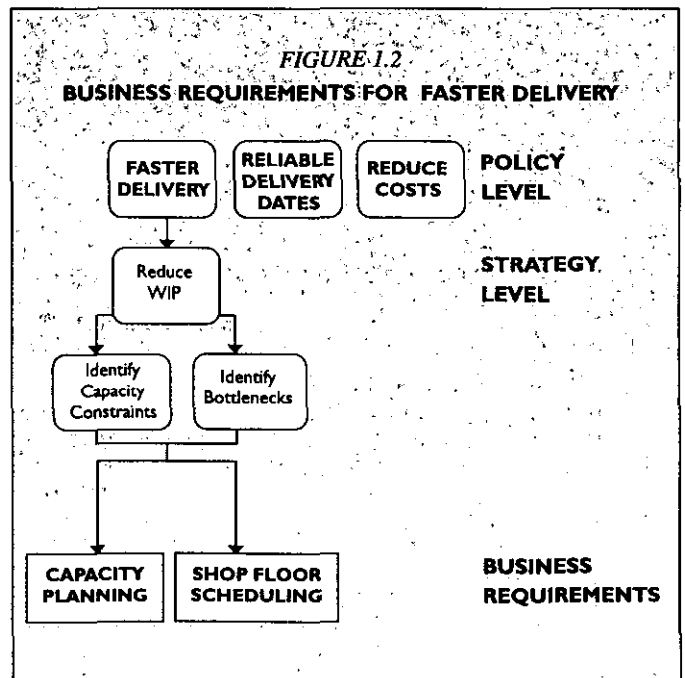


FIGURE 1.3
BUSINESS REQUIREMENTS FOR RELIABLE DELIVERY DATES

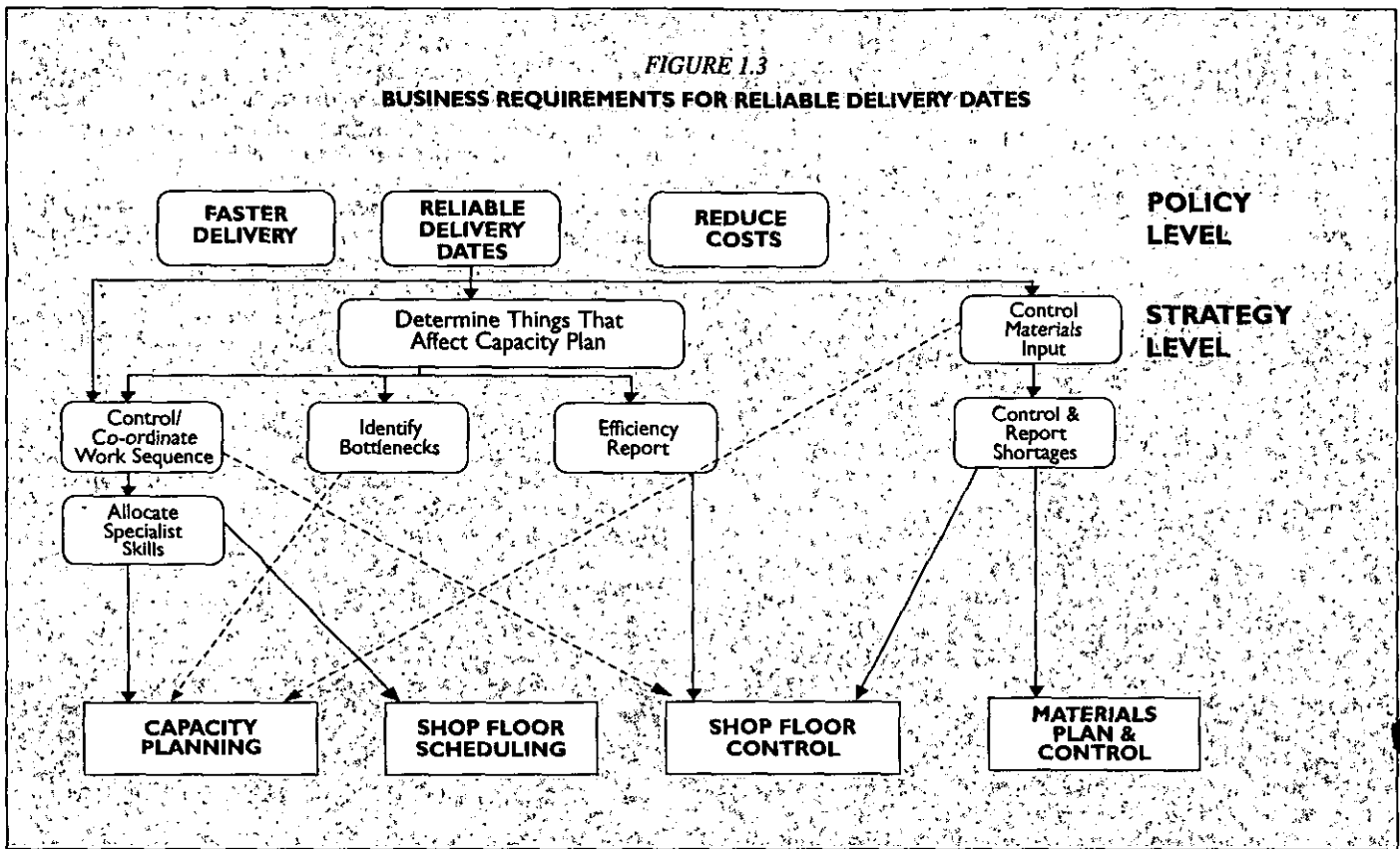
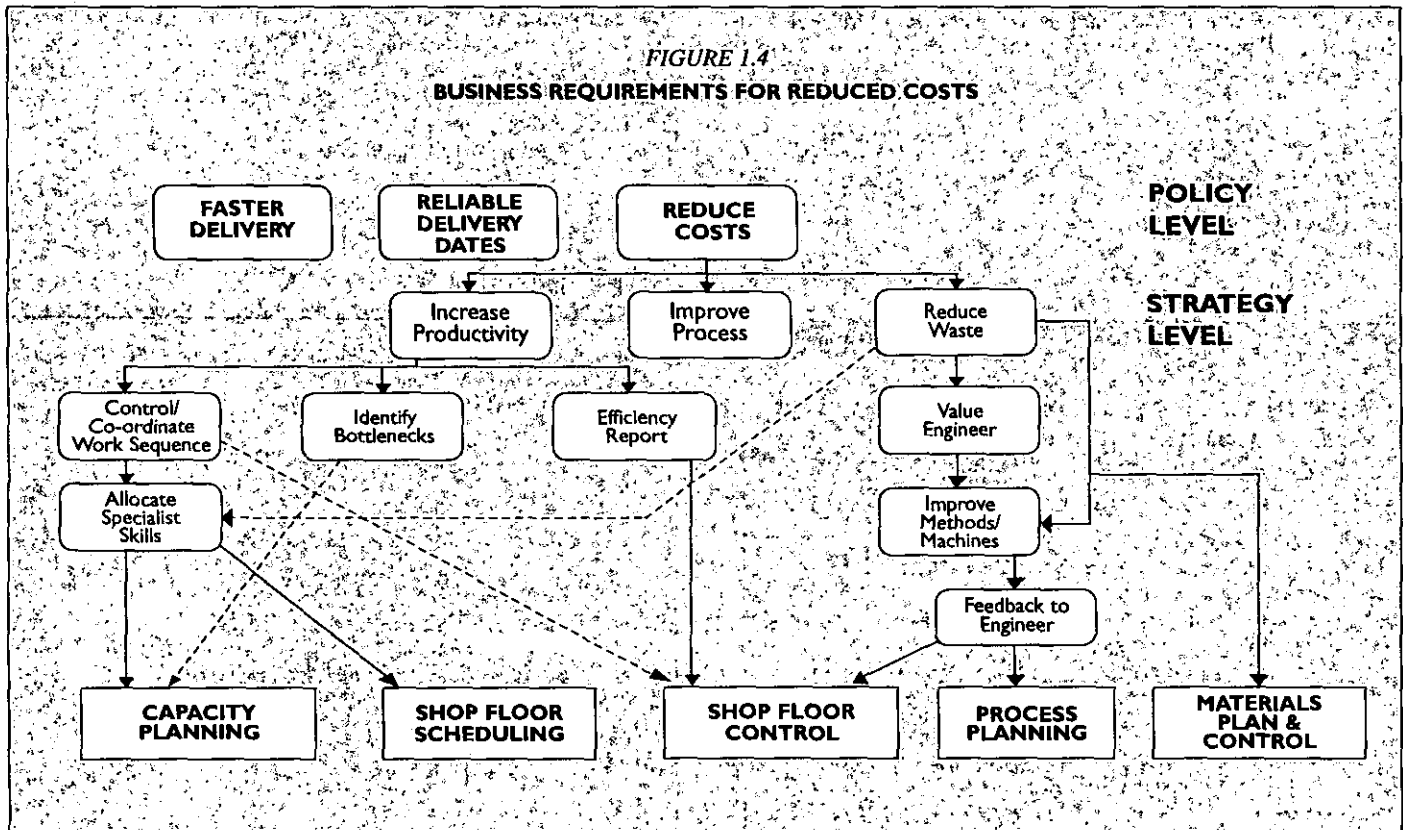


FIGURE 1.4
BUSINESS REQUIREMENTS FOR REDUCED COSTS



Quality is discussed later. Plant and machinery have been assumed to be constant, perhaps funding not currently being available for new equipment. Benefits, through additional profits, will provide for additional future investment. The emphasis will be to generate more revenue from the same assets. Use of state-of-the-art planning systems, will enable companies to synchronise all of their activities. This will enable performance to be continually improved.

Financial benefits can be considered in two ways. There are once-only savings and ongoing benefits. Once-only savings reduce investment and improve cash flow. These can be

achieved through reductions in work-in-progress and stock levels. Revenue improvements arise from increased productivity and reduced levels of scrap and rework. These recur, forever.

Benefits have accrued from implementing these policies in client companies. These have reduced investment in stock and WIP by 50% and improved revenue by increasing output from between 20-100%. Profitability usually rises dramatically and exponentially. Meanwhile, improved cash flow will result through reduced lead times and accurate knowledge of lead times.

Impact on the Marketing Strategy

While this article deals with manufacturing strategies, the relationship to marketing must be carefully considered. When companies substantially raise output, opportunities to produce increased output arise. These can be difficult to tackle. If these opportunities have not been researched and do not result in increased sales, then the company may start to run out of work. If this is resolved by reducing employee numbers, then morale will suffer. Since applying world class technologies requires the total commitment of a business and its employees, then performance improvements must be harnessed in positive ways. Otherwise, the effects will not be sustained.

When productivity is substantially improved, other markets become attractive, because unit costs reduce. Also, reliability of supply, delivery dates and quality, will improve the share of existing markets.

Since marketing initiatives will take perhaps twelve months to show through as increased sales, then the marketing strategy must complement the manufacturing strategy.

Faster Delivery

There are a number of ways to provide faster delivery. Processes can be made to run quicker, for example, through investments in equipment and production engineering efforts. Process time is invariably a minor constituent of lead time and queuing time is easily the major component. Investment in faster processes may only build work-in-progress (WIP). Faster processing is not guaranteed to provide increased throughput and may actually increase WIP.

The ratio of queuing to process time is directly related to the WIP level. Reductions in WIP are readily available through reductions in queuing time. This is achieved by managing with much lower levels of work that is waiting for manufacturing resources to become available.

Major improvements in lead time are therefore available by reducing WIP and this is shown as the strategy. To reduce WIP and queuing time, tools are required to control the release of work onto the shop floor, in line with available capacity. The factory must not be flooded with work it cannot process. Simultaneously, activities will need to take place to enable raised output. This is achieved by increasing capacity and recognising the effect of bottlenecks on throughput. The tools necessary to control the flow of work and identify capacity constraints and bottlenecks are available through finite capacity planning and finite capacity scheduling.

The business solutions therefore, for faster delivery, are to perform planning and shop floor scheduling, both to finite capacity. (A detailed definition of these functions will appear in the next article).

Reliable Delivery Dates and Reduced Costs

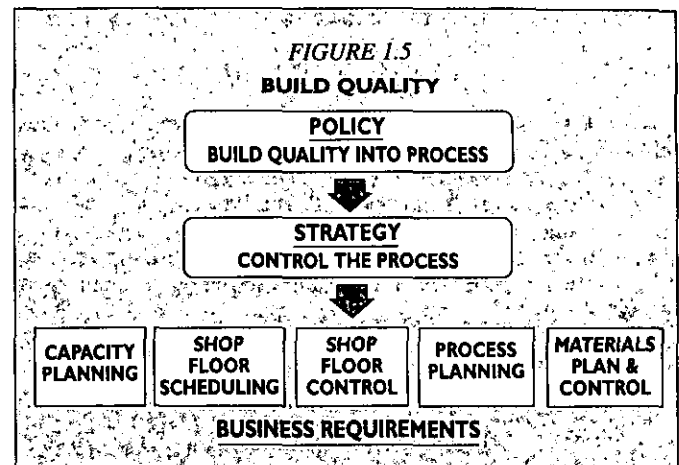
In a similar way to the above, the solutions to enable reliable delivery dates and reduced costs can be defined. The requirements and solutions hierarchy for these are shown in Figures 1.3 and 1.4. In summary the business solutions are:

- Capacity Planning
- Shop Floor Scheduling
- Shop Floor Control
- Process Planning
- Materials Planning and Control.

Quality

The five business requirements above, working bottom-up, could be interpreted as controlling the complete manufacturing

process. Once mapped in, this will introduce process control at the lower level and this is discussed below. This is represented in figure 1.5.



The strategy of controlling the process, will meet a policy requirement of building quality into the process, both intrinsic product quality and quality of service. This is shown by working bottom-up. If the process is controlled, so is the quality. Expressed another way, when all the requirements for control are satisfied, then quality will result. Quality is built in, not added afterwards.

Process Control and Automation

Manufacturers are well served with process control systems, with a wide range of sophisticated equipment and tools available.

Most research and expertise on controlling manufacturing in industry centre on control of discrete and independent processes. However, the problem that manufacturers have, is what to do with process data collected. Process control works well when there are a limited number of operations. The difficulty is linking a number of manufacturing operations together. This creates a requirement for shop floor control.

CONCLUSIONS

The overall requirements have now been defined. These will meet the policy and strategy leading to world class control. They can be considered as essential components of world class manufacturing.

The next article will explore the detailed requirements to meet the strategy and discuss some of the features of a world class manufacturing system.

Acknowledgement

This series of articles is based on a World Class Manufacturing trilogy, first published in Wire Industry. Part I was published in September 1996, Part II in March 1997, and part III in July 1997.

About the author

Nick Norton, BSc, CEng, MIEE, FIOM, is consultancy partner of Borderbow. He has 20 years experience applying the described methodologies across the spectrum of manufacturing industry.

Borderbow is a manufacturing consultancy specialising in the definition and implementation of world class systems and practices, featuring shop floor control, finite capacity planning and scheduling.