

**COSTING SYSTEMS AND
THE COST OF SPARE CAPACITY -
IS THE CAPACITY ISSUE GIVEN
ADEQUATE CONSIDERATION?**

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Abstract

In the increasingly competitive environment of the 21st century we hear how firms have to become lean, eliminate non-value added activities and strive to maximise asset utilisation, but there are inevitably firms with excess capacity and their management need relevant information on the under utilisation of resources. In this paper we question whether cost system designers have been taking appropriate account of the capacity issue and ask whether costing systems are sufficiently adaptable for fluctuating levels of capacity utilisation. We highlight that the capacity issue has received diminishing attention in the literature since the 1960s and then identify the dangers of not identifying the cost of spare capacity and describe two cases that demonstrate alternative approaches to this issue. The manufacturing case is an SME with a traditional costing system that was hindering management's pricing and product mix decisions because it was using budgeted volumes as the denominator for overhead absorption rate calculations when there was significant spare capacity. The second case relates to a large financial services company that implemented a complex activity based costing system and gained a much greater understanding of resource consumption, and hence tighter cost control in their back office operations.

Costing systems and the cost of spare capacity - is the capacity issue given adequate consideration?

This paper resurrects the spare¹ capacity issue and its costs. We question whether cost system designers have been taking appropriate account of the capacity issue and ask whether costing systems are sufficiently adaptable for fluctuating levels of capacity utilisation.

The paper is divided into seven sections. The first gives an introduction into management's need to receive condensed, summarised reports of operating results highlighting only the significant variations of actual performance from standards that act as benchmarks. This includes relevant information on the under utilisation of capacity resources², as there are inevitably firms with excess capacity. Section two gives a brief historical background of why the capacity issue was of importance in the past only to be followed by its almost complete disappearance from the accounting literature and modern textbooks. The next section deals in some detail with the issue of spare capacity and its costs. In section four the identification of idle³ capacity is discussed, a synopsis of 14 types of idle capacity is given and those that should be excluded from the product or service cost are identified. The fifth section highlights the dangers of not identifying the cost of spare capacity. Section six describes two cases that demonstrate alternative approaches to the capacity issue. The final section is the conclusion.

Introduction

Managers have been using cost accounting data for decision-making since Biblical times. Information provide by costing systems are used by managers to assist them in the management and control of their business operations. Thus, although the recognition of management accounting as a discipline is a relatively recent development, its fundamental objective of providing relevant information to assist management in the planning and control of their business operations has not changed in essence over the years (Kistler et al., 1984). Management need to receive condensed, summarised reports of operating results highlighting only the significant variations of actual performance from standards (i.e., controls as tools for the achievement of control) such as cost standards, production targets, expenditure limits, quotas, and so on. However, benchmark information about all aspects of business operations are needed against which actual performance can be measured (Parker, 1986). Although this automatically includes information regarding the impact of competition on operations, such information should not be at the expense of excluding information pertaining to productive efficiency and capacity resource consumption.

Brief historical background

A review of the cost accounting literature of the first half of the 20th century shows that the topic idle capacity appeared frequently and regularly. This should be no surprise as return on investment has long been a key performance indicator and hence businesses need to focus on their operational efficiency and seek productivity improvements to maximise the utilisation of

¹ We have used the term "spare capacity" and "excess capacity" interchangeably.

² Capacity resources are resources involving up-front cost commitments, regardless of subsequent utilisation of the acquired capacity. Thus, capacity costs refer to the spending on these resources (Balachandran et al., 1997).

³ We have used the term "idle capacity" and "unused capacity" interchangeably. However not all "unused" or "idle" capacity represents "excess" or "spare" capacity (Cooper and Kaplan, 1992).

their plant and equipment. Thus, there was a need to measure the efficiency of business operations and discuss how to increase it (Vollmers, 1996).

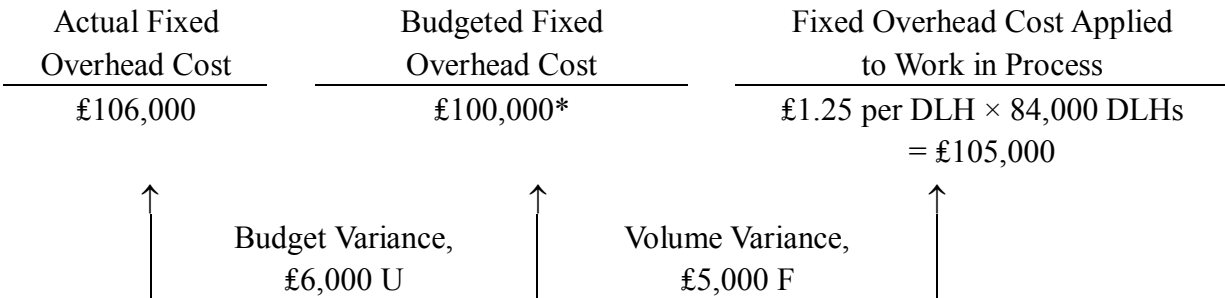
During the second half of the 20th century the coverage of idle capacity as an independent topic declined and largely disappeared in the accounting literature. Possible reasons are delayed influences of the changes in the world economy including World War II and the movement from production towards sales and marketing opportunities. For example, during the great depression, according to Fligstein (1990), large businesses exercised control over their business operations by either concentrated on the manufacturing or the sales and marketing conceptions of control (Vollmers, 1996). According to the manufacturing conception of control, management concentrated on operational efficiency in order to compete as this facilitated them maintaining stable prices through attention to the production process. On the other hand, management that concentrated on the sales and marketing conception of control competed via searching for new markets and product differentiation. This was done by advertising and establishing brand names, which proved successful for those businesses, considering their consumers' behaviour. However, those businesses that concentrated on operational efficiency did poorly, as a whole (Vollmers, 1996). All of which made productive efficiency irrelevant as what is the purpose in measuring such efficiencies and discussing how to improve them when product sales is the constraining factor, and not production capacity.

What followed in the accounting literature was the increasing interest in calculating financial accounting income for reporting purposes. Theories of income measurement became increasingly important and the components of income, which had previously been considered proprietary information, were disclosed in income statements. Soon, the matching principle came to dominance and sales were to be matched with the costs incurred to produce them in order to calculate income. This required the use of a denominator volume based on sales figures so that production capacity costs could be matched with sales revenues. The matching process did not allow for any inclusion of spare capacity measurements.

Example based on expected sales figures

Budgeted cost of fixed overhead or of capacity	£100,000
Budgeted sales volume	80,000 units
Budgeted direct labour hours	80,000 DLHs
Cost of fixed overhead, or of capacity, absorption rate	£1.25 per DLH
Actual direct labour hours for actual production volume achieved	84,000 DLHs
Actual production volume	80,000 units

Fixed overhead budget and volume variances:



*As originally budgeted. This figure can also be expressed as: 80,000 denominator DLHs (based on budgeted sales volume) × £1.25 per DLH = £100,000.

Explanation of Fixed Overhead Variances

Budget variance: This variance is simply the difference between the budgeted fixed overhead cost and the actual fixed overhead cost. In this case, the variance is unfavourable which indicates that actual fixed overhead costs were higher than anticipated in the budget.

Volume variance: This variance occurs as a result of actual activity being different from the denominator activity in the predetermined fixed overhead absorption rate. In this case, the variance is favourable, so actual activity was more than the denominator activity. It is difficult to place much of a meaningful economic interpretation on this variance.

According to Ferrara (1960: 492), who only concentrated on financial income measurement, income measurement is not based on the physical output potential of facilities but on the expected or useful life of the facilities. Therefore when using expected capacity there is no unutilised fixed cost, which is the same thing as an idle capacity loss, since all fixed costs are allocated to actual output. Accordingly, there is no item such as an idle capacity loss or any other capacity measure appropriate for income measurement (Ferrara, 1960). Reason being that using anticipated sales would automatically generate idle-time in terms of sales volume and not plant capacity. However, Weinwurm (1961) argued that accounting has a responsibility to provide management with relevant information for operational decision-making purposes and that included capacity utilisation information. Not doing so risked damaging business operations. Ferrara (1961: 422) responded, emphasising that accounting data are useful for many purposes and although idle capacity may be relevant to business decision-making, he did not see its relevance to income measurement. He thought it quite reasonable to amortize the capacity costs related to the purchase of capacity resources over their expected output during their expected useful life (Ferrara, 1961). Thus, the interest in financial income measurement had consequences, namely: the need to measure idle capacity supposedly disappeared and there was a disappearance of the topic from the literature, which suggests that it was no longer of interest to management and was indeed not being measured in practice (Vollmers, 1996).

In the increasingly competitive environment of the 21st century we hear how firms have to become lean, eliminate non-value added activities and strive to maximise asset utilisation, but there are inevitably firms with excess capacity and their management need relevant information on the under utilisation of resources. Nonetheless, the majority of modern textbooks use an estimated base denominator activity, when calculating the resource capacity overhead absorption rate, which is based on expected sales volume when generating the annual production budget (Vollmers, 1996), thus focusing on business's expected sales with disregard to the actual capacity of the business's resources, and hence ignoring the possibility of spare capacity and more importantly its distorting effects on product costs. The majority of students and upcoming managers using these textbooks are then fortunate if they are exposed to a page or two on the capacity issue in general, often in the form of an appendix (for example Garrison, Noreen and Brewer, 2006: 117-8).

The issue of spare capacity and its costs

Reverting back to the literature of the first half of the 20th century, Jordan and Harris (1920), according to Vollmers (1996), devoted an entire chapter of their cost accounting textbook to the issues of idle machine capacity. They expressed the opinion that due to managers not getting timely information regarding problems of idle machinery, they failed to get the utmost use out of their machinery.

Furthermore, according to Vollmers (1996), Fiske (1931) believed that poor business decisions were made when management were unaware of the various causes of idle capacity losses, losses which were usually depicted as an aggregated amount. He therefore classified idle capacity into three:

- Productive idle capacity: possible idleness causes included breakdowns and power-failures.
- Administrative idle capacity: possible idleness causes included building a larger factory than required and retaining highly skilled staff when they are not required so as not to lose them to competitors.
- Economic idle capacity: possible idleness causes included seasonal businesses, cyclical business cycles and broad changes in demand that created conditions of over- or under-capacity.

Although Fiske (1931) was concerned with the sources and causes of idleness and the assessment of responsibility where possible, he was not concerned with the technical accounting aspects. However, he did suggest that idle capacity losses caused by normal seasonal business should be charged to the product and those caused by equipment purchased that would satisfy future usage requirements be expensed (Vollmers, 1996). This suggestion of Fiske (1931) has a similarity to DeCoster's (1966) concept that not all idle capacity necessary representing spare capacity.

According to DeCoster (1966) there have been misconceptions in the accounting literature in quantifying the idle-capacity variance, the main misconception being the assumption that it measures an idle-capacity loss due to the presence of idle plant and equipment. Furthermore, this idle-capacity variance was calculated incorrectly by contrasting actual hours worked with planned hours, which creates the impression of costing the unused or idle capacity, which it does not. DeCoster was aware that variations in capacity react with the total fixed overhead cost to produce a fixed overhead absorption rate that varies inversely to the variation in the capacity. Thus, according to DeCoster, the cause of the misconceptions was the slow transition in overhead theory from historical to standard costing, which revolved around the volume base denominator used to calculate the fixed overhead absorption rate. First, after-the-fact historical measurement was used to obtain the base denominator activity, automatically resulting in a nil variance as actual overhead costs were absorbed using actual volume. Second was the use of a predetermined actual overhead rate by management. Although the rate was forecasted before the actual events were known, the intent was to ultimately absorb all actual overhead costs into cost centres (DeCoster, 1966: 298). This would in all probability have lead to over- or under-absorption, which may then have been closed to the cost of sales account. Finally, a predetermined standard volume was used as the base denominator activity to calculate a fixed overhead absorption rate that was substantially unaffected by moderate fluctuations in economic activity.

During this transition in overhead theory, accountants had been motivated to move to time-orientated capacity concepts such as fiscal year capacity, normal capacity and practical capacity.

The fiscal year capacity used the expected sales volume for the coming period, which provided a constant absorption rate for that one fiscal year. The normal capacity used an expected sales volume, which was the average obtained from a medium to long-run time span with the most commonly suggested time span being three to five year, as that would "normalise" cyclical economic variations and normalise costs over a business cycle. However, due to the dominance of the matching principle, both fiscal year and normal capacity concepts generated idle-capacity concepts in terms of sales volume and not the physical output capacity of the resources. Both capacity concepts identified differing amounts of spare capacity and its costs all of which did not relate to plant capacity but

expected sales. Furthermore, they absorbed fixed overhead costs without regard to operational efficiency and whether hours or costs were effective or ineffective (DeCoster, 1966).

Enter the practical capacity as the maximum physical output volume attainable given a fixed quantity of capital facilities, taking management's operational policy decisions regarding set-up, maintenance, and work shifts into account. Thus this predetermined practical capacity standard volume implies certain operational efficiency, not present in the other base denominators' activity used. Management are required to make an expert value judgement, via the application of knowledge and technical skill, in the measurement of the costs to be absorbed such that they were to depict efficient operations. An additional aspect of this practical capacity volume is the assumption that the true constraining factor of production capacity is the limited resource of plant and equipment. Furthermore, the capacity volume is the quantity of output that can be produced per unit of time with a given supply of capacity resources. Thus the total fixed overhead cost of the limited resource is to be converted to a fixed overhead absorption rate utilising that capacity volume of the true limiting factor (DeCoster, 1966). Hence, in this scenario, the idle-capacity variance should measure the physical idleness of the business and its costs. Here the idle-capacity variance is descriptive of the relationship between the predetermined practical capacity standard volume, upon which the fixed overhead absorption rate is based, and the equivalent standard volume achieved during production. The equivalent standard volume is the actual volume achieved during production converted to its equivalent standard volume. Note that only the equivalent standard volume is used in calculating the idle-capacity variance thus maintaining management's concept of operating efficiency consistent with reality, thereby isolating a true idle-capacity variance. Although the term "idle-capacity" variance has been used in this article, some readers and authors may prefer the term "volume" variance. Furthermore, if the difference between the actual volume achieved and its equivalent standard volume were taken and multiplied by the predetermined fixed overhead rate, an efficiency variance should result which depicts an amount by which actual operating efficiency is above or below management's concept of operating efficiency. This seems to provide more useful information to management for managing their business operations in comparison to the information provided by the traditional costing system based on sales figures.

Example based on practical capacity figures

Budgeted cost of capacity or of fixed overhead	£100,000
Budgeted sales volume	80,000 units
Budgeted direct labour hours	80,000 DLHs
Practical capacity volume (given the supply of capacity resources)	100,000 units
Expected direct labour hours* (given the supply of capacity resources)	100,000 DLHs
Cost of capacity, or of fixed overhead, absorption rate	£1.00 per DLH
Actual direct labour hours for actual production volume achieved	84,000 DLHs
Actual production volume	80,000 units
Equivalent standard volume in direct labour hours	80,000 DLHs

*Based on the supply of capacity resources given and on management's concept of operating efficiency.

Capacity, or fixed overhead, budget and idle-capacity variances:

Actual Fixed Overhead Cost	Budgeted Fixed Overhead Cost	Fixed Overhead Cost Applied to (Equivalent Std) Work in Process (Hrs)
£106,000	£100,000**	£1.00 per DLH × 80,000 DLHs = £80,000
↑	↑	↑
Budget Variance, £6,000 U		Idle-capacity Variance, £20,000 U

**As originally budgeted. This figure can also be expressed as: 100,000 denominator DLHs (based on the supply of capacity resources given) × £1.00 per DLH = £100,000.

Explanation of Capacity Variances

Budget variance: This variance is simply the difference between the budgeted fixed overhead cost and the actual fixed overhead cost. In this case, the variance is unfavourable which indicates that actual fixed overhead costs were higher than anticipated in the budget.

Idle-capacity variance: This variance occurs as a result of the equivalent standard volume for actual activity achieved being different from the practical capacity standard volume denominator activity in the predetermined cost of capacity absorption rate. Note that this idle-capacity variance maintains management’s concept of operating efficiency. In this case, the variance is unfavourable, depicting that actual activity was less than the denominator activity. Furthermore, inline with management’s concept of operating efficiency, multiplying the difference between the actual volume achieved and its equivalent standard volume, with the predetermined cost of capacity rate will result in an efficiency variance which depicts an amount by which actual operating efficiency is above or below management’s concept of operating efficiency. That is, £1.00 per DLH × (84,000 DLHs – 80,000 DLHs) = £4,000 Unfavourable efficiency variance. In this case, the unfavourable efficiency variance indicates that actual operating efficiency is below management’s concept of operating efficiency.

In the manufacturing environment of the 21st century there are many business processes that add cost to their products and services but not all such activities necessarily add value. The business objective is to ensure that decisions made should deliver value to the customer in excess of the costs required to produce that value. This requires managerial decision-making with regard to the elimination of non-value adding activities. However, costs are usually regarded as generating value and measuring business operational activities in accounting terms, rather than merely representing the usage of capacity resources by business operational activities (Bromwich and Bhimani, 1994). Hence the transition in, or evolution of, overhead theory continues with the event of activity-based costing (ABC).

According to Cooper and Kaplan (1992), the central focus of ABC is managing used and unused capacity. They emphasise that ABC systems are models of resource *consumption* and hence highlight the critical role played by unused capacity. This is in stark contrast to conventional costing systems that measure the cost of *supplying* resources. Drury (2004: 384) is one of the few textbook authors to pay particular attention to this issue. He highlights this as “possibly the most important theoretical advance in ABC systems” and highlights how Kaplan (1994) formalised the relationship between the cost of activity resources supplied and activity resources used in the following equation:

Cost of Resources Supplied = Cost of Resources Used + Cost of Unused Capacity;

This formula had evolved from the formulas:

Activity Available = Activity Usage + Unused Capacity

Or

Cost of Activity Supplied = Cost of Activity Used + Cost of Unused Activity

(Cooper and Kaplan, 1992: 3).

Kaplan and Cooper (1998) explains further that unused capacity arises because the supply of some resources has to be acquired in discrete amounts in advance of usage and hence the supply cannot be adjusted in the short run to exactly match actual usage. Kaplan and Cooper describe these resources, not as fixed costs, but as “committed resources”. They describe those resources that can be continually adjusted to match exact usage, not as variable costs, but as “flexible resources”. It should be clear that it is the committed resources (or fixed costs) that are the problem, because they do not vary with short-run usage, and give rise to a difference between cost of resources supplied and cost of resources consumed by the actual output produced. In the short-run some management decisions, e.g. dropping a product, that result in a decline in demand for activity resources only tend to reduce the “cost of resources used” and not the “cost of resources supplied”, and hence to keep the above equation in balance we will see an increase in the “cost of unused capacity”. What is required is management action to translate the potential benefits of reduced activity demands into actual cost savings by reducing spending on the supply of resources. There are therefore two steps involved, firstly to reduce the demand for the resource and secondly to lower spending on the resource, but note that unless management gets a clear signal from the costing system, i.e. the system identifies the cost of unused or idle capacity, it is unlikely that the second step will be taken.

Classification of idle capacity types

Moving to the 21st century, Vercio et al. (2005) suggest that only selected types of idle capacity should be excluded from the cost of the product or service. However, their emphasis is on understanding the various types of idle capacity as this facilitates their identification and the measurement of the material amounts, thereby promoting better decisions. Managing the various types of idle capacity involves different decision processes. Aggregating the various idle capacity types together detracts from the value of the relevant information required for the different decision processes. According to Vercio et al. idle capacity is a material waste of capacity resources and if not identified product and service costs will not be optimal. Given a certain amount of capacity resources, management has the responsibility to create idle capacity through productivity improvements. Furthermore, if idle capacity is not identified, productivity improvements may be working in the wrong areas. There follows a synopsis of their classification of 14 types of idle capacity (Vercio et al., 2005).

Types of idle capacity to be excluded from product and service costs

The following three types of idle capacity are identified as those that should be excluded from the product or service cost, and thus they should not form part of the “cost of resources supplied”:

Marketable idle capacity is caused by competitor market share, product substitution, distribution constraints, customer satisfaction, or price/cost constraints. Its measurement is

based on the difference between practical capacity and the peak demand during that peak demand hour and day of the year.

Obsolete idle capacity is caused by management deciding not to participate in the market or not to increase market share or a market does not exist. Its measurement is based on the difference between practical capacity and the peak demand during that peak demand hour and day of the year. Although its measurement base is the same as that of marketable idle capacity above, management need to decide on the classification type based on cause.

Start-up external idle capacity is caused by the start-up of a new operation. Its measurement is based on the difference between the long-range practical capacity and the current usage.

Note that, based on Cooper and Kaplan's (1992) opinion that not all "idle" or "unused" capacity represents "spare" or "excess" capacity, we are of the opinion that these three types of capacity costs, which are excluded from product or service costs, should be classified as "spare" or "excess" capacity and not as "idle" or "unused" capacity as has been done by Vercio et al. (2005) below.

Types of idle capacity to be included in product and service costs

Capacity resources are lumpy resources, which require up-front cost commitments. In periods when these resources are not fully utilised, the business incurs the cost of idle capacity. Thus, idle capacity represents a normal cost of business operations. Conversely, when business has insufficient capacity resources to satisfy realised demand the business incurs an opportunity cost (Balachandran et al., 1997). The following eleven types of idle capacity should all be included in the product and service cost being a normal cost of business operations.

Start-up internal idle capacity is caused by an internal capacity expansion. Its measurement is based on the difference between the maximum planned capacity usage and the current usage.

Management internal policy idle capacity is caused by a management policy that classifies certain capacity as unavailable. For example: not working on Sundays or closing down over the end of year festive season.

External policy idle capacity is caused by regulations external to the company, which classifies certain capacity as unavailable. For example: environmental regulations or union policies.

Contingent idle capacity is caused by the need to hold reserve capacity for a catastrophic event. For example: major interruptions in providing selected products or financial services to customers may not be acceptable to management. They will then need to consider risk and cost and make an investment in contingent idle capacity.

Demand variability external idle capacity is caused by customer behaviour. Its measurement is based on the difference between the peak demand and non-peak demand time periods. Businesses will try to manage their consumer behaviour. For example: offering special discount rates to customers during non-peak demand time periods.

Demand variability internal idle capacity is caused by the need to hold reserve capacity so management can execute a change in business operations that will have a material impact on the capacity optimisation in another area of the business. However, one should not find a material amount of this type of idle capacity, as management is usually able to make use of

temporary resources to handle the temporary change in business operations, if well planned and communicated, thereby ensuring that base service levels are not infringed. For example: making a mass mail-out to customers or running an all-week sale.

Base service level idle capacity is caused by the need to hold standby capacity that is required to meet the targeted customer response time for standard customers. However, it is recognised that there may be times when the standby capacity is not sufficient such as when workers call in sick, when supplies are not delivered on time or machinery breaking-down more frequently than expected, or problems with plumbing and electricity. Management need to decide on the base service level that will optimise customer satisfaction and profitability.

Specific service level idle capacity is caused by the need to hold standby capacity that is required to meet the targeted customer response time, which is shorter than the base service level for the standard customers. For example: priority customers who need to receive priority service.

Process balance idle capacity is caused by the need to ensure that whatever the constraint (bottleneck) in the product or service process flow is, it is never starved. Accordingly, process balance idle capacity may be added in other areas to ensure the constraint is not starved.

Strategic idle capacity is caused by the need to meet best practice standards and is unavoidable. For example: an ATM machine is not utilised non-stop 24 hours a day, similarly hotels are not at full occupancy levels every day of the year.

All other idle capacity is used to denote any type of idle capacity, other than those above, and which are immaterial and will not be measured.

The above identified eleven types of idle capacity should all be costed into current products and services (Vercio et al., 2005: 37). Their identification can help management's understanding of idle capacity and should help with the disaggregation of the "Cost of Unused Capacity" figure.

Dangers of not identifying spare capacity

Cooper and Kaplan (1991) claim that whilst virtually no companies use theoretical capacity as the denominator volume, as it would always lead to under-absorption and under-costing of products, the most common method used is the budgeted volume (or actual utilisation). This is based on the budgeted sales as apposed to the practical capacity. They point out, however, that whilst this may seem appropriate for financial reporting as all equipment charges are charged to products and hence are neatly dealt with in either cost of sales or inventory, and also for responsibility accounting as all production expenses are assigned to products and hence become the production manager's responsibility, it can lead to highly variable and distorted product costs and occasionally devastating results. This is because with budgeted demand as the denominator volume, falling demand leads to a higher overhead absorption rate (OAR) and hence a higher product cost which exerts pressure on management to either increase prices or turn away apparently unprofitable business. This in turn leads to a further reduction in budgeted volume and a yet higher OAR and product costs, and a real danger of triggering the death spiral if the costs of "spare" or "excess" capacity are not excluded from product costs when budgeted volumes fall below practical capacity.

Cooper and Kaplan (1991) also highlight a different type of death spiral associated with the installation of a new piece of equipment that is initially under utilised. If the new equipment is initially only utilised at about 20% capacity and yet all its costs are assigned to the budgeted or actual volume of output from the equipment, the cost per unit for using the equipment will be exceptionally high (actually 5 times the cost per unit if based on practical capacity). Managers will prefer to use the lower cost older technology, and be discouraged from loading the new “expensive” equipment and the new technology will not in fact get exploited and so its unit costs will never fall.

As well as avoiding the above pitfalls, a further advantage of using practical capacity as the denominator volume is that it provides a more stable basis for assessing the impact of productivity improvements as product costs do not fall simply because output has risen (and fixed costs are shared out over higher volumes), this giving the false impression of productivity gains that quickly drain away as soon as volumes fall again.

Alternative Approaches to the Capacity Issue

The above literature review has demonstrated a certain amount of variation over time in the importance placed on the need to measure idle capacity, with this issue apparently diminishing in importance from the 1960s onwards and still receiving scant attention in many 21st century mainstream management accounting textbooks. We have to turn to the more specialised texts on cost management systems, and the literature on activity-based costing to gain adequate insights into the dangers of the all too common approach of using budgeted volumes as the denominator in OAR calculations. We would therefore not be particularly surprised to find a variety of approaches to the treatment of spare capacity in practice and the following two cases are examples which demonstrate considerably different approaches to the capacity issue.

Case One

Case one deals with a manufacturing scenario in which a Small to Medium size Enterprise (SME) utilises a traditional costing system that was hindering management’s pricing and product mix decisions. Bodyworks, operating in the light commercial vehicle (LCV) market, designs and manufactures aluminium commercial vehicle bodies and components. In 2004 their pre-tax net profit margin was about 6% on a turnover of £7.5m. Established in 1972, they remain a wholly owned family business employing approximately 70 employees and producing around 1500 vehicles a year from a single site. Bodyworks faces competition from many small UK companies and also some large European competitors and although their products are differentiated on quality and functionality they cannot charge premium prices as they sell mainly to powerful original equipment manufacturers (OEMs) who constantly squeeze margins whilst demanding high quality and service. Note that one OEM currently contributes around 70% of Bodyworks revenue (and 78% of gross margin). Over the last 5 years the market has grown principally due to legislation changes increasing the demand for LCVs.

Over the last decade the business has grown steadily and having outgrown their original premises they acquired a new purpose built factory in 2000. Despite a steady growth in overheads as a proportion of total costs, as shown in Figure 1, and the implementation of a detailed enterprise requirement planning (ERP) system, the company has clung on to its traditional standard costing system, which has always employed a factory wide OAR using budgeted manufacturing labour hours as the denominator volume.

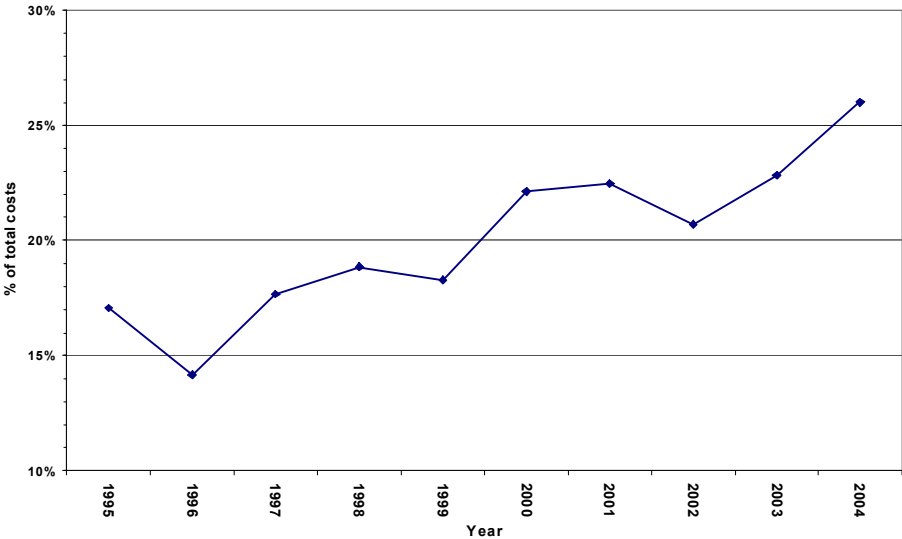


Figure 1: 10 Year overhead growth as % of total cost

The company has five key functional managers, responsible for sales/marketing, finance/administration, design/engineering, production and purchasing/stores, and a further 25 indirect workers compared to around 40 direct workers⁴. Over the last 5 years the company has produced a range of other aluminium products, including fabrication work such as scaffolding towers. The core products remain aluminium bodies for 3.5t trucks. There are three main product types: a body with dropsides, a box van and a recently introduced tipper body, each with numerous variants for the different chassis used by OEMs and the different sizes. An additional area of complexity is the variety of fitted extras, such as cranes and tail lifts.

The OAR is re-calculated annually, when the next year’s budgeted output is determined, and this feeds into the standard costing system to provide a full cost for each product broken down into material, labour and overheads. The company has in the past operated a cost plus pricing system but in recent years has increasingly needed to manually adjust, downwards, the mark up percentage to “adjust the prices to ones acceptable in the competitive market place”. At the time of the move into the new factory the directors recognised that a “step change” was needed and the company needed to “gear up” significantly if it wanted to succeed as a volume producer (competitors in continental Europe were much larger) and consistently win large orders from fleet purchasers and the OEMs. The management team was therefore strengthened. These changes explain the out of proportion rise in overheads, which led to problems with the information produced by the traditional costing system. In January 2000 the company accountant used the normal formula of budgeted overheads divided by budgeted direct labour hours to calculate the revised OAR for the coming year and was shocked by the result. The OAR would rise by nearly 20% from the OAR used in the previous year, and this

⁴ Chargehands are classed as direct workers as although they do supervise they are an integral part of each manufacturing team.

was at a time when there was downward pressure on process as OEMs were threatening to “impose a” 5% decrease! In the event the accountant decided that the better part of valour was discretion and simply did not change the OAR. It was only at a later date, when this action was queried, that the issue was fully debated by the management team, external expert advice was sought and a revised, but still relatively simplistic, approach was adopted.

There were two main reasons for the dramatic increase in OAR. Firstly, the step change in overheads as a result of gearing up for higher volume business. Unfortunately there would inevitably be a time lag before winning this extra business and hence the extra overheads were in the 2000 budget but very little in the way of extra sales (and hence extra labour hours). Secondly, with the company already having changed significantly from jobbing work, which was very labour intensive, to higher volume batch production that realised significant labour efficiencies, the number of budgeted labour hours had not risen in proportion to the rise in sales (nor in proportion to the rise in overheads). There were two further contributing factors, one related to new capital equipment and the other relating to outsourcing. The new capital equipment was the introduction of an improved programmable, automated punching machine. The idea was “to drive out drilling on the assembly line” by ensuring that all raves, bearers, etc. would be pre-punched so that assembly labour never needed to stop to drill holes. This reduced direct labour hours on assembly for only a slight increase in direct labour on pre-production. This “gain in efficiency” reduced labour hours whilst increasing overheads (machine depreciation, maintenance, etc.) and hence would result in a higher OAR. Secondly, the increase in outsourcing was as a result of a drive to reduce complexity and concentrate on core competencies “instead of being busy fools and trying to do absolutely everything in-house”. Historically, Bodyworks did do everything themselves, as they would start with raw metal and cut, weld, mill and drill as necessary to make all plates, brackets, etc. in pre-production. In some cases this could lead to labour getting involved in non-core processes, dealing with small batch sizes and to the diversion of valuable skilled welder’s time from core operations. There were also issues relating to the cost of holding the additional stocks of various different types of raw materials and restocking the sub-assemblies awaiting final assembly. In many cases, even ignoring the difficult to quantify, potential savings relating to reducing complexity, it was still found to be cheaper to outsource such sub-assembly work to local specialists. However, the net result of this quite logical change was to increase material costs and further reduce labour time (and possibly also increase the overheads relating to purchasing) a hence further increase the OAR.

Clearly there are issues here relating to the use of a single OAR based on labour hours, but this was a small company and would certainly be afraid of any suggestion to consider a complex activity-based costing system, but the bigger issue at the time was the dramatic rise in the OAR which, if applied, would lead to a rise in product costs, at a time of severe competitive pressure on prices.

The company realised that the large increase in overheads was not an increase in costs caused by current production. They recognised that a proportion of those extra overheads could be considered to be either “development” relating to future products or the cost of spare capacity (or some combination of both). After long debate and inspection of the five year plan it was agreed that the extra space provided by the move to the new factory and the step up in overheads actually represented unused capacity and hence until sales increased to fill the void the company would effectively be planning to operate at 85% capacity. It was unfair (and ill advised) to include the overhead costs relating to this as yet unused capacity in the OAR as its use would inflate product costs⁵ and either put upward pressure on prices or encourage the

⁵ What the company actually did in reality was to leave the budgeted overhead figure as it was and inflate the labour hours by dividing by 0.85 to demonstrate that additional work could be supported with the same overheads.

company to turn away apparently marginal or loss making business and thus make it less likely that the spare capacity would be filled.

There were further unexpected developments in this case. The company directors' intention was clearly that the "investment" would pay off and, over the next few years, growing sales would reduce the spare capacity and the OAR calculation could revert to budgeted overheads/budgeted labour hours. By 2002 this was looking quite likely (see Figure 1) but then in 2003 the company budgeted for the introduction of a new product (a wholly in-house designed and manufactured tipper) and hence there was another step change in overheads, this time for a somewhat different reason. Initially at least two of the technical staff were to be employed full time on the tipper development and subsequently a large amount of additional production and purchasing resources would be needed, all before any new products could be sold.

This time, use of the historical OAR calculation would have resulted in the overheads relating to the design, development and pre-production of the new product being absorbed into the cost of the old products, leading to them being overcosted and potentially overpriced. In the event the management team decided on the relatively unsophisticated short cut of leaving the OAR calculation as it had been i.e. as if the company was still operating at 85% capacity. Technically the company should have eliminated the design, development and pre-production costs from the numerator, but instead they increased the denominator to produce a similar effect, at least in terms of the size of the resulting OAR.

It is interesting to note that, even in the early stages of ABC development, Cooper and Kaplan (1998) highlighted that only two types of costs should be excluded from a system of activity-based costing. They recommended that the costs of excess capacity should not be charged to individual products and that the cost of research and development for entirely new products should not be allocated to products that benefit from the applied R&D programme. They explained that the cost of excess or idle capacity should be treated as a separate cost of the period, not of individual products as companies that spread capacity costs over budgeted volume report higher product costs when actual or budget volumes fall even though workers and machines have become no less efficient in terms of their ability to produce. Thus, the approach common in traditional costing systems (as for Bodyworks above) causes product costs to fluctuate erratically with predicted volume changes. This can lead to the "death spiral", because a downturn in budgeted volumes creates idle capacity which in turn leads to higher reported product costs. If management raised prices as a result, demand will continue to fall and create even higher idle capacity costs. Turning to R&D expenditure, even though financial reporting systems may expense R&D immediately it is incurred, the management accounting system needs to treat the cost as an investment for the future and allocate the costs over the life cycle of the products that benefit from it.

Case Two

The second case relates to a service scenario in which a large financial services company that implemented a complex activity based costing system and gained a much greater understanding of capacity resource consumption in their back office operations. We shall call the company Global Financial Services (GFS) as they are a truly global player with a presence in all major financial centres worldwide. They have offices in 50 countries and over 67,000 employees. In this case we briefly review some capacity related issues in relation to an activity-based costing model that was implemented in the late 1990s to improve performance management and control in the back office, which supports the main trading arm of a regional office. The system that was implemented enabled assessment of operations on a

unit cost basis in contrast to the absolute cost basis used previously. This was facilitated by the identification and costing of more than 200 activities and sub activities. These were required to provide the 5 umbrella services, namely: trade processing and settlement, new issues, position event management, margin collateral management, and custody services. The calculation of predetermined fixed and variable cost rates and then the allocation of relevant costs to the actual clients' trades supported each month. The system thus identified not only the cost of capacity resources *supplied* but also the cost of resources *consumed* each month by the clients' trades performed. Hence, the system provided detailed information for billing to front office and for cost control. It is interesting to note that during early discussions when system developers were specifically asked: Does the ABC system measure the cost of spare capacity? They answered "no" but in subsequent discussions the system developers explained that the system provided a "headcount report" which compared the actual staffing levels (and costs) across the various activities performed in the back office with the staffing levels (and costs) actually needed to perform the actual clients' trades each period (i.e. the resources consumed). The difference identifies spare capacity in that period and hence measures the cost of spare capacity. Even from this brief insight into a quite complex ABC system there are several important observations that can be made. Firstly, the ability of a sophisticated ABC system to identify the cost of spare capacity, not just as one big aggregated figure (like the total overheads under-absorbed for the period) but broken down into actual activity costs and/or numbers of staff performing them. This is important information that should support prompt management action to translate the potential benefits of reduced activity demands into actual cost savings by reducing spending on the supply of resources. (Kaplan and Cooper, 1998) Secondly, the important design component of the system which split out both a fixed element and a variable element of the various activities, thus avoiding the pitfall of many early activity-based systems that treated all overhead costs as if they were variable when obviously many are not.

Conclusion

The above two cases show that there are inevitably firms with excess capacity and regardless of their size their management needs relevant information on the under utilisation of capacity resources in order to accurately measure product profitability and set appropriate prices and/or make product mix decisions. Bodyworks had always employed a traditional standard costing system with a factory wide OAR based on budgeted labour hours and management was not aware of the dangers of using a denominator based on budgeted volumes. Product costing information had probably been seriously flawed for some time but realisation only came when several factors worked together to produce an OAR that was so obviously out of line that it was obviously nonsense to use it. The second case provides an excellent contrast and clearly demonstrates what Cooper & Kaplan (1992) highlight as the most important theoretical advance in ABC systems, the fact that they can be designed to measure the cost of resources used, and when compared to the cost of resources supplied, on an activity by activity basis, this provide detailed information on the cost of unused capacity. The fact that the importance of this theoretical advance has not been fully recognised is probably not surprising given the limited attention paid to the capacity issue generally in modern accounting literature. We contend that this is an under researched area and call for more case study research on alternative approaches to idle capacity and into whether cost system designers are taking appropriate account of the capacity issue. We contend that management accountants will be in a much stronger position to achieve their fundamental objective of providing relevant information to assist management in the planning and control if their organisations if they design more flexible costing systems that are sufficiently adaptable for fluctuating levels of capacity utilisation and appropriately recognise different types of idle capacity. Recent survey evidence indicates that take up of ABC is slow and some authors attribute this to the lack of evidence that ABC systems have actually improved the bottom line. We suggest that whether

using simple, traditional costing systems or sophisticated ABC systems designers need to think carefully about the capacity issue or they certainly run the risk of damaging the bottom line.

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