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**SWP 17/89    PRODUCTIVITY AND EFFECTS ON QUALITY  
IN SERVICE OPERATIONS**

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# PRODUCTIVITY AND EFFECTS ON QUALITY IN SERVICE OPERATIONS

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## INTRODUCTION

Service organisations have been increasingly concerned with improving the quality of customer service and have used quality as a strategic dimension to gain market share or to increase profitability; examples abound in all sectors of services from air transport, retailing, financial service, and after sales services. However increasingly many service organisations are being forced by market pressures in their sectors at the same time to improve their productivity while at the same time maintaining or improving quality levels. This is likely to be an increasing trend because at the present time the improvements in productivity which have been made in service industries are less than the improvements made in manufacturing organisations. In the period 1980 to 1986 labour productivity in services in the UK increased by 4% against a 42% gain in manufacturing industries [Armistead et al, 1988] [Johnston 1988].

Technology is seen often as a contributor to the improvement of productivity but whether this is at the expense of customer service quality is often something of a paradox. Would the use of customer operated scanning systems in food retailing increase or decrease the quality of that service? And using the same example would this involvement of the customer improve the productivity of the operation?

Service operations managers need to understand the relationships between quality and productivity and recognise the influence the use of technology may have on the relation. This paper looks at the strategic influences on productivity and quality and attempts to provide some guides for examining operating systems and to identify those areas of the quality-productivity which are in need of further investigation.

## STRATEGIC ASPECTS OF THE SERVICE OPERATIONS

Approaches to the development of service business strategy build on general model of the Porter type [Porter, 1981] and have been refined for service operations [Heskett, 1986; Johnston : Sasser et al 1978; Voss et al 1985]. The derived service strategies present the service business in the context of its market environment in relation to perturbing forces which include competitors, customers, suppliers, and substitute product services. Such analyses allow the development of broad strategies which are classified in three groups; namely differentiation, cost focus, and market focus.

The business strategy provides a starting point for developing the definition of the task to be undertaken by the service production and delivery system. Irrespective of the general direction of the business strategy the operations managers require statements which define boundaries for the operations task. It is these boundary setters which transpose the service concept and the market demand into terms which can be worked on by the operations.

The definition of the operations task results from knowledge in three areas, namely the volume and nature of the demand, the variety of the services and the variation in the level and the nature of the demand [Armistead et al 1988]. The nature of the demand includes statements on how the service products gain and retain customers at the expense of competitive products. The criteria derived are similar in essence to the 'order winning' and 'order qualifying criteria' for manufacturing companies [Hill 1985].

Taken together information on the three dimensions of volume, variety, and variation permit the establishment of a service operations directive. The creation of the means to produce and to deliver the service product entails decisions on the use of technology and the operational factors involved in running the operation and controlling the service output. The control aspects contain the quality and productivity elements.

Operations management theories have in the past tended to pronounce a trade-off between quality and productivity; however the manufacturing experience has shown that such a trade-off is not inevitable and there may be reasons to question the trade-off theory in the context of the service encounter. Furthermore, evaluation of the relationship between quality and productivity requires an understanding of the elements of productivity and of quality relative to the operations strategy.

PRODUCTIVITY ELEMENTS			
	INPUT COSTS	EFFICIENCY OF RESOURCES	UTILISATION OF RESOURCES
VOLUME	Quantity factors Specialisation	Learning specialisation	Accommodation of service mix
VARIETY	Reduces volume Range of Skills	Learning General purpose technology	Time to manage variety Change costs
VARIATION	Overtime  Subcontract	Regularity of pacing  Standards Predictability	Capacity more fixed than demand

COST OF SERVICE PROVISION

FIGURE 1

Input Costs	Hi	Danger Zone	Possible Threats
	Lo	Imminent Danger?	"Target"
		Lo	Hi

Quality

Figure 2

Utilisation	Hi	Danger Zone	"Target"
	Lo	Failure	Sometimes Acceptable
		Lo	Hi

Quality

Figure 3

Efficiency	Hi	Danger Zone	"Target"
	Lo	Common Outcome	Opportunities?
		Lo	Hi

Quality

Figure 4

## A FRAMEWORK FOR SERVICE QUALITY AND PRODUCTIVITY

Service productivity is comprised of three elements, the input costs to the production system, the utilisation of the production system, and the efficiency of the product system. The strategic dimension of volume, variety and variation effect the operation productivity in a variety of ways and these are summarised in Figure 1 [Armistead et al 1988].

Performance in an operating system includes not only a productivity but also a quality dimension and the relationship between the two requires examination. A further understanding of the operating boundaries can be gained from an examination of the elements of productivity and quality of customer service and their relationship in different service operations.

### Input Cost v Quality

The influence of input costs on quality of the service package is not as easy to predict as might be thought at first sight where it might be expected for there to be a direct relation between the two. Indeed this might be so in some instances and it might be assumed that the trend must be in that direction. However, in many operations it is unlikely always to be the case because the improvement in delivery of the intangible attributes of service quality are not necessarily achieved by increased costs.

Perhaps more insight can be gained from considering extremes of quality and input costs Figure 2. The goal of operations managers is high quality delivery at low cost, although what may be achieved in many cases is a low quality of service. The danger is shown by the experience of British Telecom. Attempts to reduce input costs by cutting the number of service staff lead to a fall in service quality against standards and was followed by a subsequent increase in labour numbers in an attempt to improve service quality.

High input costs (relative to competitors) and low quality is a dangerous state for service operations just as is high quality with high input costs if company profitability is threatened. British Airways are an example of a service operation which has moved between these two positions; poor quality with high input costs threatened the future of the company a few years ago before the start of 'Customer Care' programmes. In the future with increased competition in the airline industry the danger is that the company will remain in the high quality-high input cost

segment while not being able to maintain profitability at acceptable levels to shareholders; particularly if there is restraint on prices.

### Utilisation v Quality

Operations management concepts would predict an inverse relationship between utilisation of the resources of the service delivery system and quality of the service package; i.e. a trend towards reduction in quality of service with increasing utilisation.

Considering a matrix of extremes for utilisation and quality in Figure 3 the segment for low utilisation and low quality are clearly an indicator of incipient failure of the operation.

Low utilisation may of itself be acceptable as for emergency services. However if when there is an emergency say a fire to which the fire brigade fails to respond the quality of the service is clearly inadequate. The most likely position achieved by service operations is high utilisation and low quality or low utilisation and high quality of service. Service operations which find themselves in the high utilisation low quality segment are in danger from competition, particularly if their sector of business is currently being influenced by competitors who differentiate on quality rather than price. There are indications of this occurring within food retailing within recent years with the market leaders aiming to differentiate themselves on quality. Those businesses which are in the high quality low utilisation segment rely on either a low reliance on utilisation productivity where the costs are low or where sufficiently high prices can be charged: or they form part of the emergency services sector.

The goal is for a positioning in the lower left segment where high utilisation and high quality of service is achieved. Can this be achieved from a theoretical standpoint? High utilisation in service operations are usually only achieved consistently either in low contact back room operations or through customers being prepared to wait for service often seen in queueing. Unless any waiting period can be seen as being part of the acceptable quality of the service product then clearly in this type of service delivery cannot be placed in this segment of the matrix.

It is not uncommon, however to find service activities where the waiting period is included in the main service package. Many restaurant operations seek to do this to maintain high utilisation of the main eating area by providing additional services for

the waiting period. One of the best examples of this is in the Chicago Pizza Pie Factory [Voss et al, 1985] where people in the queue to the restaurant are at times served garlic bread and then provided with a bar area adjacent to the restaurant; these features and the behaviour of the service personnel lead to the delivery having an overall high quality service whilst at the same time maintaining high utilisation of resources.

An alternative strategy for maintaining high utilisation and high quality is to manage the capacity of the delivery system to keep in line with demand. This can be achieved by workforce scheduling and by the use of part-time staff. The latter requires careful handling for quality standards to be consistently maintained. Also short-term peaks may frustrate the objectives of this strategy.

### Efficiency v Quality

The efficiency of the service delivery system is most likely to be a direct relationship with quality of the service package. Efficiency is characterised by lack of waste of resources and time and optimisation of these elements is in line with high quality so long as these elements correspond to the quality attributes and variables of the service package.

In a matrix of efficiency and quality, Figure 4, the most common outcome is low efficiency and low quality typified by the service organisation which is late with the delivery of the service and which at the same time makes many mistakes; a common example is of jobbing builders who invariably start late and then fail to do all that has been requested. Consequently service operations in this segment are the source of many of the anecdotes of poor service which we all have and which abound from service operations such as British Telecom, British Rail and the Post Office.

Service operations which lie in the high efficiency and low quality segment are those for which some aspect of efficiency and not directly related to quality within the service concept and the expectation of the customers. This is often seen when customers feel that they are being unduly hurried through a service encounter; for example patients who are discharged from hospital when they feel unready to leave.

The low efficiency and high quality segment seem an improbably position for any service operation and any service business which finds itself in that fortunate position has an opportunity to improve efficiency so long as this does not influence the quality achieved and consequently to make savings.



The goal is for high efficiency and high quality commensurate with the quality which is set for the customer service. This might be demonstrated by speed of response in a field service operation and speed of repair in an after sales service.

### The Role of Technology

The introduction of new technology into a service operation has the potential for both improving productivity and quality. The productivity gain is usually through a reduction in labour costs which compensate for the additional capital costs, increased efficiency by way of faster processing and higher utilisation (particularly in backroom operations but also in some front office environments like with automatic cash dispensers and ticketing machines). Quality gains may come through factors like faster processing, or availability of information, or access to service personnel.

However there are dangers as illustrated by the service to small investors in the wake of Big Bang. One large city firm increased its number of small investors from 2000 to 12000, but the firm was unable to handle all the paperwork and enquiries. The technology introduced at the time did not help and the costs of the operation increased due to capital charges and labour costs. The result has been an increase of 70% to 100% in minimum commission for small transactions along with a diminution in other service factors. Improvements in technology are now to be introduced which will improve the efficiency of this type of transaction and make possible a better service.

If technology is introduced its likely effect must be viewed against all services the service organisation offers and an appraisal made of the quality factors and the elements of productivity.

## CASE STUDIES

### People Transport Reservation Service

A major passenger transport company has a large reservation centre which provides a range of services to both the travel trade and the travelling public. What began as an order taking function has developed with time into an order making operation with staff being responsible for selling.

## Current activity

The centre receives over 400,000 calls a month split into three units, namely calls from small travel agents, calls from large multiple travel agents, and calls from the public. The calls are taken by reservation agents who give a range of travel information and make or change bookings in response to the calls. The skills required in the three units differ. Also the performance attributes for the centre reflect a combination of aims.

- \* To be the 'best' at meeting the market needs. This includes response time to answer calls, correctness of information, attitude of the staff to the customers.
- \* Handling the volume of calls as cheaply as possible and maintaining the highest volume of booked revenue for journeys.

Some of the main operational measures are:

1. The number of calls/offered/answered/and lost from each unit.
2. The transaction time for each call
3. The response time for a call to be answered.

## Capacity and Demand

Demand for the three units is variable on a monthly basis and there is also variation through a day. At times the system cannot cope with demand and calls are lost with the consequential loss of potential revenue and customer goodwill. It is not practice to staff to peak demand and it takes several months to train new staff. Also there is a loss of staff into other positions in the company.

## Aspects of Quality and Productivity

The main issues are balancing demand and capacity and increasing revenue. Policies to reduce input costs lead to increasing lost calls and poor quality of service either customers not being able to get through or by inexperience staff making errors. High utilisation at times of peak demand has a similar effect on quality.

Technology assists in the assembly of information and without it the reservation centre could not operate. The efficiency measured by the time for a transaction has been reduced. Also there is the capability to re-direct calls from one unit to another at times of over load.

Productivity could be raised by reducing input cost if units were staffed at the appropriate skill level. While not reducing staff numbers it would reduce costs because of differential grade payments; the effect on quality should not be minimal. However there would be loss in flexibility to move staff between units. Performance as measured by revenue could be increased by capturing lost calls which could also have the effect of raising quality standards as less customers would be frustrated at not being able to get through.

The issue is whether a strategy to chase demand can be managed without raising input costs to much and without reducing flexibility of skills and experience.

#### Data Information Services PLC

Data Information Services are a company which provides information of companies for purposes of company appraisal and credit worthiness; included in the product package is an up to date balance sheet, trade information, list of directors, numbers of employees and market credit worthiness. Customers can choose to access information either on-line, by teleprinter, by fax line, by telex or mail.

#### Current Activity

There are about 15000 customers for the service although up to 500 could be within one company for whom a contract has been negotiated. At the present time demand is greater than available capacity and it takes four to six months for a new analyst to be fully effective.

The operation consists of company analysis carried out by analysts who gain information about a company from Companies House, bankers, and trade referees. The information which is gathered is first prepared manually on paper and then subsequently fed into the central data base by data entry personnel. The data base maintenance aims to keep information current but it could be several years old if there has not been a direct enquiry about a particular company.

Performance standards relate to the accuracy of data and to the speed of delivery, current standards are 60% of enquiries met within 5 days and 100% in 9 days. Constraining factors are the time to obtain other data and information about a particular company which does not exist on the data base. The analysts tasks are regulated by standards times and part of the reward system is linked to the standards.

Information accuracy is very important because the use of incorrect information a customer could result in Data Information Services being sued if it caused commercial loss to the customer.

### Aspects of Quality and Productivity

The service delivery process lends itself to standardisation even though there is a fairly high level of skill required by the business analyst. Productivity issues focus on by the lowering costs while dealing with the constraints of high utilisation due to shortage of capacity.

The ability to reduce costs is limited because of the high labour cost of the operation and if this were to be realised by reducing staff numbers the quality of service would decrease by lowering the speed of response for a larger proportion of the customers and by increasing the likelihood of errors occurring. Efficiency tends to increase with experience of the analysts although it is difficult to maintain at a constant level as there is a high turnover of staff.

Installation of new technology to enable analysts to work on PCs and input their own data could assist with productivity by reducing labour costs (data entry personnel would no longer be needed) and by improving efficiency through the ability to build in quality checks for the integrity of the data. Examples exist from other companies of improvements in throughput time which can be gained in this way; the actuarial department of a life assurance company reduced the time staff needed to enter and check all the rates for policies from two weeks to one to two hours by the use of a PC network (Financial Times 1988).

Reduction in delivery time to the customer would be restricted to some extent by the time taken to deliver on the part of information suppliers when it was not available. Further improvements in technology to allow a wider use of tape to tape transfer of information from say Companies House to Data Information Services would overcome this shortcoming; however such developments are some way off.

The issue is to reduce input costs to raise productivity through the use of technology. As the operation has a high back room element this is unlikely to lower quality but rather to bring about improvements.

### Comex Motor Services

Comex are a bus company operating in the South Midlands area where they run services in a town and between the town and London. The company own nearly 200 buses the majority of which are double deckers and coaches (for the London service) and the rest are minibuses. The double deckers hold 70 people and the minibuses 20 or 27 people. The main quality factors for the service are a function of the speed of the journey, the frequency of the service, and the comfort.

### Current activity

On the town service Comex operates between 6.00am and 12.00am. The peak demand is on a weekday when 13,000 passengers/hour are carried; this figure drops to 5000 passengers/hour during the day with a further reduction to 1000 passengers/hour in the evenings. The travellers are categorised as making journeys for educational, social, work or shopping purposes.

The costs are due to the cost of buses, fuel, drivers, other staff, and maintenance. These are influenced by the length of routes and the type of bus used. The performances of the operation is measured in terms of cost and revenue per bus, cost and revenue per bus mile, cost and revenue per employee, and cost and revenue per passenger.

### Aspects of Quality and Productivity

Input costs could most easily be influenced by labour costs. Reducing numbers of drivers would put the availability of the service at risk for Comex as the absentee rate is currently high; likewise reduction in maintenance could have a similar affect by reducing the availability of buses. Reducing these costs would have to be carried out alongside measures to improve labour availability and to improve the efficiency of the maintenance activity.

Utilisation is of great importance. Two devices are used; interlinking of services where two or more services have part of their route in common, and interworking where two or more services are operated by one bus or a group of buses. While

these practices have operational advantages both for recovery of cost reasons and satisfying peak demand they could affect quality adversely through overcrowding or reduction in frequency of service.

Efficiency of operation can be heavily influenced by external factors of traffic density and road conditions. Improvements in fare collection and boarding operations clearly could assist efficiency although there could be a reduction in quality if these did not match customer expectations.

The newer technology used in the operation centres on electronic ticket machines which give more information on the performance on a daily basis. This company does not use a bus tracking system which allows the position of buses to be known so that alterations to the services can be made to cope with unforeseen events.

The main issues for the operations management are maintaining an adequate frequency of service to foster demand and to cope with peak demand. Measures to improve productivity must be handled carefully if these quality elements are not eroded in the process.

#### Conclusion

The strategy dimensions of volume, variation, and variety have a great effect on the ability of operations managers to change productivity through the elements of input costs, utilisation, and efficiency. Any alternation in these productivity elements can lead to adverse changes in the quality of the service package.

It is important for operations managers to understand the possible movements in the quality with the productivity elements. This is particularly true if new technology is being introduced when it is important to understand the affect the new process might have on the main dimensions of quality and also on the elements of productivity.

## References

Armistead C.G., Johnston R., Slack N., 1988 The Strategic Determinants of Productivity, International Journal of Production and Operations Management, Vol. 8, No. 3, 109-115.

Financial Times, 1988, Friday September 16.

Heskett J.L., 1986, Managing in the Service Economy, Harvard Business School Press, Boston.

Hill T., 1985, Manufacturing Strategy, Macmillan

Johnston R., 1988, Service Industries - Improving Competitive Performance, Service Industries Journal, Vol. 4, No. 2.

Johnston R., "Service Operations: Designing the Operations for Strategic Advantage" The International Handbook of Production and Operations Management, Ed. R. Wils, Cassells, 1988.

Susser F.W., Olsen P.R., Wyckoff D.D., 1978, Management of Service Operations, Allyn and Bacon.

Voss C.A., Armistead C.G., Johnston R., Morris B., 1985, Operations Management in Service Industries and the Public Sector, Wiley, Chichester.