SWP 61/87   ASSESSING THE COSTS OF LOGISTICS SERVICE

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Probably one of the most important 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 system of the firm. 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 with particular product mixes. Without this facility to analyse 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 system costs, and from their impact on sales revenue. 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, throughout the corporate system are not taken into account. 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 with a view to improving 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 organisation 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 1 outlines the various cost elements involved in the complete order processing cycle.

Accounting practice for budgeting and standard-setting has tended to result in a compartmentalisation 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 is the nature of logistics that, like a stone thrown into a pond, the effects of policies spread beyond their immediate area of impact.

A further feature of logistics decisions contributing to the complexity of generating appropriate cost information is that they are usually taken against a background of an

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existing system. The purpose of total cost analysis in this context is to identify the change in costs brought about by these decisions. The 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, e.g. order processing. It is the incremental cost difference which is the relevant accounting information for decision making in this case. Figure 2 shows how total logistics costs can be influenced by the addition, or removal, of a depot from the system.

It can be seen therefore that the logistics cost accounting problem is substantial and yet it must be solved for the full potential of improved logistics management to be realised.

Principles of Logistics Service 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 conceal substantial variations either side of the mean.

To operationalise the first principle requires an 'output' orientation to costing. In other words, 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 the 'mission'[1] In the context of logistics, a mission is a set of goals to 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 illustrates the concept and demonstrates the difference between an 'output' orientation based on missions and the 'input' orientation based on 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 distribution costing system must seek to determine the total systems cost of meeting desired distribution objectives (the 'outputs' of the system) and the costs of various inputs involved in meeting those outputs. Interest has been generated recently in an approach to this problem known as 'mission costing'[2].

Figure 4 illustrates how three distribution missions may make a differential impact on 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 4, the cost per mission is identified horizontally and from this the functional budgets may be determined by summing vertically.

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Given that the logic of mission costing is sound, how might it be made to work in practice? The pioneering work of Barrett[2] developed a framework for the application of mission costing. 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 which would still be incurred even if the mission were abandoned. Barrett makes use of the idea of 'attributable costs'[3] to operationalize the concept:

'Attributable cost is a cost per unit that could be avoided on average if a product or function were discontinued entirely without changing the supporting organisation structure'.

In determining the costs of an activity centre, e.g. transport, attributable to a specific mission the question could 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. 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.

With more complex delivery routes the same principles could be applied. To identify the costs of servicing individual customers a delivery routeing programme could be run, firstly to identify the least cost solution for servicing all customers (see Figure 5(i)) within required service constraints. Next the routeing programme could be run again without customer 1 (C_1). This might produce quite a different route with a different total cost (see Figure 5 (ii)). The difference between the new cost and the previous cost could be seen as the transport costs attributable to that customer. A similar principle can be applied to identify the attributable costs of inventory, warehousing, etc.

It might be argued that the flaw in this method is that if individual customer costs are identified by this method and summated the likelihood is that they will come to less than the known total cost. However, this difference could logically be defined as the common cost of servicing all customers and therefore is not relevant to the analysis.

This approach becomes particularly powerful when combined with a customer revenue analysis, because even customers with low sales offtake may still be profitable in incremental cost 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 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.

Mission Costing in Practice

Since 1980 we have been fortunate at Cranfield School of Management in the active support of a number of major companies in funding research into mission costing. This support has not only been financial but has also been provided through access to their costing systems and data. We have thus had a real world laboratory in which to test our ideas.

Whilst this research is still continuing the major findings to emerge could be summarised as:

■   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 - yet products don't make profits, customers do.

To overcome the basic problems with traditional accounting approaches we have installed a number of 'parallel' systems in the sponsor companies using the mission costing approach. Essentially there are six steps to the process:

1. Define the customer service segment

   What are the different service needs of different customer types?

2. Identify the factors that produce variations in the costs of service

   E.g. Delivery characteristics, product mix, etc.

3. Identify the actual difference in the provision of service to individual customers

   E.g. Direct delivery, merchandising support, special packs etc.

4. Identify specific resources used to support customer segments

   E.g. People, computers, warehouses, inventory etc.

5. Attribute costs by customer type

   Using the concept of 'avoidability' attribute incremental costs.

6. Restructure the cost coding system

   Code all resource and operating costs as they are incurred by customers.

We have found using the framework described above, based upon the principles of mission analysis and avoidability, that great insights into customer profitability can be achieved. It is possible through this approach to make the costs of logistics service 'visible' and thus controllable.

The possibilities for the use of this approach are considerable. Perhaps the greatest advantage of using customer-focused costs is that it helps re-direct the marketing effort. Where the true costs of customer service are high in relation to the revenue generated

then management attention can be focussed on the opportunities for profit improvement and/or a re-allocation of marketing and logistics resources.

REFERENCES:

1. M. Christopher, <u>Total Distribution: A Framework for Analysis, Costing and Control</u>, Gower. 1971.

2. T. Barrett, 'Mission Costing: A New Approach to Logistics Analysis' in <u>International Journal of Physical Distribution and Materials Management</u>, Vol.12, No.7, 1982.

3. G. Shillinglaw, 'The Concept of Attributable Cost' in <u>Journal of Accounting Research</u>, Vol.1, No.1, Spring 1963.

4. A. Anandarajan and M. Christopher, 'A Mission Approach to Customer Profitability Analysis' in <u>International Journal of Physical Distribution and Materials Management</u>, Vol. 17, No.7, 1987
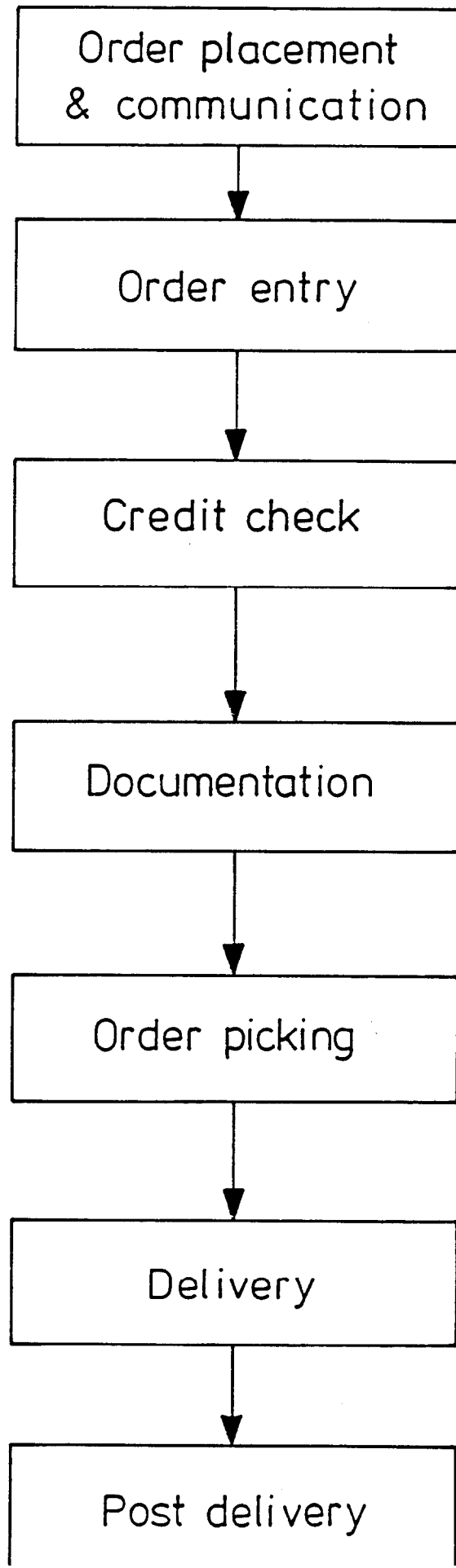
Figure 1   Stages in the order cycle

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┌─────────────────────────┐
│     Order placement      │
│     & communication      │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│       Order entry        │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│       Credit check       │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│      Documentation       │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│      Order picking       │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│        Delivery          │
└─────────────────────────┘
             │
             ▼
┌─────────────────────────┐
│      Post delivery       │
└─────────────────────────┘
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Figure 2 The total costs of a distribution network

Total distribution costs

Cost

Trunking costs

Inventory costs

Outlet costs

Local delivery costs

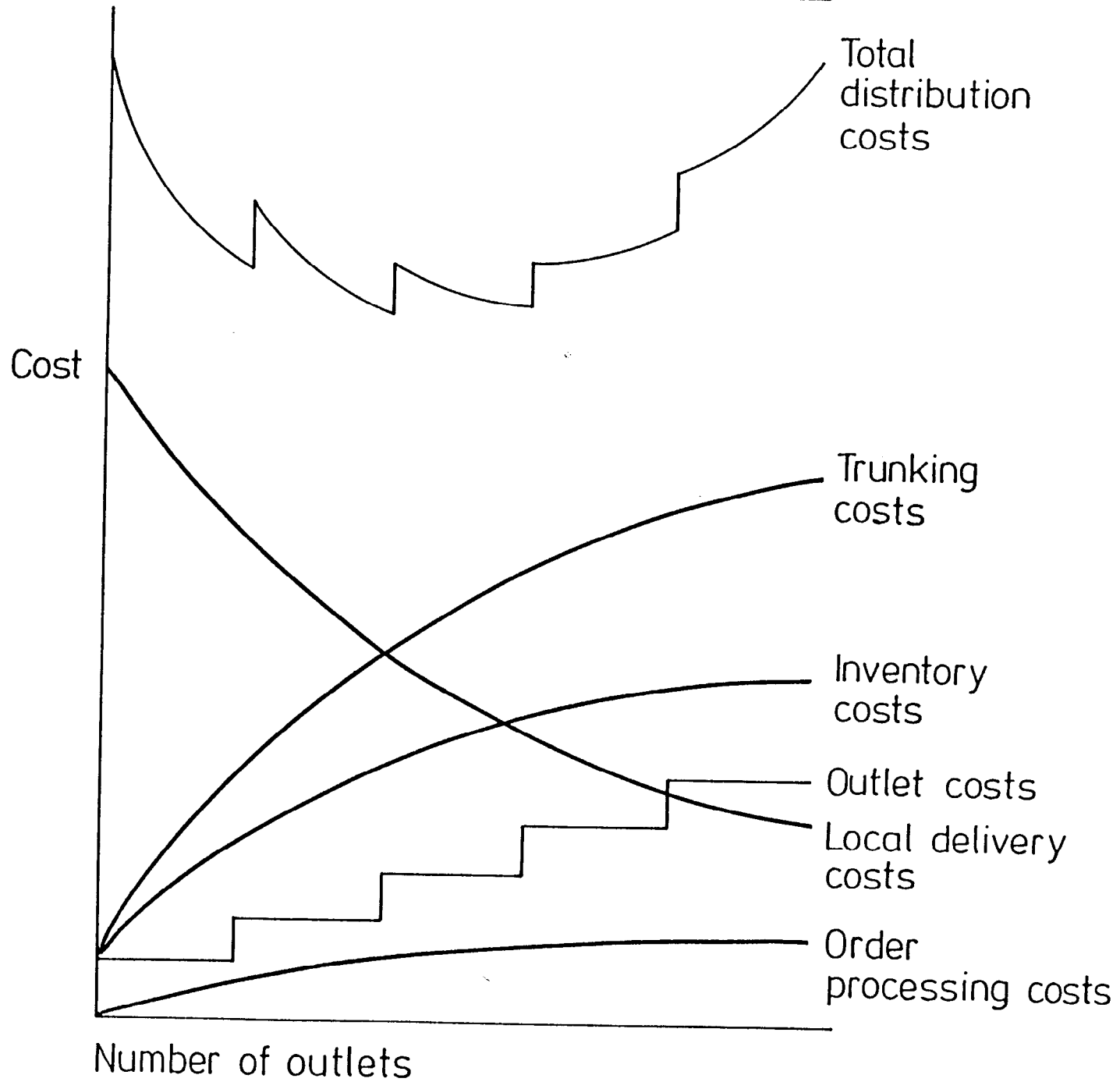Order processing costs
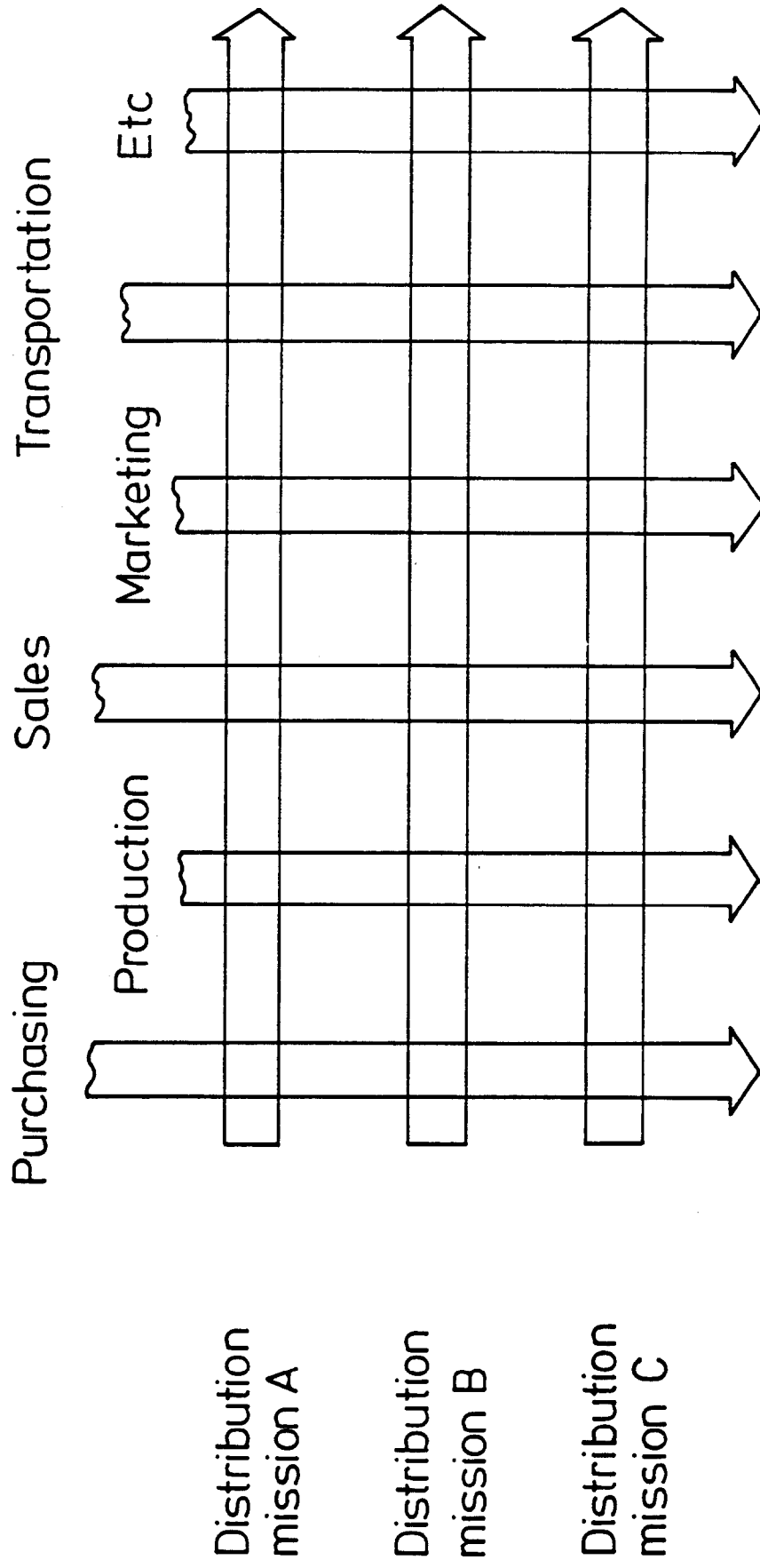
Number of outlets

Figure 3   Logistics Missions that cut across functional boundaries

Figure 4   The programme budget (£'000)

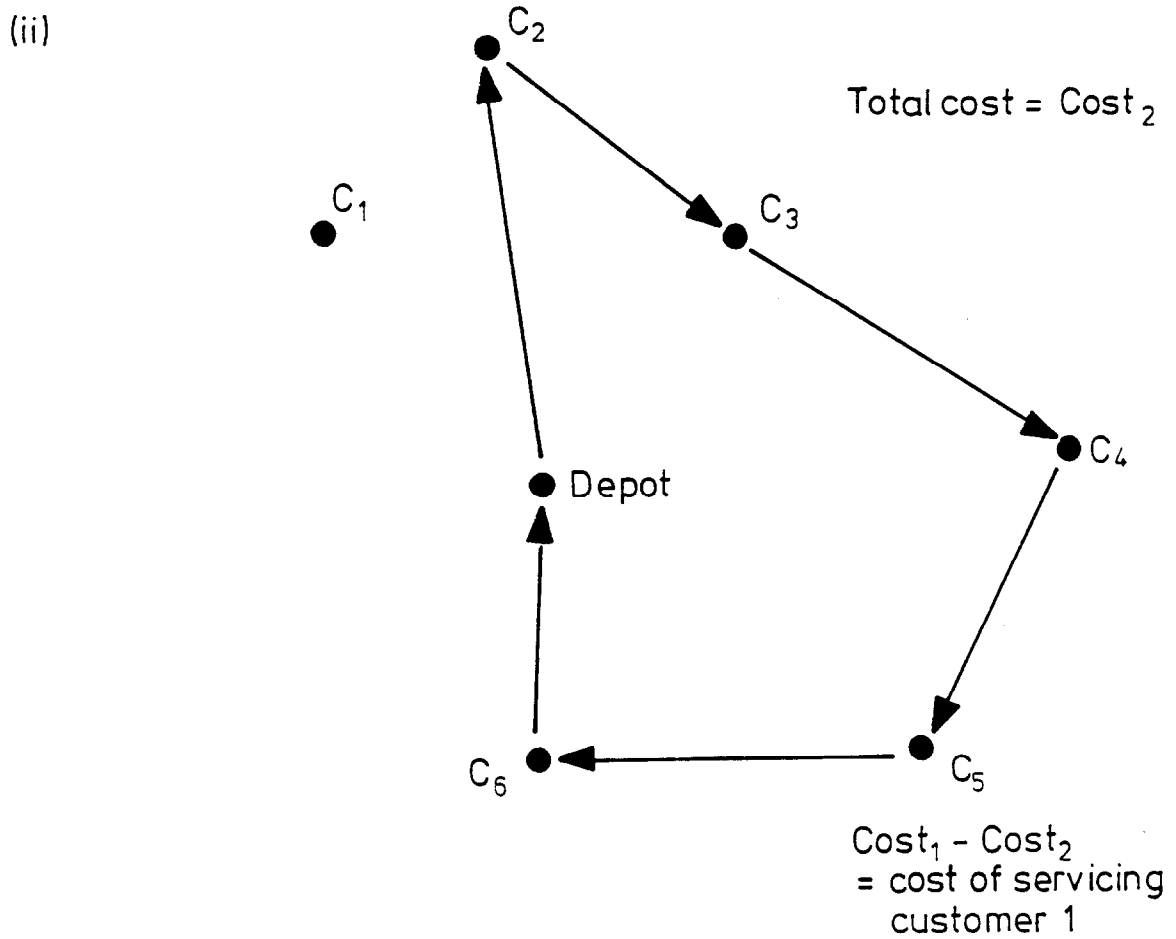|	Functional Area/ Activity centre 1	Functional Area/ Activity centre 2	Functional Area/ Activity centre 3	Functional Area/ Activity centre 4	Total mission cost
Mission A	100	90	20	80	290
Mission B	50	70	200	20	340
Mission C	70	30	50	70	220
Activity centre inputs	220	190	270	170	850
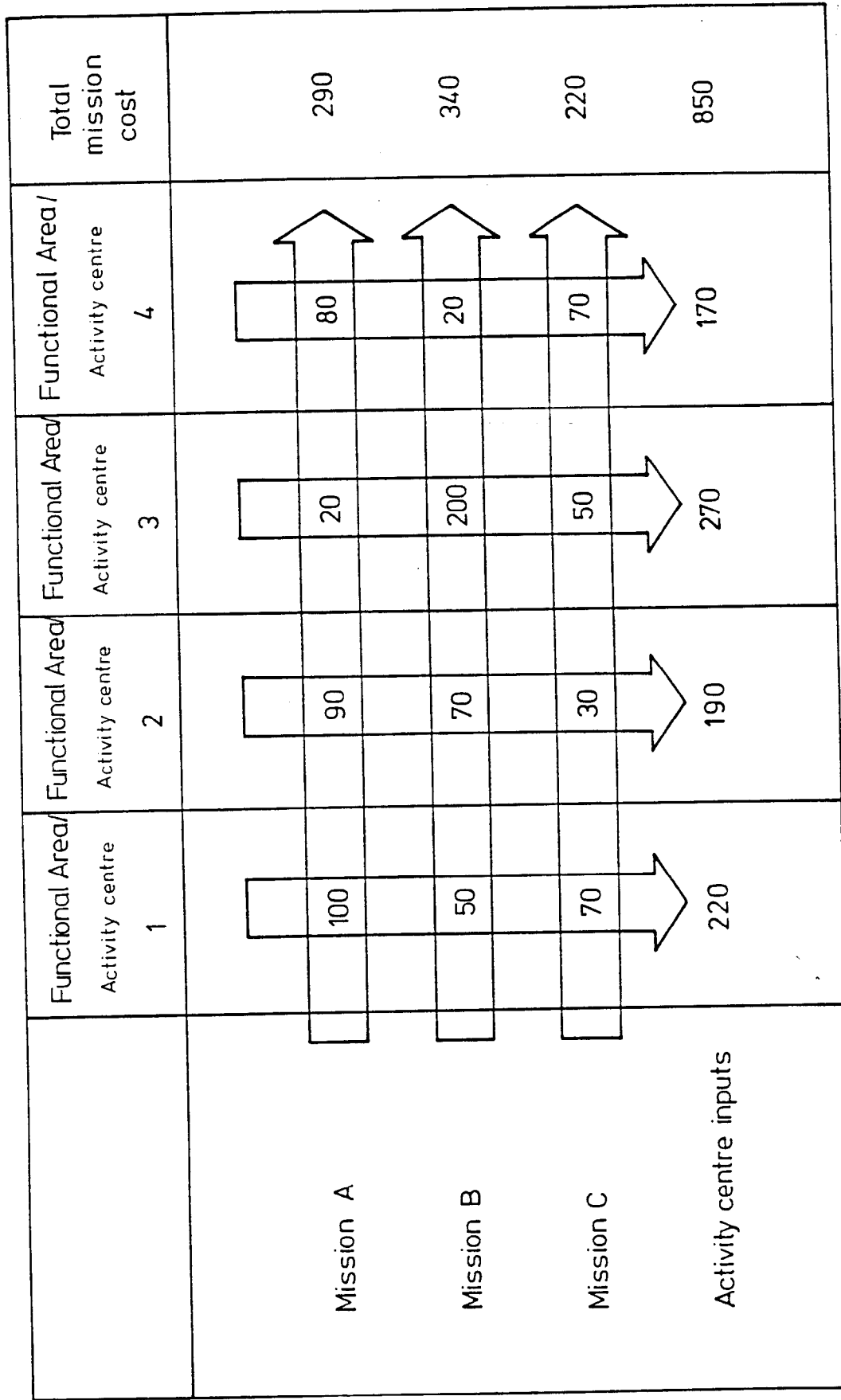
Figure 5 The use of optimal routeing methods to identify attributable customer service costs

(i)

$C_1, \ldots C_6$ are customer delivery points

Total cost = $Cost_1$

(ii)

Total cost = $Cost_2$

$Cost_1 - Cost_2$
= cost of servicing customer 1

INPUT
DATA

ACCOUNTING
SYSTEM

PD COSTS

TRANSPORT
COSTS

WARE-
HOUSING

COSTS

COMMUNIC-
ATION

COSTS

COSTS PER
TRANSPORT
COST
CENTRES

COSTS PER
WARE-
HOUSING
COST
CENTRES

COSTS PER
COMMUNIC-
ATION
COST
CENTRES

INPUT
DATA

ACCOUNTING
SYSTEM

PD COSTS

TRANSPORT
COSTS

WAREHOUSING
COSTS

COMMUNI-
CATION
COSTS

COSTS PER
TRANSPORT

COST
CENTRE

COSTS PER
WAREHOUS-
ING

COST
CENTRE

COSTS PER
COMMUNIC-
ATION

COST
CENTRE

TOTAL
PD COSTS
OF
MISSION A

PD
MISSION
A

CURRENT ISSUES IN LOGISTICS COSTING

- 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 – yet products don't make profits, customers do.

THE MISSION COSTING PROCESS

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    What are the different service needs of different customer types?

2. **Identify the factors that produce variations in the costs of service**
    E.g. Delivery characteristics, product mix, etc.

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