

SIXTH EDITION

LOGISTICS & SUPPLY CHAIN MANAGEMENT

MARTIN CHRISTOPHER

Praise for *Logistics and Supply Chain Management*

‘Major world events in recent years – ranging from the Covid-19 pandemic, blockage of the Suez Canal and war in Ukraine – have highlighted the critical role played by logistics and supply chain management in the global economy and have brought these subjects to the forefront of public interest. This important book by one of the leading thinkers in the field is essential reading, not just for practitioners and students of these subjects, but for everyone with a keen interest in how logistics activities and supply chain designs shape our everyday lives. The clear text and logical flow of chapters, augmented by a range of interesting and diverse case examples, take the reader on a journey of discovery into how today’s supply chains should be structured and managed.’

**Professor John Mangan, Chair in Marine Transport and Logistics,
School of Engineering, Newcastle University, UK**

‘It should not have needed a global pandemic and a war in Europe to raise the importance of building and managing resilient supply chains. The techniques to achieve this are not new; achieving value has always been the goal, and the latest edition of this excellent book lays these out in a clear and compelling manner. It is updated to embrace digitisation, and to address the sustainability imperative, and is set in today’s context of volatility and disruption. Procurement and supply chain professionals can learn from this book as part of their continuing professional development.’

Malcolm Harrison, CEO, Chartered Institute of Procurement and Supply

‘Since the first edition was published thirty years ago, this book has become one of the leading texts on logistics and supply chain management, providing guidance both to students and practitioners. The author provides valuable insights into how performance in these vital business processes can be improved and sustained.’

Yossi Sheffi, Eliza Gray II Professor of Engineering Systems, MIT, USA

‘Martin Christopher’s latest book captures the entire evolution of logistics and supply chain thinking and associated concepts through to current times, including digitisation, new business models, sustainability, and perspectives on what we can expect to see in the years ahead. It is comprehensive and beautifully illustrated with examples and short case studies. A must-read for students and managers alike.’

Dr John Gattorna, global supply chain ‘thought leader’ and author

‘Excellence in supply chain management is imperative in today’s commercial environment. It is the heartbeat of the enterprise, significantly influencing its success / failure and, when orchestrated correctly, will assure the right balance of growth, cash and cost.

The utopia of supply chain excellence requires transparency, real time visibility, collaboration and digital integration end to end to empower relationships with customers and suppliers, thus facilitating optimal fulfilment and perfect order achievement. In this valuable guide the author addresses how end-to-end processes, systems, tools and competencies must be designed and managed to achieve success in the marketplace.’

**Stuart Whiting, Senior Vice President, Logistics and Planning,
Global Supply Chain, Schneider Electric**

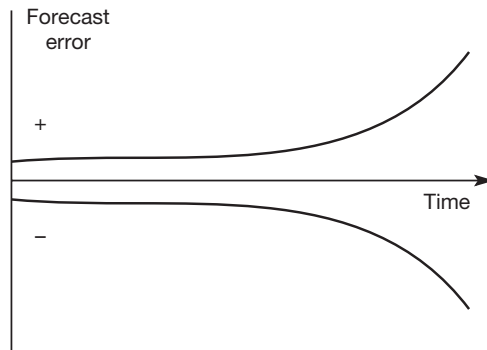
Matching supply and demand

- The lead-time gap
- Improving visibility of demand
- The decoupling point
- The supply chain fulcrum
- Forecast for capacity, execute against demand
- Demand management and planning
- Collaborative planning, forecasting and replenishment

Reduced to its basic essence, the goal of supply chain management is very simple – to try to match supply and demand. However, what makes this seemingly simple task so difficult in reality is the presence of uncertainty. In other words for most organisations, on both the supply side and the demand side, there can be no certainty what tomorrow will bring. This uncertainty brings with it a serious challenge to the classic practice of running a business on the basis of a forecast. The levels of volatility and turbulence that typify today's business environment add to the problem. It will be apparent that in conditions of stability – and hence lower uncertainty – forecast accuracy should generally be high. Equally the converse will be true, i.e. as uncertainty increases so too will forecast accuracy reduce.

All forecasts are prone to error, and the further ahead the forecast horizon is, the greater the error. Figure 5.1 shows how forecast error increases more than proportionally over time.

Figure 5.1 Forecast error and planning horizons



The lead-time gap

Most organisations face a fundamental problem: the time it takes to procure, make and deliver the finished product to a customer is longer than the time the customer is prepared to wait for it.

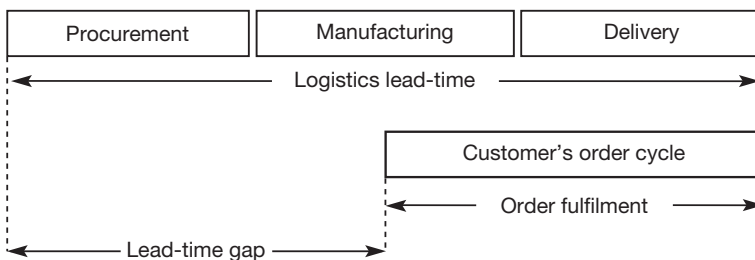
This is the basis of the lead-time gap. Figure 5.2 demonstrates the problem.

The customer's order cycle refers to the length of time that the customer is prepared to wait, from when the order is placed through to when the goods are received. This is the maximum period available for order fulfilment. In some cases this may be measured in months but in others it is measured in hours.

Clearly the competitive conditions of the market as well as the nature of the product will influence the customer's willingness to wait. Thus a customer may be willing to wait a few weeks for delivery of a car with particular options but only a day for a new set of tyres.

In the conventional organisation the only way to bridge the gap between the logistics lead-time (i.e. the time taken to complete the process from procurement to delivered product) and the customer's order cycle (i.e. the period they are prepared to wait for delivery) is by carrying inventory. This normally implies a forecast. Hence

Figure 5.2 The lead-time gap



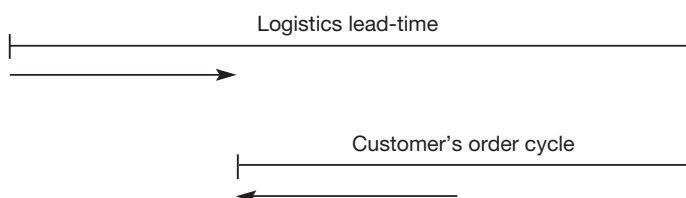
the way most companies address this problem is by seeking to forecast the market's requirements and then to build inventory ahead of demand. Unfortunately all our experience suggests that no matter how sophisticated the forecast, its accuracy is always less than perfect. It has been suggested that all mistakes in forecasting end up as an inventory problem – whether too much or too little!

Whilst improving forecast accuracy will always be a desirable goal, it may be that the answer to the problem lies not in investing ever greater sums of money and energy in improving forecasting techniques, but rather in reducing the lead-time gap.

The company that achieves a perfect match between the logistics lead-time and the customer's required order cycle has no need for forecasts and no need for inventory.

The challenge for logistics management is to search for the means whereby the gap between the two lead-times can be reduced if not closed (see Figure 5.3).

Figure 5.3 Closing the lead gap



Reducing the gap can be achieved by shortening the logistics lead-time (end-to-end pipeline time) whilst simultaneously trying to move the customer's order cycle closer by gaining earlier warning of requirements through improved visibility of demand.

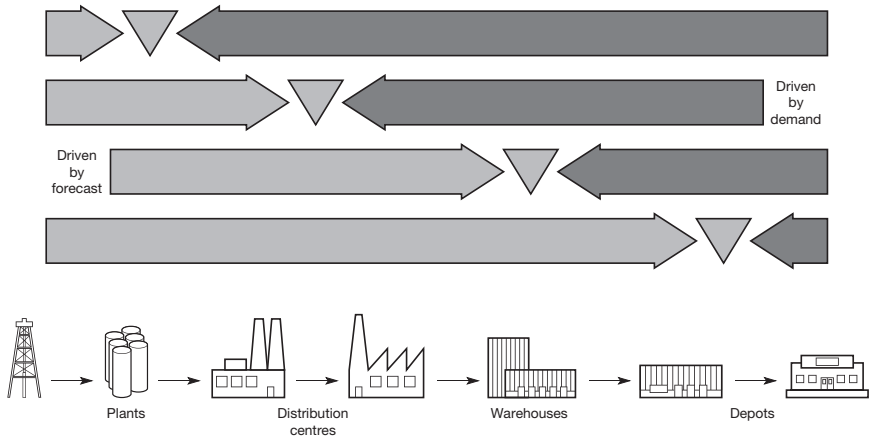
Improving visibility of demand

In many cases, companies have an inadequate 'visibility' of real demand. By 'real' demand we mean the demand in the final marketplace, not the 'derived' demand that is filtered upstream through any intermediary organisations that may lie between the company and the final user. The challenge is to find a way to receive earlier warning of the customers' requirements. What we frequently find is that first of all the *demand penetration point* is too far down the pipeline and that secondly, real demand is hidden from view and all we tend to see are orders. Both these points need further explanation; firstly the concept of the demand penetration point.

The simplest definition of the demand penetration point is that it occurs at that point in the logistics chain where real demand meets the plan. Upstream from this point everything is driven by a forecast and/or a plan. Downstream of that point we can respond to actual customer demand. Clearly in an ideal world we would like everything to be demand-driven so that nothing is purchased, manufactured or shipped unless there is a known requirement.

A key concern of logistics management should be to seek to identify ways in which the demand penetration point can be pushed as far as possible upstream. This might be achieved by the use of information so that manufacturing and purchasing get to hear of what is happening in the marketplace faster than they currently do. Figure 5.4 illustrates a range of possible demand penetration points in different industrial and market contexts. The inverted triangles represent the inventory that is held at that point, preferably in as ‘generic’ a form as possible.

Figure 5.4 Demand penetration points and inventory



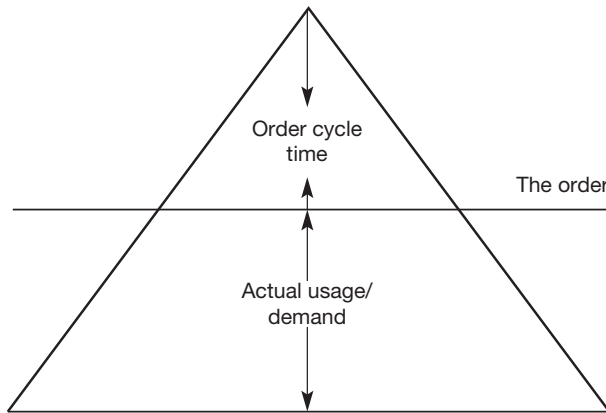
Perhaps the greatest opportunity for extending the customer’s order cycle is by gaining earlier notice of their requirements. In so many cases the supplying company receives no indication of the customer’s actual usage until an order arrives. For example the customer may be using a product ten items a day but because he orders only intermittently the supplier sometimes receives an order for 100, sometimes for 150 and sometimes for 200. If the supplier could receive ‘feed-forward’ on what was being consumed he could anticipate the customer’s requirement and better schedule his own logistics activities.

In a sense, the information we receive if we only have the order to rely on is like the tip of an iceberg. Only a small proportion of the total iceberg is visible above the surface. Likewise the order cycle time (i.e. the required response time from order to delivery) may only be the visible tip of the ‘information iceberg’ (see Figure 5.5).

The area below the surface of the iceberg represents the ongoing consumption, demand or usage of the product which is hidden from the view of the supplier. It is only when an order is issued that any visibility of demand emerges.

There are now signs that buyers and suppliers are recognising the opportunities for mutual advantage if information on requirements can be shared on a continuing basis. If the supplier can see right to the end of the pipeline then the logistics system can become much more responsive to actual demand. Thus, whilst the customer

Figure 5.5 The information iceberg



will still require ever swifter delivery, if an ongoing feed-forward of information on demand or usage can be established there is a greater chance that the service to the customer will be enhanced and the supplier's costs reduced.

This twin-pronged approach of simultaneously seeking to reduce the logistics lead-time whilst extending the customer's order cycle may never completely close the lead-time gap. However, the experience of a growing number of companies is that substantial improvements can be made both in responsiveness and in the early capture of information on demand – the end result of which is better customer service at lower cost.

The decoupling point

A related concept to the demand penetration point is the principle of the *decoupling point*. The purpose of a decoupling point is to separate adjacent processes so that they can operate independently of each other.¹ Processes can be decoupled by placing a 'buffer' between them. These buffers may comprise inventory or they could be in the form of capacity or time. There may be more than one decoupling point in a supply chain and hence more than one buffer.

The purpose of these buffers is to enable demand to be met within the required lead-time (i.e. within the customer's order cycle). The size of these buffers, i.e. how much inventory, how much capacity and how much time is allowed, should be constantly reviewed in light of the level of prevailing demand. Managing the decoupling point(s) in this way is the basis for what has been termed 'demand-driven supply chain management'.^{2,3}

Figure 5.6 below illustrates the way in which a combination of moving the demand penetration point as far upstream as possible along with a strategy of decoupling the supply chain with buffers (in this case inventory) can enable better matching of supply with demand.