Control of Information Technology Costs by Allocating Costs to Users

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Control of Information Technology Costs by Allocating Costs to Users.

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Abstract
This paper considers the control of information technology costs by allocating those costs to user departments. User departments are assumed to use these costs in making decisions about the appropriate levels of information technology use. The use of accounting information in decision making is discussed, and allocation methods which fit within the decision framework are considered. The possible methods are (i) those based on the use of computer resources and (ii) those based on taking an extra step by converting resources used into products of the information technology system which are comprehensible to users. Problems in using allocations to control costs relate to the difficulty of calculating product based allocations, the level of fixed costs in an information technology facility, lack of control over usage levels and the stage of computer development.

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Introduction

Information technology costs have grown dramatically in recent years and are now a substantial part of the total costs of operating in many organisations. This can be seen in the banking sector, for example, with the introduction of highly sophisticated electronic funds transfer at point of sale systems, home banking and the popularity of automatic teller machines in addition to complex administrative systems. The control of information technology costs is of concern to organisations operating in a highly competitive environment where the substantial nature of the costs involved impacts on their profitability (National Association of Accountants 4F 1986). Not-for-profit oriented organisations are also under pressure to control their total operating costs and the resources required for their operation.

Control to ensure cost efficient and cost effective use of information technology requires managers to make decisions about the appropriate level of investment in information technology in the long term and decisions about the operational use of the resources in the short term. Cost data about information technology resources and resource utilisation are relevant to those decisions.

In some organisations, information technology costs are incurred directly by each department, which acquires and

uses its own departmental resources. In these instances cost data relevant to controlling information technology costs are available at the manager's discretion. In other organisations information technology costs are incurred indirectly as departments are supplied with information technology facilities and services by a separate information technology department. In this situation the costs are recorded for the information technology department and may be allocated to each department using one of a number of allocation methods.

This paper focuses on the issue of the choice of method for allocation of the information technology costs of a separate information technology department to user departments which utilise the shared facilities for the purpose of providing relevant cost data for the control of information costs for the company as a whole. These shared facilities are often large mainframe computers, with terminals in user departments. In those organisations in which departments acquire their own resources, the information technology department (if it exists at all) mainly provides maintenance and problem diagnosis and correction services. It is much easier to *attribute* costs directly to users in such a facility, as the time spent on each user's problems can be easily recorded. In addition, those who desire to experiment and require innovative uses for information technology will pay for those innovations directly (King 1988).

Facilities which are able to attribute costs in this way are not discussed in this paper.

It has been suggested that incentives for efficient performance by the managers of service departments and for prudent use of service departments' outputs can be achieved by the cost accounting system charging the costs of the service department to the user departments (Kaplan and Atkinson p241). Some writers have suggested the use of cost allocations which effectively results in charging users for information technology costs as a method of controlling information technology costs (National Association of Accountants 4F 1986).

There also appears to be widespread practical support for the use of allocations to control costs. This has been documented by Fremgen and Liao (1981) and Zimmerman (1979). Zimmerman used agency theory to explain the prevalence of cost allocations in practice, suggesting that they are performed to influence management behaviour in 1) controlling discretionary spending and 2) rationing an internal service, such as information technology. The data processing literature has many examples of the use of allocations, known as "chargeback" (see e.g. Buse 1988, Emery 1986) emphasising their use in cost control.

Decision framework

The weight given to accounting information when making decisions depends on the users' perceptions of the

quality of the accounting data. Accounting information is perceived as useful when rewards or penalties are tied to accounting results (Siegel and Ramanauskas-Marconi p 348). Bruns (1968) suggested that even if accounting information is relevant to the decision, if accounting is perceived as an imperfect measure, less weight will be given to accounting information. Further, if non-accounting information is relevant when accounting is perceived as imperfect, the "imperfect" accounting information will not affect decisions.

If cost allocations are to be used to encourage user departments to control their use of information technology resources they should satisfy the following criteria.

1. the allocations should be non-arbitrary
2. the allocations should effectively measure the use of information technology resources and relate actions to the allocations received.
3. the allocations should satisfy the general measurement characteristics of being precise, objective, timely and understandable.
4. the user departments must have influence over the results as measured by the allocation received. (Emmanuel, Otley and Merchant p 115)

The allocation method needs to result in cost measures which meet these criteria to be perceived as relevant and influence operating decisions.

Cost allocations are necessarily imperfect as they cannot be directly attributed to cost objects. If allocations are also perceived to be arbitrary, then they will have no effect on decisions as the decision is not perceived to affect the allocation received. Consequently, if allocations of information technology costs to user departments are perceived as arbitrary, operating decisions about the use to be made of information technology resources by operating managers will be made independently of those allocations. Such allocations will not have any impact on controlling information technology costs.

Impact of cost allocations on decisions

If decisions are being made using a cost-benefit approach, users should decide to use information technology only to the point where the marginal cost equals the marginal benefit, which is the point of optimal usage. The cost measures resulting from allocation will provide positive cost data for comparison with benefits. The absence of cost data (no allocations or allocations perceived as arbitrary) is likely to lead to overuse of information technology resources, as benefits are being compared with "zero" costs or unrelated costs and not with the real costs to the company. Information technology will be used to the point where the marginal benefit is zero, which is beyond the point of optimal usage (Kaplan and Atkinson p 241). Such

over-use leads to excessive investment in information technology and inefficient use of it. The service may be degraded to the point where information technology facilities must be upgraded or alternative means of information processing such as departmental PCs or external processing must be purchased (Emmanuel, Otley and Merchant p 241). Conflicts between users may arise over access to currently available information technology resources when there is excess demand for the services (Hoshower & Verstraete 1986). Uncontrolled information technology costs for the company may be the overall result.

Cost measures resulting from allocations may be compared with industry "benchmarks" or with market prices for services and this may enable managers to focus the information technology department on improving its efficiency in providing the required services. The users may be permitted to source information technology services externally if the allocation is perceived as excessive. Users will press for reduced internal charges to continue "purchasing" internal information technology services. The internal department is thus forced to operate more efficiently to retain its position. This should help to contain information technology costs.

If it is not feasible to use external information technology services and users believe the costs to be unreasonable compared with benchmarks, there will be

pressure placed on information technology to contain costs only if the users perceive that their allocated costs are relevant in determining their rewards or penalties. If users are not evaluated on their allocated information technology costs, or if user departments cannot affect the costs they receive, they will ignore them in making decisions as the costs will be perceived as irrelevant.

Cost measures may relate directly to the volume of services provided using a broad approach, or they may be finely tuned to differentiate between various levels of quality of service, e.g.response times or flexibilty of reports. If users are aware of the differential costs of operating at different service levels some may well opt for a more economical service level, while others are prepared to pay more for a higher quality service. (Kaplan & Atkinson p 241) The reduction in service levels for some departments should help to contain information technology costs.

Alternative allocation methods

There are two broad types of allocation methods which can be used for information technology costs. Both are non-arbitrary and relate the use of information technology to the costs generated. Both are able to provide timely and reliable cost measurement. However they differ in their understandability to information technology service users, and in the users' perceptions of their ability to

influence the allocations received. To ensure that the allocations are perceived as relevant to the operating decisions, it is necessary that the system developed is understood by the users and that users are able to identify the relationship between the charges they receive and their operating decisions.

Method 1: Allocations based on computer resources consumed by the information technology department on behalf of users.

Many service department costs are allocated using an appropriate cost driver or drivers which are considered to be the causes of those costs. Allocations to user departments of information technology costs often reflect this philosophy and are based on the users' consumption of one or more of the following computer resources or inputs, which are considered to be the cost drivers:

CPU time used

terminal connect time

size of memory accessed

number of input/output devices accessed

lines printed

These cost drivers are indicators of the functional categories of information technology services: processing (CPU time), data communications (terminal connect time), data storage (size of memory) and input/output (number of devices and lines printed) (Willits & Alley 1985). CPU time alone is indicative of only one of the functional categories, so many centres charge on the basis of

several factors rather than just CPU time. Complex algorithms are developed to factor in the elements which represent the true costs of information technology (Cook 1985).

Allocations may be based on
(i) a single rate developed from total costs and total usage of one or a combination of each of the above cost drivers, or
(ii) a more sophisticated dual rate which distinguishes between fixed and variable costs and between capacity and usage of the cost drivers (Horngren & Foster p 464-5).

With a dual rate method fixed and variable costs are considered separately. Fixed costs are largely determined by past decisions determining the capacity of the system, so users are allocated a charge based on their requests for capacity in the system design process, rather than on their actual operating use. In theory, this should discourage users from requesting large amounts of capacity, some of which remains unused, as they are charged for all available capacity requested. A separate allocation reflects the variable costs of operating.

Allocations based on computer inputs are unlikely to completely satisfy the objective of cost control as many users will not understand how they can modify their behaviour to affect the charges they receive. With an input or use of resources method, users cannot associate

the costs they are allocated with the activities necessary to carry out their tasks (Olson & Ives 1982). The allocations use unfamiliar terminology and concepts. For example, a charge for size of memory may be in terms of megabytes of RAM the user's program occupies or data storage requirements in terms of MB of disc space, when what is relevant to the user is a charge for the number of customer files stored. The input or resource based allocations received are perceived by the users as irrelevant and therefore as uncontrollable expenses (McKinnon & Kallman 1987).

With a resources-used allocation method users cannot easily control operating costs because they cannot easily link their actions to the allocations received. The only real control they have is in the design stage of information technology projects, by not overestimating future requirements and avoiding future charges which include a component for unused capacity.

Methods which use computer resources consumed as an allocation base require the user to have specialist information technology knowledge to fully understand the allocation and how user operating decisions can influence the allocation received. For users without that specialist knowledge, the other broad range of methods based on outputs of the system is preferable.

Method 2: Allocation based on finished products of the information technology system.

Information technology costs can be expressed as costs of resources used, as shown above. However, by using a two stage system which first costs computer resources and then combines the costs of the resources used for the final "product" requested by the user, they can also be expressed in user transactions such as cost per cheque, cost per item of inventory processed, or cost per report printed (McKinnon & Kallman 1987).

Consider a law department wishing to know the cost of processing a speeding fine which was detected by the use of speed cameras. To determine this cost, it is necessary to know the CPU time taken during the process of scanning the photographs, the time taken and file space needed to access registration number files, the CPU time and printer time taken to print notices, the space taken by the storage of fine information, the number of times information regarding driver history is accessed, and so no. Using special software, the information technology department can combine these individual computer resource costs to calculate the cost of the finished product which has meaning to the user: the cost of the notice of infringement and fine sent to the offending driver. The use of product cost measures overcomes the problem of allocating individual resource cost measures which are meaningless to the user when taken in isolation.

A system where allocations are based on finished products and have the characteristics of a user charge more than an uncontrollable allocation has the following advantages:

i) Users can understand the charges they receive. They can identify the costs with the cost drivers, for example the cost of an exception report, or a bank branch manager identifying the computer cost for each account, by category (Howard 1987). They can identify the link between their actions and the charges that they receive.

ii) Users can control their information technology charges by controlling the number of transactions that they process in the information technology system.

iii) If users make decisions on a cost-benefit basis, information technology costs overall will be contained as users contain their controllable costs. Resource allocations will be improved as charges will apply to scarce resources and users will decide if the cost of using the resource is beneficial.

For these reasons, product based costs allocated to users are more likely to lead to control of information technology costs as users understand how their activities impact on the allocations they receive and the overall cost of information technology. Users do not require the

specialist computer knowledge required for resources consumed allocations.

Problems in using cost allocations to control information technology costs

In some information technology installations it is unlikely that charges to users will affect the operating costs of the system for the following reasons:

i) A major problem with the use of product based allocations of information technology costs is the difficulty in defining products or transactions in a standard form. A great deal of detail on standard tasks is needed, together with the necessity to standardise procedures (McKinnon & Kallman 1987). It is possible to develop output charges where the output is a standardised activity. For example, a charge can be developed for each bill printed in the process of billing customers. The task is much harder for non-standard items such as on-line enquiries, which may require one screen or many screens to complete. Although the product definition may be extremely difficult, once the product has been defined, software is available to determine the computer inputs, track the costs of the inputs and thus determine the product cost.

Products can be developed for most information technology systems if sufficient time and effort is expended but the development will be of necessity a slow process. Due to

the time needed and the resultant costs involved, small to medium information technology facilities may decide that the costs of developing accurate charges outweigh the benefits to be gained. They may prefer to limit their allocations to computer resources used, rather than take the extra and more costly step of linking the use of these resources to the products which consume the resources.

ii) In many information technology installations, a large proportion of the information technology costs are fixed. The costs are often predetermined by past decisions such as the size and type of both hardware and software already purchased. Provided that an increase in user demands does not require an increase in capacity and therefore capital expenditure, the increase in use will result in an increase in cost (if any) which is proportionately much smaller than the increase in usage. Conversely, if users reduce demand, they may decrease the current charges to their departments but the main effect is to increase the predetermined unit charge for the following period.

In a situation where there is a high level of fixed costs, users can usually exert very little influence on the total operating costs. Deciding on the level of service required may influence some costs. For example, if the system is to be operative 24 hours per day, or if the response time for problems is to be ten minutes, a

higher level of salaries and thus costs will be incurred than if the system operates 10 hours per day or if the problem response time is two hours. Users can decide on the required service level based on a cost/benefit analysis if they are provided with the different cost allocations which would be received.

iii) Many users have usage levels over which they have little or no control e.g. the level and processing of speeding fines detected by speed cameras depends on government policy, police actions and the efficacy of driver education programs. The law department cannot control the fines it issues: it must process and fine all speeding drivers detected by the use of the speed cameras.

Some users may have the ability to control administrative tasks, for example daily summaries of cheques received, but may be unable to control operational transactions, such as customers' use of automatic teller machines (Howard 1987). Distinguishing between controllable and non-controllable transactions and allocating only the controllable transactions will induce better decision making with respect to the controllable costs as they will be perceived to be relevant for decisions about the quantity of transactions.

iv) The life cycle of a computer system may require different allocations at different stages in the cycle.

The demands on information technology centres are not constant over the life of the computer development. A major new computer is likely to be underutilised early, with demand increasing to the point where there are some overloaded periods, and finally to the point where the computer is mostly fully utilised with excess demand.

To control the costs of information technology over the life cycle of the facilities, the amount charged to the users could vary according to the stage of development (Hoshower & Verstraete 1986).

Stage 1: Newly opened or underused information technology centre

A newly opened information technology centre may be initially underutilised as potential users may be unaware of the benefits to be gained or concerned about the costs involved. As many of the costs relating to information technology are fixed, if an information technology centre is underutilised, any potential users who would benefit should be encouraged. To achieve this it may be necessary to treat information technology as a free service and not allocate its costs (charge for) its use. To avoid an explosion in demand, it is necessary to (a) report on the actual cost of the services used and (b) inform users that they will be charged when the centre is fully utilised.

Stage 2: Expanding information technology centre

When usage of information technology increases to the stage that the resource is fully utilised at some times and underutilised at others, an allocation can be made in two parts. Users who wish to use the resource at peak times should be allocated the full cost, while a reduced allocation can be applied to non-peak usage. This should encourage non-urgent uses to be scheduled at off-peak times, thereby reducing or delaying the pressure for extended capacity.

Stage 3: Fully utilised information technology centre

If cost allocations are to be made to ensure that the best economic use is made of the resources it is necessary to allocate the full costs of running the information technology centre to the users when the centre is fully utilised. The arguments for this have been fully discussed in the preceeding sections.

Conclusion

This paper has argued that control of information technology costs will not always be achieved through cost allocations. Unless the cost measures from the allocations are perceived as decision relevant by the recipients, they will not be used in decisions which influence information technology costs.

Cost allocations which reflect the products consumed by users are those most likely to influence decisions. These allocations are user oriented in that they link actions

to the allocations received and do not require specialist information technology knowledge. Allocations related to computer resources consumed are less likely to influence decisions as they require specialised knowledge the user may not have. Allocation methods based on products require a great deal of time and effort to develop, and due to the cost involved it may be better to use a less desirable but less costly allocation based on computer resources consumed.

The overall level of information technology costs may not be easily controllable even when the allocation system appears relevant to decision makers due to the high level of fixed costs in information technology centres, the lack of control over usage levels and the requirement for different allocations at different stages of the information technology life cycle.

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