

# Measuring logistics costs and performance

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**This chapter:**

**Outlines the many ways in which logistics management can impact on overall return on investment and, ultimately, shareholder value.**



**Explains the rationale behind total cost analysis, a systematic logistics-oriented cost accounting system and the principal requirements for an effective logistics costing system.**



**Emphasizes the importance of customer profitability analysis based upon an understanding of the ‘cost-to-serve’.**



**Introduces the concept of direct product profitability and underlines the need to understand the customers’ logistics costs.**



**Highlights the need to identify the cost drivers in the logistics pipeline and to replace traditional forms of cost allocation with more appropriate methods.**

The costs of satisfying customer demand can be significant and yet, surprisingly, they are not always fully understood by organizations. One reason for this is that traditional accounting systems tend to be focused around understanding *product* costs rather than *customer* costs. Whilst logistics costs will vary by company and by industry, across the economy as a whole that total cost of logistics as a percentage of gross domestic product is estimated to be close to 10 per cent in the US<sup>1</sup> and in other countries costs of similar magnitudes will be encountered.

However, logistics activity does not just generate cost, it also generates revenue through the provision of availability – thus it is important to understand the profit impact of logistics and supply chain decisions. At the same time logistics activity requires resources in the form of fixed capital and working capital and so there are financial issues to be considered when supply chain strategies are devised.

### **Logistics and the bottom line**

Today's turbulent business environment has produced an ever greater awareness amongst managers of the financial dimension of decision making. 'The bottom line' has become the driving force which, perhaps erroneously, determines the direction of the company. In some cases this has led to a limiting, and potentially dangerous, focus on the short term. Hence we find that investment in brands, in R&D and in capacity may well be curtailed if there is no prospect of an immediate payback.

Just as powerful an influence on decision making and management horizons is cash flow. Strong positive cash flow has become as much a desired goal of management as profit.

The third financial dimension to decision making is resource utilization and specifically the use of fixed and working capital. The pressure in most organizations is to improve the productivity of capital – 'to make the assets sweat'. In this regard it is usual to utilize the concept of return on investment (ROI). Return on investment is the ratio between the net profit and the capital that was employed to produce that profit, thus:

## LOGISTICS AND SUPPLY CHAIN MANAGEMENT

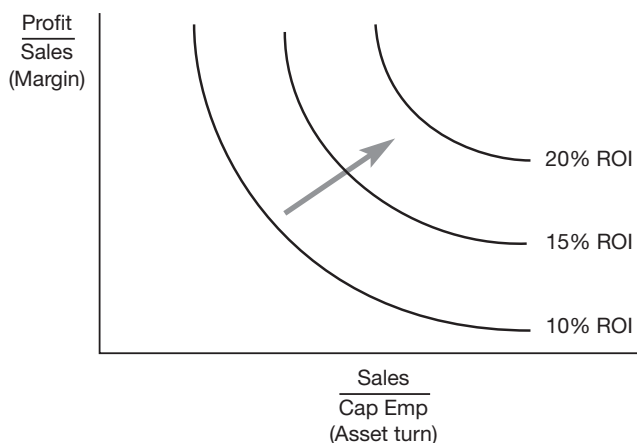
$$\text{ROI} = \frac{\text{Profit}}{\text{Capital employed}}$$

This ratio can be further expanded:

$$\text{ROI} = \frac{\text{Profit}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Capital employed}}$$

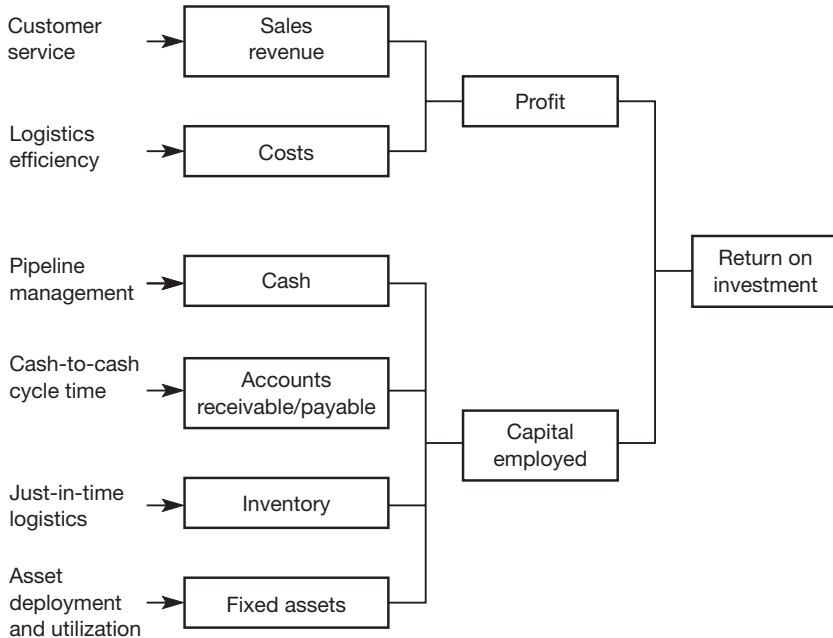
It will be seen that ROI is the product of two ratios: the first, profit/sales, being commonly referred to as the margin and the second, sales/capital employed, termed capital turnover or asset turn. Thus to gain improvement on ROI one or other, or both, of these ratios must increase. Typically many companies will focus their main attention on the margin in their attempt to drive up ROI, yet it can often be more effective to use the leverage of improved capital turnover to boost ROI. For example, many successful retailers have long since recognized that very small net margins can lead to excellent ROI if the productivity of capital is high, e.g. limited inventory, high sales per square foot, premises that are leased rather than owned and so on.

Figure 3.1 illustrates the opportunities that exist for boosting ROI through either achieving better margins or higher assets turns or both. Each 'iso-curve' reflects the different ways the same ROI can be achieved through specific margin/asset turn combination. The challenge to logistics management is to find ways of moving the iso-curve to the right.



**Fig. 3.1 The impact of margin and asset turn on ROI**

The ways in which logistics management can impact on ROI are many and varied. Figure 3.2 highlights the major elements determining ROI and the potential for improvement through more effective logistics management.



**Fig. 3.2 Logistics impact on ROI**

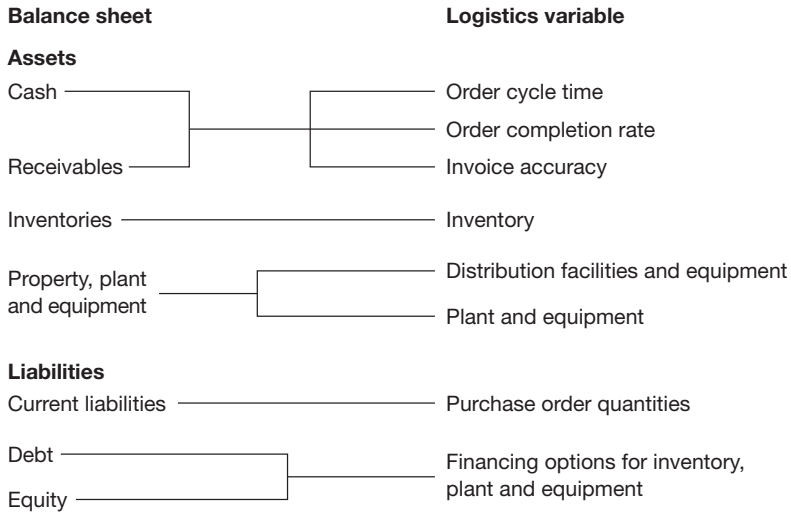
### Logistics and the balance sheet

As well as its impact on operating income (revenue less costs) logistics can affect the balance sheet of the business in a number of ways. In today's financially-oriented business environment improving the shape of the balance sheet through better use of resources has become a priority.

Once again better logistics management has the power to transform performance in this crucial area. Figure 3.3 summarizes the major elements of the balance sheet and links to each of the relevant logistics management components.

By examining each element of the balance sheet in turn it will be seen how logistics variables can influence its final shape.

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**Fig. 3.3 Logistics management and the balance sheet**

#### Cash and receivables

This component of current assets is crucial to the liquidity of the business. In recent years its importance has been recognized as more companies become squeezed for cash. It is not always recognized however that logistics variables have a direct impact on this part of the balance sheet. For example, the shorter the order cycle time, from when the customer places the order to when the goods are delivered, the sooner the invoice can be issued. Likewise the order completion rate can affect the cash flow if the invoice is not issued until after the goods are despatched. One of the less obvious logistics variables affecting cash and receivables is invoice accuracy. If the customer finds that his invoice is inaccurate he is unlikely to pay and the payment lead time will be extended until the problem is rectified.

#### Inventories

Fifty per cent or more of a company's current assets will often be tied up in inventory. Logistics is concerned with all inventory within the business from raw materials, subassembly or bought-in components, through work-in-progress to finished goods. The company's policies on inventory levels and stock locations will clearly influence the size of total inventory. Also influential will be the extent to which inventory levels are monitored and managed, and beyond that the extent to which strategies are in operation that minimize the need for inventory.

**Property, plant and equipment**

The logistics system of any business will usually be a heavy user of fixed assets. The plant, depots and warehouses that form the logistics network, if valued realistically on a replacement basis, will represent a substantial part of total capacity employed (assuming that they are owned rather than rented or leased). Materials handling equipment, vehicles and other equipment involved in storage and transport can also add considerably to the total sum of fixed assets. Many companies have outsourced the physical distribution of their products partly to move assets off their balance sheet. Warehouses, for example, with their associated storage and handling equipment represent a sizeable investment and the question should be asked: 'Is this the most effective way to deploy our assets?'

**Current liabilities**

The current liabilities of the business are debts that must be paid in cash within a specified period of time. From the logistics point of view the key elements are accounts payable for bought-in materials, components, etc. This is an area where a greater integration of purchasing with operations management can yield dividends. The traditional concepts of economic order quantities can often lead to excessive levels of raw materials inventory as those quantities may not reflect actual manufacturing or distribution requirements. The phasing of supplies to match the total logistics requirements of the system can be achieved through the twin techniques of materials requirement planning (MRP) and distribution requirements planning (DRP). If premature commitment of materials can be minimized this should lead to an improved position on current liabilities.

**Debt/equity**

Whilst the balance between debt and equity has many ramifications for the financial management of the total business it is worth reflecting on the impact of alternative logistics strategies. More companies are leasing plant facilities and equipment and thus converting a fixed asset into a continuing expense. The growing use of 'third-party' suppliers for warehousing and transport instead of owning and managing these facilities in-house is a parallel development. These changes obviously affect the funding requirements of the business. They may also affect the means

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whereby that funding is achieved, i.e. through debt rather than equity. The ratio of debt to equity, usually referred to as 'gearing' or 'leverage', will influence the return on equity and will also have implications for cash flow in terms of interest payments and debt repayment.

### **Logistics and shareholder value**

One of the key measures of corporate performance today is shareholder value. In other words, what is the company worth to its owners? Increasingly senior management within the business is being driven by the goal of enhancing shareholder value. There are a number of complex issues involved in actually calculating shareholder value but at its simplest it is determined by the net present value of future cash flows. These cash flows may themselves be defined as:

$$\begin{array}{r}
 \text{Net operating income} \\
 \text{less} \\
 \text{Taxes} \\
 \text{less} \\
 \text{Working capital investment} \\
 \text{less} \\
 \text{Fixed capital investment} \\
 = \\
 \text{After-tax free cash flow}
 \end{array}$$

More recently there has been a further development in that the concept of economic value added (EVA) has become widely used and linked to the creation of shareholder value. The term EVA originated with the consulting firm Stern Stewart,<sup>2</sup> although its origins go back to the economist Alfred Marshall who, over 100 years ago, developed the concept of 'economic income'.

Essentially EVA is the difference between operating income after taxes less the true cost of capital employed to generate those profits. Thus:

$$\begin{array}{r}
 \text{Economic value added (EVA)} \\
 = \text{Profit after tax} - \text{True cost of capital employed}
 \end{array}$$

It will be apparent that it is possible for a company to generate a negative EVA. In other words, the cost of capital employed is greater than the profit after tax. The impact of a negative EVA, particularly if



sustained over a period of time, is to erode shareholder value. Equally improvements in EVA will lead to an enhancement of shareholder value. If the net present value of expected future EVAs were to be calculated this would generate a measure of wealth known as market value added (MVA), which is a true measure of what the business is worth to its shareholders. A simple definition of MVA is:

$$\begin{aligned} & \text{Stock price} \times \text{Issued shares} \\ & \quad \textit{less} \\ & \text{Book value of total capital invested} \\ & \quad = \\ & \text{Market value added} \end{aligned}$$

and, as we have already noted,

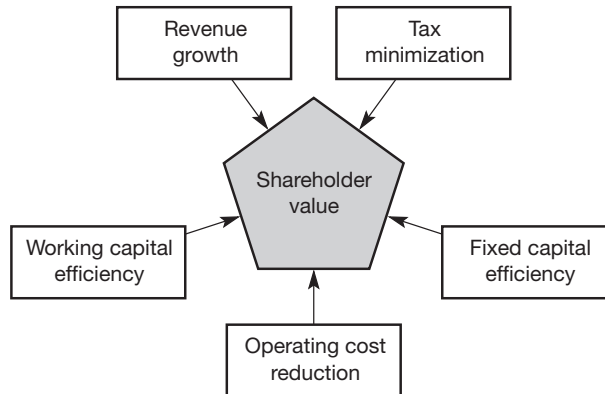
$$\text{MVA} = \text{Net present value of expected future EVA}$$

Clearly, it will be recognized that there are a number of significant connections between logistics performance and shareholder value. Not only the impact that logistics service can have upon net operating income (profit) but also the impact on capital efficiency (asset turn). Many companies have come to realize the effect that lengthy pipelines and highly capital-intensive logistics facilities can have on EVA and hence shareholder value. As a result they have focused on finding ways in which pipelines can be shortened and, consequently, working capital requirements reduced. At the same time they have looked again at their fixed capital deployment of distribution facilities and vehicle fleets and in many cases have moved these assets off the balance sheet through the use of third-party logistics service providers.

#### **The drivers of shareholder value**

The five basic drivers of enhanced shareholder value are shown in Figure 3.4. They are revenue growth, operating cost reduction, fixed capital efficiency, working capital efficiency and tax minimization. All five of these drivers are directly and indirectly affected by logistics management and supply chain strategy.

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**Fig. 3.4 The drivers of shareholder value**

#### **Revenue growth**

The critical linkage here is the impact that logistics service can have on sales volume and customer retention. Whilst it is not generally possible to calculate the exact correlation between service and sales there have been many studies that have indicated a positive causality.

It can also be argued that superior logistics service (in terms of reliability and responsiveness) can strengthen the likelihood that customers will remain loyal to a supplier. In Chapter 2 it was suggested that higher levels of customer retention lead to greater sales. Typically this occurs because satisfied customers are more likely to place a greater proportion of their purchases with that supplier.

#### **Operating cost reduction**

The potential for operating cost reduction through logistics and supply chain management is considerable. Because a large proportion of costs in a typical business are driven by logistics decisions and the quality of supply chain relationships, it is not surprising that in the search for enhanced margins many companies are taking a new look at the way they manage the supply chain.

It is not just the transportation, storage, handling and order processing costs within the business that need to be considered. Rather a total pipeline view of costs on a true 'end-to-end' basis should be taken. Often the upstream logistics costs can represent a significant proportion of total supply chain costs embedded in the final product.

There is also a growing recognition that time compression in the supply chain not only enhances customer service but can also reduce costs through the reduction of non-value-adding activities. This is an issue that we shall return to in Chapter 5.

**Fixed capital efficiency**

Logistics by its very nature tends to be fixed asset 'intensive'. Trucks, distribution centres and automated handling systems involve considerable investment and, consequently, will often depress return on investment. In conventional multi-echelon distribution systems, it is not unusual to find factory warehouses, regional distribution centres and local depots, all of which represent significant fixed investment.

One of the main drivers behind the growth of the third-party logistics service sector has been the desire to reduce fixed asset investment. At the same time the trend to lease rather than buy has accelerated. Decisions to rationalize distribution networks and production facilities are increasingly being driven by the realization that the true cost of financing that capital investment is sometimes greater than the return it generates.

**Working capital efficiency**

Supply chain strategy and logistics management are fundamentally linked to the working capital requirement within the business. Long pipelines by definition generate more inventory; order fill and invoice accuracy directly impact accounts receivable and procurement policies also affect cash flow. Working capital requirements can be dramatically reduced through time compression in the pipeline and subsequently reduced order-to-cash cycle times.

Surprisingly few companies know the true length of the pipeline for the products they sell. The 'cash-to-cash' cycle time (i.e. the elapsed time from procurement of materials/components through to sale of the finished product) can be six months or longer in many manufacturing industries. By focusing on eliminating non-value-adding time in the supply chain, dramatic reduction in working capital can be achieved. So many companies have lived with low inventory turns for so long that they assume that it is a feature of their industry and that nothing can be done. They are also possibly not motivated to give working capital reduction a higher priority because an unrealistically low cost of capital is being employed.

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**Tax minimization**

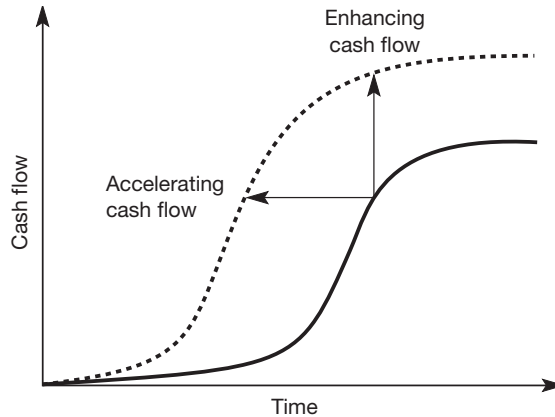
In today's increasingly global economy organizations have choices as to where they can locate their assets and activities. Because tax regimes are different country by country, location decisions can have an important impact on after-tax free cash flow. It is not just corporate taxes on profits that are affected, but also property tax and excise duty on fuel. Customs regulations, tariffs and quotas become further considerations, as do rules and regulation on transfer pricing. For large global companies with production facilities in many different countries and with dispersed distribution centres and multiple markets, supply chain decisions can significantly affect the total tax bill and hence shareholder value.

**The role of cash flow in creating shareholder value**

There is general agreement with the view of Warren Buffet<sup>3</sup> that ultimately the value of a business to its owners is determined by the net present value of the free cash flow occurring from its operations over its lifetime. Thus the challenge to managers seeking to enhance shareholder value is to identify strategies that can directly or indirectly affect free cash flow. Srivastava *et al.*<sup>4</sup> have suggested that the value of any strategy is inherently driven by:

1. An acceleration of cash flows because risk and time adjustments reduce the value of later cash flows;
2. An increase in the level of cash flows (e.g. higher revenues and/or lower costs, working capital and fixed investment);
3. A reduction in risk associated with cash flows (e.g. through reduction in both volatility and vulnerability of future cash flows) and hence, indirectly, the firm's cost of capital; and
4. The residual value of the business (long-term value can be enhanced, for example, by increasing the size of the customer base).

In effect, what Srivastava *et al.* are suggesting is that strategies should be evaluated in terms of how they either *enhance* or *accelerate* cash flow. Those strategic objectives can be graphically expressed as a cumulative distribution of free cash flow over time (see Figure 3.5) with the objective of building a greater cumulative cash flow, sooner. Obviously the sooner cash is received and the greater the amount then the greater will be the net present value of those cash flows.



**Fig. 3.5 Changing the cash flow profile**

Source: Srivastava *et al.*<sup>5</sup>

An example of the impact that logistics issues can have on the financial performance of a company is provided by the comparison of two North American retailers, Wal-Mart and Kmart.

### **Wal-Mart and Kmart**

In 2002 five general merchandise retailers – Wal-Mart, Kmart, Target, Costco and Sears – accounted for 60 per cent of US sales in that sector.<sup>1</sup> Wal-Mart was the undisputed market and cost leader and the main innovator in North American retailing. It was the first to introduce the ‘big box’ retail format and flexible cross-trained employees who could work in more than one department. Historically Wal-Mart also led the way with aggressive investment in IT. Back in the 1960s it was one of the first to use computers to track inventory and was an early adopter of bar-codes technology in the 1980s. In 1983 it was reported that Wal-Mart was spending only 2 cents in the sales dollar on getting goods into the stores, while its long-established competitor Kmart was spending 5 cents per dollar on the same activities.<sup>2</sup>

Wal-Mart subsequently became a classic case study for supply chain management programmes, due to its use of Electronic Data Interchange (EDI) to improve co-ordination with suppliers. Technological innovations were coupled with a strategy that exploited economies of scale in purchasing and logistics, and gradually expanded operations around central distribution centres. By 1987 it enjoyed a 9 per cent market

share, but was 40 per cent more productive than its competitors as measured by sales per employee.

The introduction soon afterwards of wireless scanning guns and the Retail Link Program, which captures sales data giving real-time visibility of stock holding and sales patterns, were just two more technological innovations that boosted capital and labour productivity. They facilitated more effective micro-merchandising campaigns as well as improved inventory management, allowing a better overall value proposition for customers, not least from significant cost savings, which were passed on to customers in the form of 'every day low prices'.

By 1995 Wal-Mart had increased its market share to 27 per cent and widened the gap on productivity to 48 per cent. Other retailers adopted many of the same practices and technological solutions to improve their own performance. Nevertheless, Wal-Mart maintained a commanding lead, improving its own performance by an additional 22 per cent in the four years to 1999. Wal-Mart's sales per employee leapt from \$148,000 to \$181,000 between 1995 and 1999. Kmart, for decades the dominant force in general merchandise retailing, only managed to improve its own performance from \$109,000 to \$133,000 over the same period.

In sharp contrast to Wal-Mart, Kmart had been losing favour with US shoppers for years. Poor in-store presentation and unhelpful staff had eroded customer satisfaction, as had promotional flyers advertising cut-price products that were often missing from the shelves. Sometimes the stock was simply unavailable, while other times it was on site but had been left to linger in the back of the stores before being unpacked and logged on the central tracking system.

Kmart had tried to challenge Wal-Mart on ever more competitive promotional pricing, but its supply chain lacked the co-ordination to respond to the demand volatility the promotions induced. Its on-shelf availability had dropped to 86 per cent, while massively bloated stocks of seasonal items filled its warehouses long after the appropriate sales period had passed. The result was that while Wal-Mart enjoyed a stock-turn of 7.3 in 2000, Kmart could only manage 3.6 turns.

In September 2001 Kmart's Chief Executive issued a statement admitting that: 'I believe the supply chain is really the Achilles heel of Kmart. Just fixing the supply chain could really turbo-charge Kmart.'<sup>3</sup>

Efforts to ‘just fix’ the supply chain involved the introduction of point-of-sale systems a month earlier and followed a two-year \$1.7bn IT upgrade, plus \$70m spent on the introduction of hand-held scanners in 2000. The investment was too little too late.

Wal-Mart had spent \$4bn on its supply chain system and then forced suppliers to invest a further \$40bn in their supply chain operations. The suppliers had no choice other than to adopt the tools required to drive their own costs down further. Kmart had no chance of matching that level of performance. Its sales per square foot were by then only \$227, almost half of Wal-Mart’s \$446.

The impact of the difference in performance of the two companies’ supply chains has been dramatic. In January 2002 Kmart became the largest company, ever to file for Chapter 11 bankruptcy. Wal-Mart, the world’s largest company, continues to prosper.

#### References

1. Johnson, B.C. ‘Retail: The Wal-Mart effect’, *McKinsey Quarterly*, No. 1, 2002.
2. Simpson, L. ‘No so Special K’, *Supply Management*, 2 March 2002, pp. 22–25.
3. *Ibid.*

## Logistics cost analysis

After a century or more of reliance upon traditional cost accounting procedures to provide an often unreliable insight into profitability, managers are now starting to question the relevance of these methods.<sup>6</sup> The accounting frameworks still in use by the majority of companies today rely upon arbitrary methods for the allocation of shared and indirect costs and hence frequently distort the true profitability of both products and customers. Indeed, as we shall see, these traditional accounting methods are often quite unsuited for analyzing the profitability of customers and markets since they were originally devised to measure product costs.

Because logistics management is a flow-oriented concept with the objective of integrating resources across a pipeline which extends from suppliers to final customers, it is desirable to have a means whereby costs and performance of that pipeline flow can be assessed.

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## LOGISTICS AND SUPPLY CHAIN MANAGEMENT

Probably one of the main reasons why the adoption of an integrated approach to logistics and distribution management has proved so difficult for many companies is the lack of appropriate cost information. The need to manage the total distribution activity as a complete system, having regard for the effects of decisions taken in one cost area upon other cost areas, has implications for the cost accounting systems of the organization. Typically, conventional accounting systems group costs into broad, aggregated categories which do not then allow the more detailed analysis necessary to identify the true costs of servicing customers buying particular product mixes. Without this facility to analyze aggregated cost data, it becomes impossible to reveal the potential for cost trade-offs that may exist within the logistics system.

Generally the effects of trade-offs are assessed in two ways: from the point of view of their impact on total costs and their impact on sales revenue. For example, it may be possible to trade-off costs in such a way that total costs increase, yet because of the better service now being offered, sales revenue also increases. If the difference between revenue and costs is greater than before, the trade-off may be regarded as leading to an improvement in cost effectiveness. However, without an adequate logistics-oriented cost accounting system it is extremely difficult to identify the extent to which a particular trade-off is cost-beneficial.

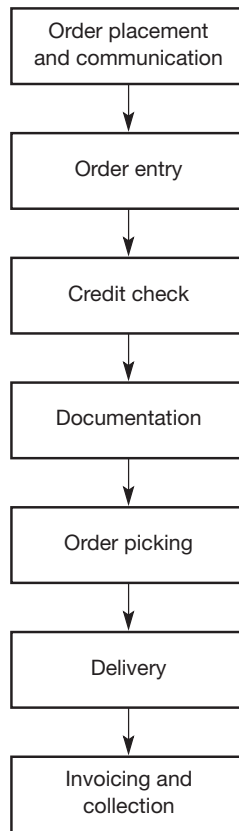
### **The concept of total cost analysis**

Many problems at the operational level in logistics management arise because all the impacts of specific decisions, both direct and indirect, are not taken into account throughout the corporate system. Too often decisions taken in one area can lead to unforeseen results in other areas. Changes in policy on minimum order value, for example, may influence customer ordering patterns and lead to additional costs. Similarly, changes in production schedules that aim to improve production efficiency may lead to fluctuations in finished stock availability and thus affect customer service.

The problems associated with identifying the total system impact of distribution policies are immense. By its very nature logistics cuts across traditional company organization functions with cost impacts on most of those functions. Conventional accounting systems do not



usually assist in the identification of these company-wide impacts, frequently absorbing logistics-related costs in other cost elements. The cost of processing orders, for example, is an amalgam of specific costs incurred in different functional areas of the business which generally prove extremely difficult to bring together. Figure 3.6 outlines the various cost elements involved in the complete order processing cycle, each of these elements having a fixed and variable cost component which will lead to a different total cost per order.



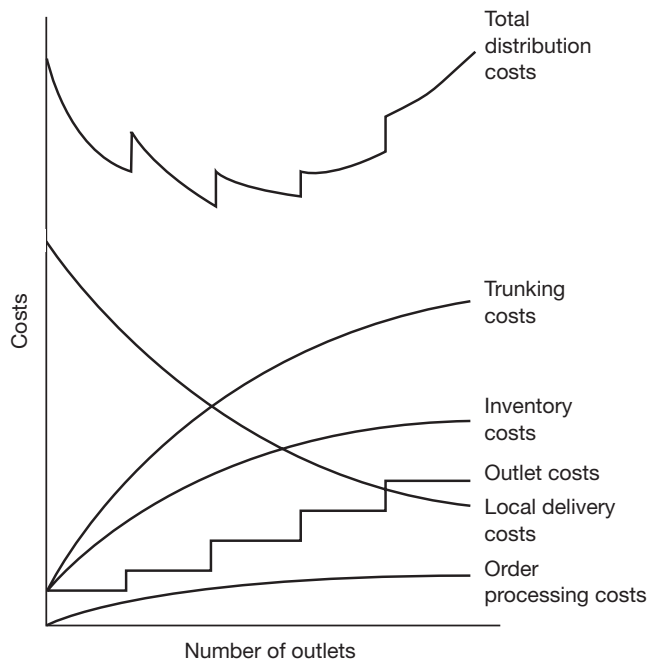
**Fig. 3.6 Stages in the order-to-collection cycle**

Accounting practice for budgeting and standard-setting has tended to result in a compartmentalization of company accounts; thus budgets tend to be set on a functional basis. The trouble is that policy costs do not usually confine themselves within the same watertight boundaries. It

## LOGISTICS AND SUPPLY CHAIN MANAGEMENT

is the nature of logistics that, like a stone thrown into a pond, the effects of specific policies spread beyond their immediate area of impact.

A further feature of logistics decisions that contributes to the complexity of generating appropriate cost information is that they are usually taken against a background of an existing system. The purpose of total cost analysis in this context is to identify the change in costs brought about by these decisions. Cost must therefore be viewed in incremental terms – the change in total costs caused by the change to the system. Thus the addition of an extra warehouse to the distribution network will bring about cost changes in transport, inventory investment and communications. It is the incremental cost difference between the two options that is the relevant accounting information for decision making in this case. Figure 3.7 shows how total logistics costs can be influenced by the addition, or removal, of a depot from the system.

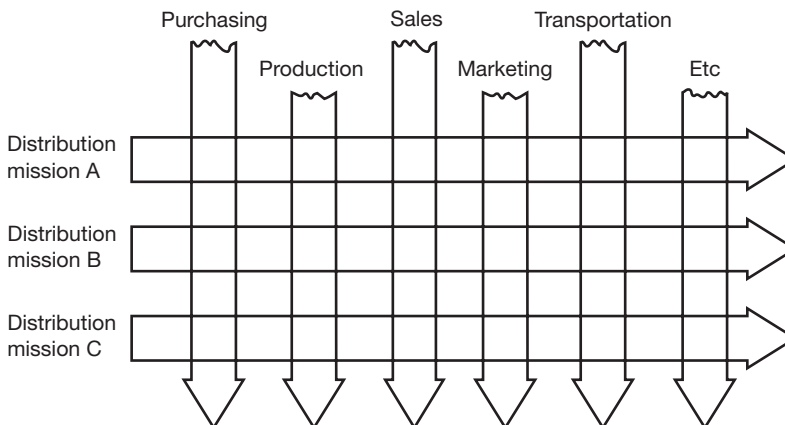


**Fig. 3.7 The total costs of a distribution network**

### Principles of logistics costing

It will be apparent from the previous comments that the problem of developing an appropriate logistics-oriented costing system is primarily one of focus. That is the ability to focus upon the output of the distribution system, in essence the provision of customer service, and to identify the unique costs associated with that output. Traditional accounting methods lack this focus, mainly because they were designed with something else in mind.

One of the basic principles of logistics costing, it has been argued, is that the system should mirror the materials flow, i.e. it should be capable of identifying the costs that result from providing customer service in the marketplace. A second principle is that it should be capable of enabling separate cost and revenue analyses to be made by customer type and by market segment or distribution channel. This latter requirement emerges because of the dangers inherent in dealing solely with averages, e.g. the average cost per delivery, since they can often conceal substantial variations either side of the mean.



**Fig. 3.8 Logistics missions that cut across functional boundaries**

To operationalize these principles requires an 'output' orientation to costing. In other words, we must first define the desired outputs of the logistics system and then seek to identify the costs associated with providing those outputs. A useful concept here is the idea of 'mission'. In the context of logistics, a mission is a set of customer service goals to

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be achieved by the system within a specific product/market context. Missions can be defined in terms of the type of market served, by which products and within what constraints of service and cost. A mission by its very nature cuts across traditional company lines. Figure 3.8 illustrates the concept and demonstrates the difference between an 'output' orientation based upon missions and the 'input' orientation based upon functions.

The successful achievement of defined mission goals involves inputs from a large number of functional areas and activity centres within the firm. Thus an effective logistics costing system must seek to determine the total systems cost of meeting desired logistic objectives (the 'output' of the system) and the costs of the various inputs involved in meeting these outputs. Interest has been growing in an approach to this problem, known as 'mission costing'.<sup>7</sup>

Figure 3.9 illustrates how three distribution missions may make a differential impact upon activity centre/functional area costs and, in so doing, provide a logical basis for costing within the company. As a cost or budgeting method, mission costing is the reverse of traditional techniques: under this scheme a functional budget is determined now by the demands of the missions it serves. Thus in Figure 3.9 the cost per mission is identified horizontally and from this the functional budgets may be determined by summing vertically.

Given that the logic of mission costing is sound, how might it be made to work in practice? This approach requires firstly that the activity centres associated with a particular distribution mission be identified, e.g. transport, warehousing, inventory, etc., and secondly that the incremental costs for each activity centre incurred as a result of undertaking that mission must be isolated. Incremental costs are used because it is important not to take into account 'sunk' costs or costs that would still be incurred even if the mission were abandoned. We can make use of the idea of 'attributable costs'<sup>8</sup> to operationalize the concept:

*Attributable cost is a cost per unit that could be avoided if a product or function were discontinued entirely without changing the supporting organization structure.*

## 3 MEASURING LOGISTICS COSTS AND PERFORMANCE

	Functional area/ Activity centre 1	Functional area/ Activity centre 2	Functional area/ Activity centre 3	Functional area/ Activity centre 4	Total mission cost
Mission A	100	90	20	80	290
Mission B	50	70	200	20	340
Mission C	70	30	50	70	220
Activity centre inputs	220	190	270	170	850

**Fig. 3.9 The programme budget (£'000)**

In determining the costs of an activity centre, e.g. transport, attributable to a specific mission, the question should be asked: 'What costs would we avoid if this customer/segment/channel were no longer serviced?' These avoidable costs are the true incremental costs of servicing the customer/segment/channel. Often they will be substantially lower than the average cost because so many distribution costs are fixed and/or shared. For example, a vehicle leaves a depot in London to make deliveries in Nottingham and Leeds. If those customers in Nottingham were abandoned, but those in Leeds retained, what would be the difference in the total cost of transport? The answer would be – not very much, since Leeds is further north from London than Nottingham. However, if the customers in Leeds were dropped, but not those in Nottingham, there would be a greater saving of costs because of the reduction in miles travelled.

This approach becomes particularly powerful when combined with a customer revenue analysis, because even customers with low sales off-take may still be profitable in incremental costs terms if not on an average cost basis. In other words the company would be worse off if those customers were abandoned.

Such insights as this can be gained by extending the mission costing concept to produce profitability analyses for customers, market segments or distribution channels. The term 'customer profitability

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accounting' describes any attempt to relate the revenue produced by a customer, market segment or distribution channel to the costs of servicing that customer/segment/channel. The principles of customer profitability accounting will be explored in detail later in this chapter.

**The cost of holding inventory**

As we noted, there are many costs incurred in the total logistics process of converting customer orders into cash. However, one of the largest cost elements is also the one that is perhaps least well accounted for and that is inventory. Is it probably the case that many managers are unaware of what the true cost of holding inventory actually is. If all the costs that arise as a result of holding inventory are fully accounted for, then the real holding cost of inventory is probably in the region of 25 per cent per annum of the book value of the inventory.

The reason this figure is as high as it is is that there are a number of costs to be included. The largest cost element will normally be the cost of capital. The cost of capital comprises the cost to the company of debt and the cost of equity. It is usual to use the *weighted cost of capital* to reflect this. Hence, even though the cost of borrowed money might be low, the expectation of shareholders as to the return they are looking for from the equity investment could be high.

The other costs that need to be included in the inventory holding cost are the costs of storage and handling, obsolescence, deterioration and pilferage, as well as insurance and all the administrative costs associated with the management of the inventory (see box).

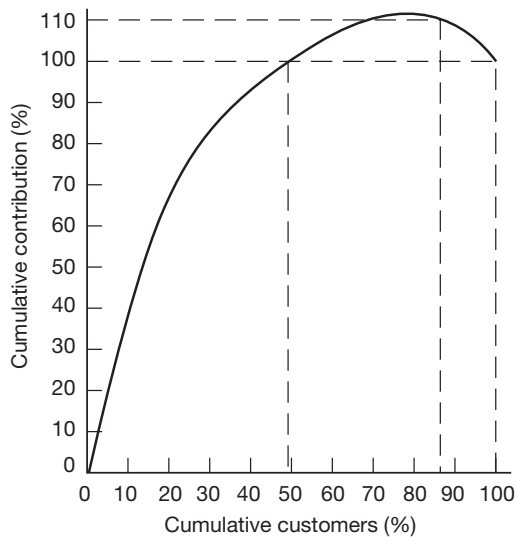
**■ The true cost of inventory ■**

- Cost of capital
- Storage and handling
- Obsolescence
- Damage and deterioration
- Pilferage/shrinkage
- Insurance
- Management costs

### **Customer profitability analysis**

One of the basic questions that conventional accounting procedures have difficulty answering is: 'How profitable is this customer compared to another?' Usually customer profitability is only calculated at the level of gross profit – in other words the net sales revenue generated by the customer in a period, less the cost of goods sold for the actual product mix purchased. However, there are still many other costs to take into account before the real profitability of an individual customer can be exposed. The same is true if we seek to identify the relative profitability of different market segments or distribution channels.

The significance of these costs that occur as a result of servicing customers can be profound in terms of how logistics strategies should be developed. Firstly, customer profitability analysis will often reveal a proportion of customers who make a negative contribution, as in Figure 3.10. The reason for this is very simply that the costs of servicing a customer can vary considerably – even between two customers who may make equivalent purchases from us.



**Figure 3.10 Customer profitability analysis**

Source: Hill, G.V., *Logistics – The Battleground of the 1990s*, A.T. Kearney.

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If we think of all the costs that a company incurs from when it captures an order from a customer to when it collects the payment, it will be apparent that the total figure could be quite high. It will also very likely be the case that there will be significant differences in these costs customer by customer. At the same time, different customers will order a different mix of products so the gross margin that they generate will differ.

As Table 3.1 highlights, there are many costs that need to be identified if customer profitability is to be accurately measured.

**Table 3.1 The customer profit and loss account**

<b>Revenues</b>	● Net sales value
<i>Less</i>	
<b>Costs</b> (attributable costs only)	<ul style="list-style-type: none"> <li>● Cost of sales (actual product mix)</li> <li>● Commissions</li> <li>● Sales calls</li> <li>● Key account management time</li> <li>● Trade bonuses and special discount</li> <li>● Order processing costs</li> <li>● Promotional costs (visible and hidden)</li> <li>● Merchandising costs</li> <li>● Non-standard packaging/unitization</li> <li>● Dedicated inventory holding costs</li> <li>● Dedicated warehouse space</li> <li>● Materials handling costs</li> <li>● Transport costs</li> <li>● Documentation/communications costs</li> <li>● Returns/refusals</li> <li>● Trade credit (actual payment period)</li> </ul>

The best measure of customer profitability is to ask the question: 'What costs would I avoid and what revenues would I lose if I lost this customer?' This is the concept of 'avoidable' costs and incremental revenue. Using this principle helps circumvent the problems that arise when fixed costs are allocated against individual customers.



### ■ The average customer ■

A study by the consulting company A.T. Kearney suggested that the significance of customer-oriented costs is not their average value, but specifically how they vary by customer, by order size, by type of order and other key factors. Whilst the average cost per customer may be easily calculated, there may be no customer that incurs the average cost to serve. The need is to be aware of the customers at the extremes of the cost range because, on the one hand, profits may be eroded by serving them and, on the other, although high profit is being generated, the business is vulnerable to competitive price-cutting. The table below shows an example of the range of values of some customer-oriented costs expressed as a percentage of net sales. This illustrates how misleading the use of averages can be.

#### Customer costs as a % of net sales

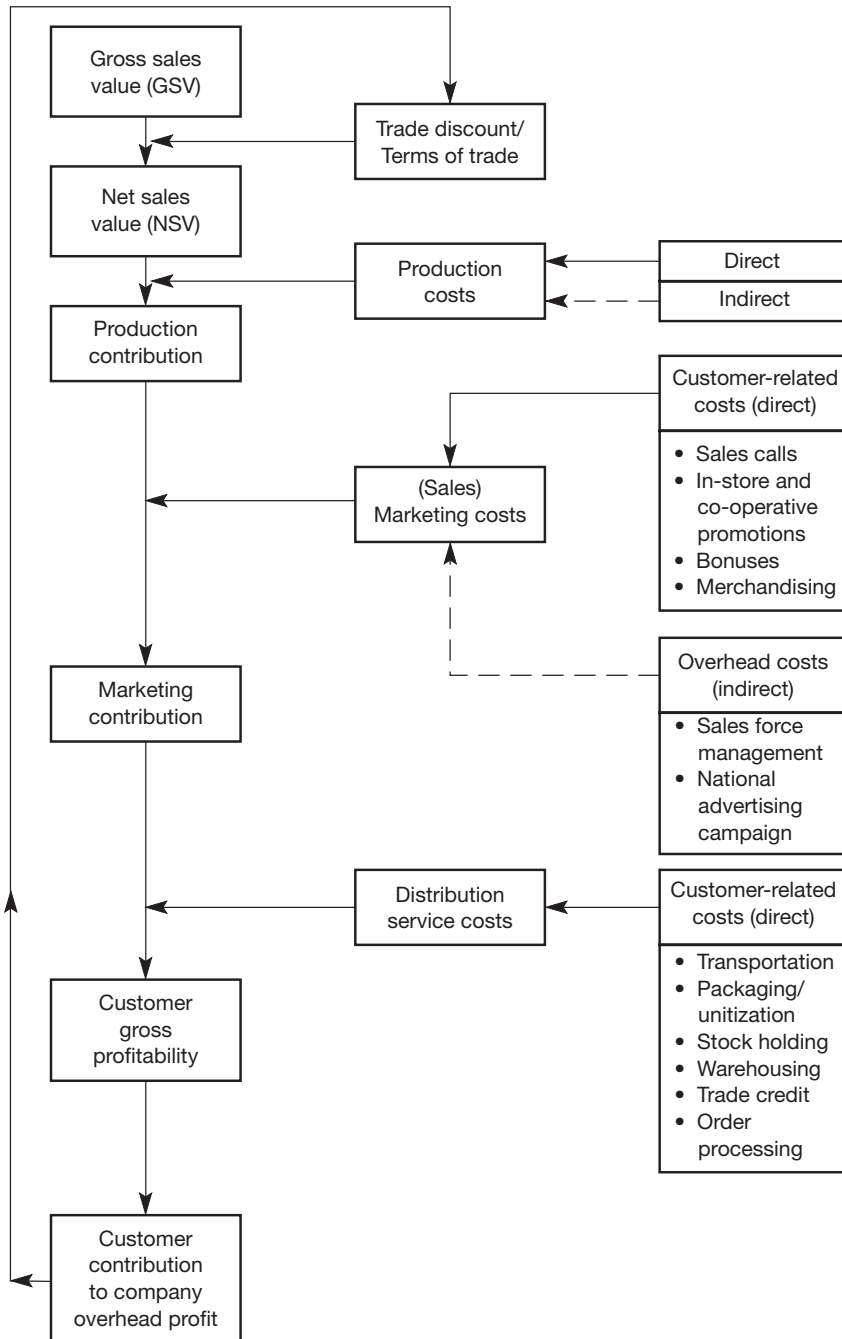
	<i>Low</i>	<i>Average</i>	<i>High</i>
Order processing	0.2	2.6	7.4
Inventory carrying	1.1	2.6	10.2
Picking and shipping	0.3	0.7	2.5
Outbound freight	2.8	7.1	14.1
Commissions	2.4	3.1	4.4

Source: Hill, G.V. and Harland, D.V., 'The Customer Profit Centre', *Focus*, Institute of Logistics and Distribution Management, Vol. 2, No. 2, 1983.

What sort of costs should be taken into account in this type of analysis? Figure 3.11 presents a basic model that seeks to identify only those customer-related costs that are avoidable (i.e. if the customer did not exist, these costs would not be incurred).

The starting point is the gross sales value of the order from which is then subtracted the discounts that are given on that order to the customer. This leaves the net sales value from which must be taken the direct production costs or cost of goods sold. Indirect costs are not allocated unless they are fully attributable to that customer. The same principle applies to sales and marketing costs as attempts to allocate indirect costs, such as national advertising, can only be done on an arbitrary and usually misleading basis. The attributable distribution costs can then be assigned to give customer gross contribution. Finally any other customer-related costs, such as trade credit, returns, etc., are subtracted to give a net

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**Fig. 3.11 Customer profitability analysis: a basic model**

Source: Gattorna, J.L. and Walters, D.W., *Managing the Supply Chain: A Strategic Perspective*, Macmillan Press, 1996.

contribution to overheads and profit. Often the figure that emerges as the 'bottom line' can be revealing as shown, in Table 3.2.

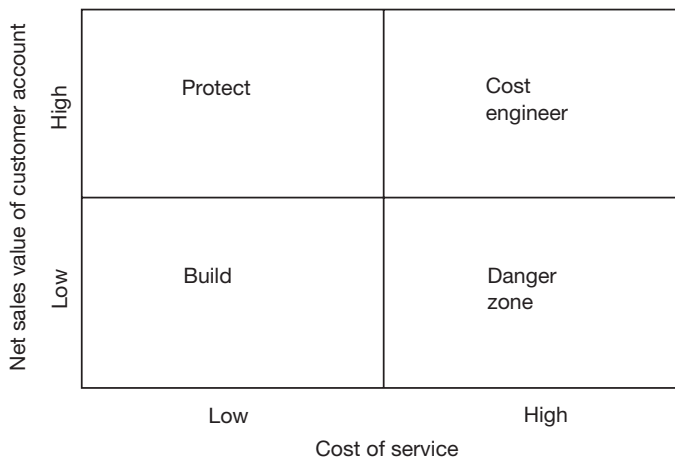
**Table 3.2 Analysis of revenue and cost for a specific customer**

	£	£
Gross sales value		100,000
Less discount	10,000	
Net sales value		90,000
Less direct cost of goods sold	20,000	
Gross contribution		70,000
Less sales and marketing costs:		
Sales calls	3,000	
Co-operative promotions	1,000	
Merchandising	3,000	
	<u>7,000</u>	
		63,000
Less distribution costs:		
Order processing	500	
Storage and handling	600	
Inventory financing	700	
Transport	2,000	
Packaging	300	
Refusals	500	
	<u>4,600</u>	
Customer gross contribution		58,400
Less other customer-related costs:		
Credit financing	1,500	
Returns	500	
	<u>2,000</u>	
Customer net contribution		56,400

In this case a gross contribution of £70,000 becomes a net contribution of £56,400 as soon as the costs unique to this customer are taken into account. If the analysis were to be extended by attempting to allocate overheads (a step not to be advised because of the problems usually associated with such allocation), what might at first seem to be a profitable customer could be deemed to be the reverse. However, as long as the net contribution is positive and there is no 'opportunity cost' in servicing that customer the company would be better off with the business than without it.

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The value of this type of exercise can be substantial. The information could be used, firstly, when the next sales contract is negotiated and, secondly, as the basis for sales and marketing strategy in directing effort away from less profitable types of account towards more profitable business. More importantly it can point the way to alternative strategies for managing customers with high servicing costs. Ideally we require all our customers to be profitable in the medium to long term and where customers currently are profitable we should seek to build and extend that profitability further.



**Fig. 3.12 Customer profitability matrix**

Figure 3.12 represents a simple categorization of customers along two dimensions: their total net sales value during the period and their cost-to-serve. The suggestion is that there could be a benefit in developing customer-specific solutions depending upon which box of the matrix they fall into. Possible strategies for each of the quadrants are suggested below.

**Build**

These customers are relatively cheap to service but their net sales value is low. Can volume be increased without a proportionate increase in the costs of service? Can our sales team be directed to seek to influence these customers' purchases towards a more profitable sales mix?

**Danger zone**

These customers should be looked at very carefully. Is there any medium- to long-term prospect either of improving net sales value or of reducing the costs of service? Is there a strategic reason for keeping them? Do we need them for their volume even if their profit contribution is low?

**Cost engineer**

These customers could be more profitable if the costs of servicing them could be reduced. Is there any scope for increasing drop sizes? Can deliveries be consolidated? If new accounts in the same geographic area were developed would it make delivery more economic? Is there a cheaper way of gathering orders from these customers, e.g. the Internet.

**Protect**

The high net sales value customers who are relatively cheap to service are worth their weight in gold. The strategy for these customers should be to seek relationships which make the customer less likely to want to look for alternative suppliers. At the same time we should constantly seek opportunities to develop the volume of business that we do with them whilst keeping strict control of costs.

Ideally the organization should seek to develop an accounting system that would routinely collect and analyze data on customer profitability. Unfortunately most accounting systems are product focused rather than customer focused. Likewise cost reporting is traditionally on a functional basis rather than a customer basis. So, for example, we know the costs of the transport function as a whole or the costs of making a particular product but what we do not know are the costs of delivering a specific mix of product to a particular customer.

There is a pressing need for companies to move towards a system of accounting for customers and marketing as well as accounting for products. As has often been observed, it is customers who make profits, not products!

**Direct product profitability**

An application of logistics cost analysis that has gained widespread acceptance, particularly in the retail industry, is a technique known as direct product profitability – or more simply ‘DPP’. In essence it is

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somewhat analogous to customer profitability analysis in that it attempts to identify all the costs that attach to a product or an order as it moves through the distribution channel.

The idea behind DPP is that in many transactions the customer will incur costs other than the immediate purchase price of the product. Often this is termed the *total cost of ownership*. Sometimes these costs will be hidden and often they can be substantial – certainly big enough to reduce or even eliminate net profit on a particular item.

For the supplier it is important to understand DPP inasmuch as his ability to be a low-cost supplier is clearly influenced by the costs that are incurred as that product moves through his logistics system. Similarly, as distributors and retailers are now very much more conscious of an item's DPP, it is to the advantage of the supplier equally to understand the cost drivers that impact upon DPP so as to seek to influence it favourably.

Table 3.3 describes the steps to be followed in moving from a crude gross margin measure to a more precise DPP.

**Table 3.3 Direct product profit (DPP)**

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**The net profit contribution from the sales of a product after allowances are added and all costs that can be rationally allocated or assigned to an individual product are subtracted = direct product profit.**

	Sales
-	Cost of goods sold
=	Gross margin
+	Allowances and discounts
=	Adjusted gross margin
-	Warehouse costs
	Labour (labour model – case, cube, weight)
	Occupancy (space and cube)
	Inventory (average inventory)
-	Transportation costs (cube)
-	Retail costs
	Stocking labour
	Front end labour
	Occupancy
	Inventory
=	Direct product profit

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The importance to the supplier of DPP is based on the proposition that a key objective of customer service strategy is 'to reduce the customer's costs of ownership'. In other words the supplier should be looking at his products and asking the question: 'How can I favourably influence the DPP of my customers by changing either the characteristics of the products I sell, or the way I distribute them?'

From pack design onwards there are a number of elements that the manufacturer or supplier may be able to vary in order to influence DPP/square metre in a positive way, for example, changing the case size, increasing the delivery frequency, direct store deliveries, etc.

### **Cost drivers and activity-based costing**

As we indicated earlier in this chapter there is a growing dissatisfaction with conventional cost accounting, particularly as it relates to logistics management. Essentially these problems can be summarized as follows:

- There is a general ignorance of the true costs of servicing different customer types/channels/market segments.
- Costs are captured at too high a level of aggregation.
- Full cost allocation still reigns supreme.
- Conventional accounting systems are functional in their orientation rather than output oriented.
- Companies understand product costs but not customer costs.

The common theme that links these points is that we seem to suffer in business from a lack of visibility of costs as they are incurred through the logistics pipeline. Ideally what logistics management requires is a means of capturing costs as products and orders flow towards the customer.

To overcome this problem it is necessary to change radically the basis of cost accounting away from the notion that all expenses must be allocated (often on an arbitrary basis) to individual units (such as products) and, instead, to separate the expenses and match them to the activities that consume the resources. One approach that can help overcome this problem is 'activity-based costing'.<sup>9</sup> The key to activity-based costing (ABC) is to seek out the 'cost drivers' along the logistics pipeline that cause costs because they consume resources. Thus, for example, if we are concerned to assign the costs of order picking to orders then in the

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past this may have been achieved by calculating an average cost per order. In fact an activity-based approach might suggest that it is the number of lines on an order that consume the order picking resource and hence should instead be seen as the cost driver. Table 3.4 contrasts the ABC approach with the traditional method.

The advantage of using activity-based costing is that it enables each customer's unique characteristics in terms of ordering behaviour and distribution requirements to be separately accounted for. Once the cost attached to each level of activity is identified (e.g. cost per line item picked, cost per delivery, etc.) then a clearer picture of the true cost-to-serve will emerge. Whilst ABC is still strictly a cost allocation method it uses a more logical basis for that allocation than traditional methods.

**Table 3.4 Activity-based costing vs traditional cost bases**

<i>Traditional cost bases</i>		<i>Activity cost bases</i>		
<i>bases</i>	<i>£000s</i>	<i>£000s</i>	<i>Cost drivers</i>	
Salaries	550	Sales order processing	300	Number of orders
Wages	580	Holding inventory	600	Value of shipment
Depreciation	250	Picking	300	Number of order lines
Rent/electricity/ telephone	700	Packing/assembly of orders	100	Number of order lines
Maintenance	100	Loading	200	Weight
Fuel	200	Transportation	500	Location of customer
		Delivery at customer	200	Number of drops
		Solving problems	380	Number of order lines
	£2,380		£2,580	

Source: Based upon Simmons, G. and Steeple, D., "Overhead Recovery – It's as Easy as ABC", *Focus*, Institute of Logistics and Distribution Management, Vol. 10, No. 8, October 1991.

There are certain parallels between activity-based costing and the idea of *mission costing* introduced earlier in this chapter. Essentially mission costing seeks to identify the unique costs that are generated as a result of specific logistics/customer service strategies aimed at targeted market segments. The aim is to establish a better matching of the service needs of the various markets that the company addresses with the inevitably limited resources of the company. There is little point in committing incremental costs where the incremental benefits do not justify the expenditure.



There are four stages in the implementation of an effective mission costing process:

1. *Define the customer service segment*

Use the methodology described in Chapter 2 to identify the different service needs of different customer types. The basic principle is that because not all customers share the same service requirements and characteristics they should be treated differently.

2. *Identify the factors that produce variations in the cost of service*

This step involves the determination of the service elements that will directly or indirectly impact upon the costs of service, e.g. the product mix, the delivery characteristics such as drop size and frequency or incidence of direct deliveries, merchandising support, special packs and so on.

3. *Identify the specific resources used to support customer segments*

This is the point at which the principles of activity-based costing and mission costing coincide. The basic tenet of ABC is that the activities that generate cost should be defined and the specific cost drivers involved identified. These may be the number of lines on an order, the people involved, the inventory support or the delivery frequency.

4. *Attribute activity costs by customer type or segment*

Using the principle of 'avoidability' the incremental costs incurred through the application of a specific resource to meeting service needs are attributed to customers. It must be emphasized that this is not cost allocation but cost attribution. In other words it is because customers use resources that the appropriate share of cost is attributed to them.

Clearly to make this work there is a prerequisite that the cost coding system in the business be restructured. In other words, the coding system must be capable of gathering costs as they are incurred by customers from the point of order generation through to final delivery, invoicing and collection.

The basic purpose of logistics cost analysis is to provide managers with reliable information that will enable a better allocation of resources to be achieved. Given that logistics management, as we have observed, ultimately is concerned to meet customer service requirements in the most cost-effective way, then it is essential that those responsible have the most accurate and meaningful data possible.

## **Summary**

Because logistics costs can account for such a large proportion of total costs in the business it is critical that they be carefully managed. However, it is not always the case that the true costs of logistics are fully understood. Traditional approaches to accounting based upon full-cost allocation can be misleading and dangerous. Activity-based costing methods provide some significant advantages in identifying the real costs of serving different types of customers or different channels of distribution.

Logistics management impacts not only upon the profit and loss account of the business, but also upon the balance sheet. Logistics is also increasingly being recognized as having a significant impact upon economic value added and hence shareholder value. It is critical that decisions on logistics strategies made based upon a thorough understanding of the impact they will have on the financial performance of the business.

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