

Increasing flexibility: what are your options?

By Dr Marek Szwejczewski and Dr Alan Cousens

In today's consumer and industrial markets it is increasingly important for manufacturing companies to have flexible production facilities.

Customer order patterns in both the industrial and commercial sectors have become more uncertain; the reasons behind the unpredictable demand are varied. Customer in industries as diverse as retail, computers and car manufacturing will only buy materials and components at the moment they are needed.

New technologies can make old stock worthless overnight, and can also create urgent demand for what is novel – and, of course, what is different! The most responsive operation will win the contract and in doing so will set new expectations for flexibility – expectations that all competitors must subsequently try to meet.

Flexibility (alongside cost, quality and time) is now a strategic objective and can bring competitive advantage.

Flexible operations are responsive; they are able to react when customers make unexpected demands. Manufacturers may be asked to supply more of a particular product (this requires volume flexibility), or to supply different products (this requires mix flexibility). Service operations must likewise be able to deal with waves of customers, or one customer after another, with each expecting something unique to them. Successfully flexible operations are able to change their production to meet their customers' needs without incurring penalties in time, effort, cost or performance.

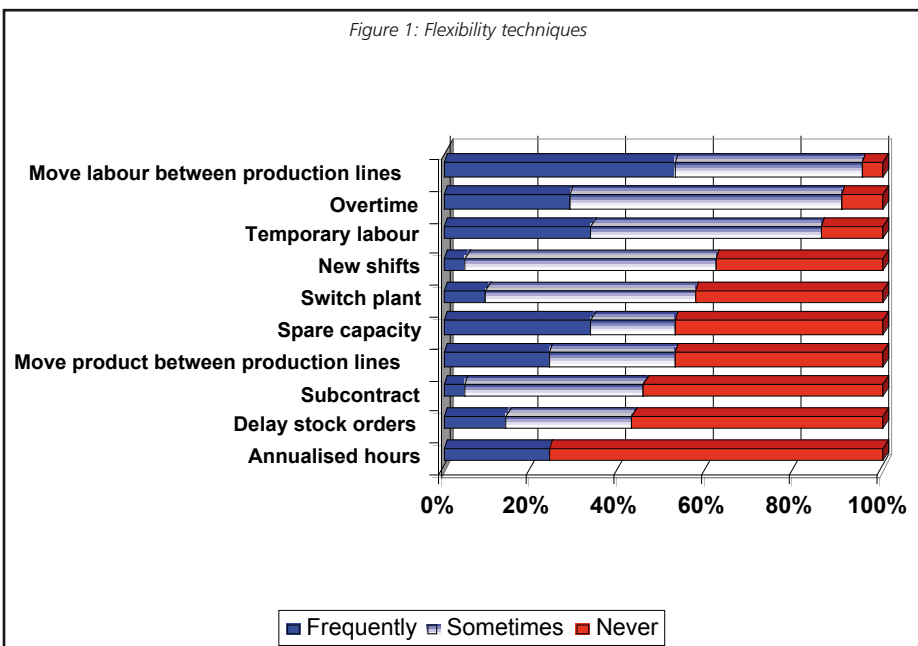
Research study of manufacturing flexibility

We recently investigated the issue of flexibility in manufacturing. One of the most frequently asked questions by managers is – what can be done to make manufacturing operations more flexible? As part of our study we conducted a series of interviews with senior manufacturing managers to discover just what actions they had taken to increase their operations flexibility (in terms of volume or mix flexibility). The managers were selected to represent a wide range of manufacturing industries, ranging from electronics to food.

All of the managers who were interviewed said that flexibility was important to their organisation; one third said it was very important. The interviewees described the customer demand they had to deal with as variable and just over half stated that this variation was difficult to forecast. One quarter said that for their organisation, demand was seasonal and could be forecast to a certain degree, while the remainder faced both seasonal and unpredictable demand.

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Figure 1: Flexibility techniques



The use of overtime is one of the most common methods used to increase manufacturing flexibility. However, there are a number of different ways that managers can increase the flexibility of their facilities. These range from using temporary labour through to subcontracting some of the work to external suppliers. During the interviews the managers were asked if they had used a number of techniques identified by previous research as effective in improving manufacturing flexibility. They were asked to indicate the extent to which they had used the various techniques – frequently, sometimes or not at all. Figure 1 shows the level of use of the various techniques.

Figure 1 shows the various techniques used in declining order. As expected many organisations used overtime working when customer orders suddenly increased. However, this was not the most commonly used technique. The method used by most of the managers was to make the best use of the available labour and move it around the factory to where the demand increase was having the most impact.

The interviews revealed that companies used a range of methods for enhancing manufacturing flexibility and all of the managers reported that their organisations used more than one approach to increase flexibility. In fact, the majority of them used

at least three of the techniques, although, of course, some were used a lot more than others.

In addition to revealing which techniques, and which combinations of techniques, had been used successfully the survey also indicated that there was no simple prescription for increasing manufacturing flexibility. What had worked well in one organisation could not be assumed to work well in another – even if they appeared to be similar.

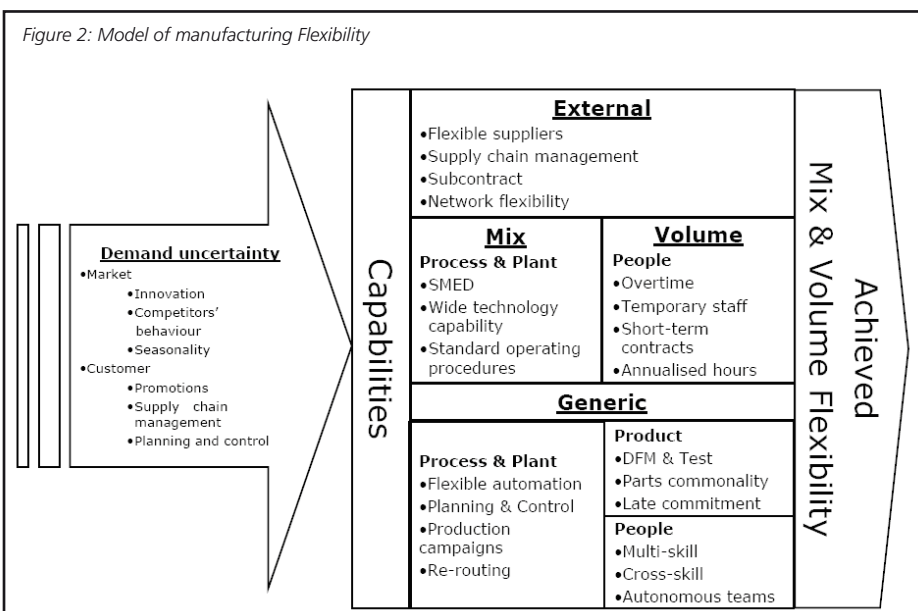
Drawing on the findings of our research project and the work carried out at Cranfield by the authors and Professor Mike Sweeney, we have developed a model of manufacturing flexibility (Figure 2). It illustrates how various capabilities can give an operation both mix and volume flexibility.

Demand uncertainty characterises the environment in which most companies must operate. The uncertainty may be due to the features of the market, or from actions taken by individual customers. To achieve competitive advantage in the context of demand uncertainty an operation will need to outperform in terms of mix or volume flexibility. This superior performance will be the result of several capabilities. In our model, capabilities are classified into four groups, which are: external, mix, volume and generic.

External capabilities relate to the ability to control suppliers or subcontractors. This ensures that the supply chain is flexible, so if demand does change the firm is not constrained by unresponsive suppliers. Some capabilities primarily relate to mix flexibility, others to volume flexibility. An operation can have volume flexibility through people, not only by using overtime, but also employing temporary staff or adopting annualised hours contracts. Mix flexibility can be achieved by having quick changeovers or improved production technology.

Generic capabilities may improve mix and volume flexibility depending on organisational context. Firms can make their operations more flexible by making their employees multiskilled and/or organising them into autonomous teams. Changes to the design of the product, for example, by having greater part commonality across a range, can

Figure 2: Model of manufacturing Flexibility





also improve a factory's flexibility. Thus the capabilities that a firm can build are related not just to the management of people, but also the product and process.

Enhancing manufacturing flexibility

When devising a change programme to enhance manufacturing flexibility it is important to characterise the degree of demand uncertainty together with levels of mix and volume flexibility that will be required. Current performance can be compared with targets using a simple form of gap analysis. An understanding of the processes in operations and the performance gaps will in turn, lead to an estimate of the required improvements in the capabilities. A change programme can then be designed by identifying the options for developing capabilities (or exploiting latent capabilities) which contribute most to closing the performance gap.

One company in our survey experienced a high degree of seasonality in demand for their products, and also significant variation in demand week by week. They manufactured fruit drinks which were mostly consumed in summer and more in especially hot weather. An analysis of their processes showed that capacity was limited by the availability of skilled labour. What was needed was for their workforce to work longer hours in advance of hot and thirsty summers. Temporary labour was not the best alternative because people with the relevant skills were not readily available.

For this company reaching agreement with their workforce to adopt annualised hours contracts (see box page 20) was vital to achieve competitive advantage. It allowed them to put their drinks on supermarket shelves when demand was high without the penalty of high overtime costs. In terms of our model, seasonality in demand required the organisation to enhance their volume flexibility which they were able to achieve by developing a capability related to their management of people. This was the capability to operate with skilled labour working annualised hours contracts.

Sometimes organisations may have the option to modify demand, and this may make better strategic sense than incurring the cost of change to develop capabilities



Firms can make their operations more flexible by making their

employees multiskilled

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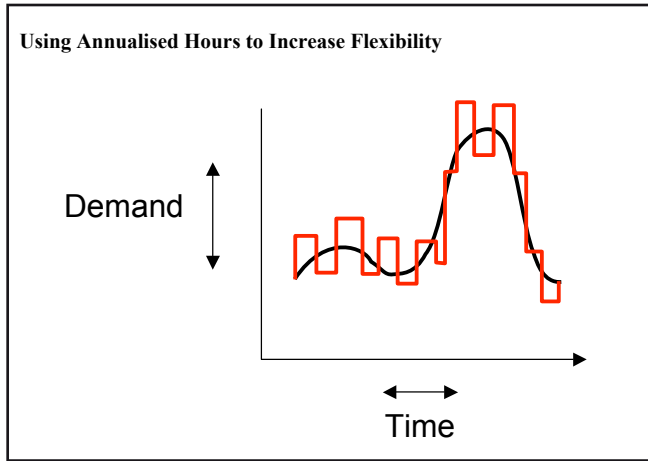
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for increasing flexibility. Some managers proposed the idea of trading off less flexibility for greatly enhanced dependability. For example, the adoption of more rigid production scheduling as a way of improving both efficiency in production and dependability of delivery. In this case, their customer valued dependability above shorter lead time promises which were not always achieved.

Finally, a word of caution. During our research project we came across several operations managers who talked to us about their need to increase manufacturing flexibility so that they could recover from problems such as machine breakdowns. Our model has been constructed to address the need to gain competitive advantage through manufacturing flexibility. If instabilities such as machine breakdowns, absenteeism, etc threaten manufacturing performance, relevant capabilities will be directed at recovery, and not at gaining advantage in the market. Rather than seeking to be flexible in order to cope with internal problems, operations managers should seek stability in their processes. When the root causes of the instability have been eliminated the flexibility of the stable operation can be re-assessed. With problems fixed the operation may discover it already has in place the capabilities to delight their customer and frustrate their competition!





Using annualised hours to increase flexibility

Annualised hours contracts are designed to match available labour to variable demand, eliminating both slack (labour available but no demand) and overtime payments (demand which can only be met by paying a premium price for labour). The contracts usually include two elements: core work schedules (ie set working hours per week) and 'banked hours'. The core schedules are designed to meet base demand levels which will vary month by month. The second element is an agreement with the workforce to be available at short notice during peak demand. The term 'banked hours' is used because the firm will pay for a certain number of hours over and above the core schedule, with the understanding that it will give (short) notice when employees need to come in and work.

Employees are paid the same amount each month over the year. Payment is independent of the agreed core hours worked that month, and also regardless of whether the employee has been asked to work the 'banked hours'.

Annualised hours allows the firm to share the uncertainty of the market demand with employees; the employees have a regular and fixed income, in exchange for giving up the certainty of working the same hours each week, over the whole year.

A UK drinks manufacturer was the most successful of the companies we surveyed in implementing annualised hours. They experienced strong seasonality in demand for their products (shown in black in the chart above) and had agreed working patterns which reflected this seasonality. In times of high demand employees worked more hours each week. When demand was low employees worked less and enjoyed regular long weekend breaks.

The annualised hours contracts

included 'banked hours', which involved rescheduling of working patterns at short notice to meet peaks in demand which could not be forecast (shown in red in the chart). In practice these were occasions when employees were asked to sacrifice a long weekend.

Annualised hours gave this company volume flexibility. Its previous strategy of meeting high season demand with a combination of overtime and temporary labour had incurred higher costs and lower production efficiencies.

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Annualised hours allows the firm to share the uncertainty of the market demand with employees

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