Abstract

Despite its theoretical superiority over traditional costing models, the majority of ABC implementations in US organisations have failed to be sustained due to a number of shortcomings. In response, time-driven activity-based costing (TDABC) and resource consumption accounting (RCA) emerge as two contenders of costing models for the next generation of cost management systems. TDABC and RCA models obtain their roots from the ABC model; and represent two different philosophies in developing cost management systems. One of the key features that distinguish TDABC and RCA models from traditional costing models is the recognition of idle resources in resource pools. This paper presents an overview of the conceptual foundations of TDABC and RCA models and examines the implications of recognising idle resources in the two models on developments and applications of cost management systems.

Keywords: Cost Management, Idle Resources, Activity-Based Costing, Resource Consumption Accounting

Introduction

Designing and maintaining effective cost management systems is a fundamental task for management accountants. In recent decades, advances in information technology have vastly improved the efficiency of collection and communication of cost data within an organisation. Unfortunately, traditional absorption and variable costing models adopted by most cost management systems in English-speaking countries do not make good use of the available data. These traditional costing models are based on simplified assumptions on cost behaviours and are designed to cope with limited availability of data. They work well when an organisation operates in a stable environment with low variability in its outputs. As complexity of an organisation’s operations increase, the weaknesses of traditional costing models become evident (Cooper, 1987).

A major initiative to address the weaknesses of traditional costing models is the introduction of activity-based costing (ABC) model. By allocating resource costs to cost objects through multiple activities performed at different levels within an organisation, ABC-based cost management systems effectively avoid product cost cross-subsidisation between high-volume, low-complexity production outputs and low-volume, high-complexity production outputs. They also provide more information on cost behaviours than traditional cost management systems. Despite its theoretical superiority over traditional costing models, implementation of ABC in business organisations yielded mixed results. According to Kiani and Sangeladji (2003), 51% of the Fortune 500 corporations implemented ABC and/or Activity-Based Management (ABM) models but only 18% of the ABC/ABM implementations sustained for more than 4 years. It was argued that lack of integration between ABC-based cost management modules and other parts of organisational information systems and complexities of maintaining ABC models in large organisations contributed to the failure of most ABC implementation projects (Sharman, 2003, Kaplan and Anderson, 2004).

Many organisations have elected not to fully implement ABC-based cost management systems after performing analyses of organisational activities. Instead they used the information gathered from the analyses to improve their existing systems (Gosselin, 1997, Baird et al., 2004).
As ABC fell short of its initial promises, a new search for other cost management solutions started again in mid-1990s. Consequently, two new costing models, Time-Driven Activity-Based Costing (TDABC) and Resource Consumption Accounting (RCA), emerged as two contenders of costing models for the next generation of cost management systems. TDABC and RCA were both designed to address the shortcoming of ABC models but the strategies adopted by the two models in achieving their objectives were very different.

TDABC was proposed by Robert Kaplan, the father of ABC (Kaplan and Anderson, 2004). The model was designed to address difficulties faced by management in implementing ABC-based cost management systems through simplification of ABC model. It was argued that TDABC-based cost management system could provide more accurate cost information whilst removing the need of performing costly and time-consuming employee surveys to maintain the costing model (Barrett, 2005).

In contrast, RCA was developed as an underlying model for comprehensive computer based cost management systems by combining features of ABC model and German costing models. It made no attempt to simplify the costing model. Instead the model relied on integration with Enterprise Resource Planning (ERP) system to overcome problems in implementing cost management systems.

German academics and practitioners developed several costing models including Grenzplankostenrechnung (GPK), and Relative Einzelkosten- und Deckungsbeitragsrechnung after the Second World War (Schildbach, 1997, Weber and Weibenberger, 1997). These models were well-documented in the German literature but were little known outside German-speaking countries until mid-1990s.

German cost management systems are generally more complex than those of their English-speaking counterparts. One indication of the complexity of German cost management systems is numbers of cost centres in their costing models. Large German organisations, like Siemens and Mercedes Benz, often have more than 1,000 cost centres in their cost management systems (Kaplan and Atkinson, 1998, p.104).

The development of German costing models was closely linked to the social and legal environments that German organisations are operating in. Therefore it was difficult for organisations outside German-speaking countries to adopt these models. Instead selected features of German costing models, like the resources-centric view on organisational cost management and quality-based costing models were combined with features of ABC and a new model, RCA, was developed (Keys and van der Merwe, 2001).

One common feature of TDABC and RCA models that distinguish themselves from traditional costing models in English-speaking countries is the recognition of idle resources in resource pools. This paper presents an overview of the conceptual foundations of TDABC and RCA models and examines the implications of recognising idle resources in the two models on developments and applications of cost management systems. The remainder of this paper is organised as follows. The second and third sections briefly explain the concepts of TDABC and RCA models and how they address the shortcomings of traditional costing models. The fourth section examines how recognition of idle resources distinguishes TDABC and RCA models from traditional costing models and the implications of such distinctions. Finally, a conclusion is drawn in the fifth section.

**Time-Driven Activity-Based Costing**

Cost management systems, like all other management accounting systems, are economic goods (Horngren, 2004). Therefore, the value of a cost management system depends on the cost of developing and maintaining the system and the benefits that an organisation can gain from operating the system.

According to Cohen et al. (2005), major perceived benefits of adopting ABC-based cost management systems include more accurate cost information for product costing and cost control, better insight into cost causation and operational efficiency improvements.
Implementation of ABC model in the cost management system requires an organisation to develop an understanding on the links between organisational activities and production outputs. Gosselin (1997) suggested that the process of identifying organisational activities and their links to production outputs itself is valuable to an organisation. The process enables an organisation to obtain knowledge of values of its operations and eliminate activities that do not add value to production. The outcomes of the process are beneficial to the organisation even when an ABC-based cost management system is not subsequently implemented.

While implementation of ABC-based cost management system can bring substantial benefits to organisations, the implementation processes often require significant time and resources commitments (Cohen et al., 2005). Moreover, maintenance of ABC-based costing systems is also costly and time-consuming.

As an example, Kaplan and Anderson (2004) cited Hendee Enterprise, a US$12 million fabricator of awnings. Hendee Enterprise had 40 departments, 150 activities, 10,000 orders and 45,000 line items. The company had an automated ABC-based cost management system but the processing of cost data from operations in one month still took three days to complete.

To facilitate implementation and maintenance of ABC-based cost management systems, Robert Kaplan and Steven Anderson developed a variant of ABC model, TDABC (Kaplan and Anderson, 2004). TDABC model simplifies cost allocation process by directly allocating costs from resource pools to cost objects with the use of quantity-based resource-activity cost drivers.

Under traditional ABC model, costs are allocated to cost objects under a two-stage process. In the first stage, Costs from resource pools are allocated to activities based on each resource’s contribution to various activities. Activity costs are then allocated to cost objects based on monetary values of activity costs and units of activities associated with each cost object.

**Figure 1: Traditional ABC-Based Costing Model for Department M**

Figure 1 presents a traditional ABC-based costing model for a production department, department M. Four resource pools, namely wages and salaries, depreciation, energy and factory supplies are identified in the model. The four cost pools are linked to three activities (administration, assembly and quality control) and activities costs are subsequently allocated to three cost objects: standard, deluxe and premium.
When an activity is added to or removed from a traditional ABC model, relationships between resources it consumes and other existing activities that consume the same resources will change. Parts of the resources originally allocated to existing activities are now allocated to the new activity. An update on all related resources and activities has to be made to incorporate the changes. For example, in department M, wages and salaries cost is linked to all three activities. If any new activity is added to the model, the percentage of wages and salaries cost allocated to each existing activity will change as part of the cost will be allocated to the new activity.

Any change in resource consumption pattern for a particular resource will also lead to changes in resource cost allocation to all activities that consume the resource. For example, if the percentage of wages and salaries cost allocated to administration change, the percentage of wages and salaries cost allocated to the other two activities will also change.

Therefore, regular updates of ABC model are necessary to maintain its accuracy. For most organisations, an ABC model typically has hundreds of resources and activities. The amount of administrative works associated with updates of model is tremendous (Kaplan and Anderson, 2004).

Under TDABC model, the costs of resources are allocated to cost objects directly through the use of quantity-based resource-activity cost drivers (Barrett, 2005). It is derived by multiplying the unit cost of a resource and the consumption of that resource for a unit of activity. Kaplan and Anderson (2004) recommend the use of time as a measure of quantity but other measures can also be used. The use of time as a measure enables management to quantify the consumption of non-volume based resource costs.

Resource-activity cost driver represents a link between a resource pool and a cost object through an activity. Each resource pool is linked to one or more cost objects through a resource-activity cost driver and a resource pool can be linked to a particular cost object through multiple resource-activity cost drivers.

![Figure 2: TDABC-Based Costing Model for Department M](image)

Transition from traditional ABC-based costing system to TDABC-based system is relatively simple. Relationships between resource pools, activities and cost objects identified in the traditional ABC-based costing model can be adopted in TDABC-based model directly and information generated by traditional ABC-based system can be used to derive the resource-activity drivers.
Figure 2 presents a TDABC-based costing model for department M. Under the current model, each resource pool is linked to the cost objects through one to three resource-activity cost drivers. The number of resource-activity cost driver between a resource pool and a cost object depends on the number of activities that consume the resource. For example, wages and salaries cost is consumed by all of three activities (administration, assembly and quality control). Therefore, wages and salaries cost is linked to all cost objects through three resource-activities cost drivers. In contrast, energy cost is only linked to the cost objects through one resource-activity driver as energy cost is only consumed by assembly activity.

The unit cost of a resource is determined based on total costs accumulated to a resource pool and capacity of the resource. Kaplan and Anderson (2004) suggested that practical capacity of a resource, rather than its theoretical capacity, should be used in TDABC model. Time is the measure of capacity used in Kaplan and Anderson to develop the model and its use give the name of the model. However, other quantitative measures can also be used as measures of capacity (Kaplan and Anderson, 2004).

Resource consumption for a unit of activity can be derived from various sources. In some cases, activity data is available from organisational information systems (Barrett, 2005). In other cases, managers make estimates based on observations, interviews with employees or surveys (Kaplan and Anderson, 2004).

Unlike traditional ABC model, not all costs are allocated to cost objects in TDABC model. Costs associated with idle resources are not allocated. Information on idle resources and their associated costs is disclosed in the management reports.

Resource Consumption Accounting

As pointed out in the introduction, RCA model is developed on the basis of German costing models, mainly GPK, and the ABC model. It is intended to be a model for comprehensive cost management systems but its principles can be selectively applied to existing cost management systems without complete overhaul of the systems (Clinton and Keys, 2002).

While most costing models are developed in isolation without considering the impacts of developments in information technology, it is not the case for RCA. RCA model provides a blueprint for the development of cost management system that works as an integral part of ERP system rather than as an independent system. In fact, the model can be seen as an evolution of ABC implementations in ERP systems. Johnson (2004) suggests that ERP-based RCA cost management systems enable automation of gathering financial and operational data into comprehensive, forward-looking applied business model and facilitate flows of day-to-day work process information to standard reporting system.

The RCA model is based on three inter-related conceptual “pillars”, namely resources focused cost management, quantity-based cost modelling and complex view of nature of cost (van der Merwe and Keys, 2002).

The concept of resources plays a central role in RCA model. Under RCA model, all resources that are consumed in an organisation’s operations are recognised. Resources are grouped into quantifiable resource pools in accordance to technologies employed by the resources. Reciprocal relationships between resource pools are recognised in the model.

RCA model separates the monetary values and quantity measures of the resources. When a resource is consumed, the quantity of the resource consumed is allocated to either a cost object or another resource pool. The distribution of resource cost for the quantity of a resource consumed can either be activity-based or volume-based. Unlike traditional costing models, no attempt is made to allocate all costs incurred to cost objects. The cost attributable to a cost object is determined by multiplying the quantity of resources allocated to that cost object by the unit costs of the resources.
The unit cost of a resource in a resource pool is determined by the total cost incurred in the acquisition of the resource and the quantity of the resource acquired. For intangible resources like IT services, the quantity of a resource acquired is based on the capacity of that resource.

RCA model recognises both linear and non-linear relationships between consumption of resources and costs incurred. A resource pool can have both fixed and variable components at the same time (van der Merwe and Keys, 2001). Both fixed and variable components of a resource pool vary with the amount of the resource consumed but in different manners. Variable component of a resource pool varies proportionally with the amount of resource consumed. In contrast, fixed component of a resource pool remains constant when consumption of the resource falls within a particular range. It only changes when consumption of the resource fall outside the designated range.

Both traditional ABC model and TDABC model assume all resource costs as variable. The resulting costing models are more suitable for long-run strategic decision making than short-run operational decision making. The separation of fixed and variable components of resource pools in RCA model enables management to model the short-run organisational cost behaviour more accurately.

The allocation of resource costs from resource pools to other cost pools is based on the quantities of resources consumed by each cost pool. Consequently, not all costs incurred during a period are allocated to cost objects. Costs may be attributed to the idle resources that are not utilised in the production processes. Idle resources and the costs associated with these resources are identified and the information is disclosed in the management reports.

As RCA model allows separation of fixed and variable components of cost pools and concurrent use of both activity-based and volume-based cost allocation methods, RCA-based costing models are likely to be different from those based on other costing models. Therefore, implementation of RCA-based costing system requires re-development of costing model for the organisation.

Figure 3 presents a RCA-based costing model for department M. Under the new model, three resource pools, namely labour, machinery and indirect materials are identified. The division of resource pools is based on the technologies employed by the resources. Depreciation and energy are combined into machinery resource pool while wages and salaries and factory supplies are re-named as labour and indirect materials respectively. Labour and machinery resource pools consist of both fixed and variable components while the indirect materials resource pool has variable component only.

For the labour resource pool, the fixed component represents the administrative salaries. Under the new model, the cost of this component is allocated to cost objects directly. Consequently, the need of administrative activity in the model is eliminated.

The fixed component of machinery cost pool represents the depreciation cost and the fixed component of energy cost. It is allocated to the remaining two activities (assembly and quality control) in a fashion similar to the variable component of the resource pool. Costs allocated to the two activities are subsequently allocated to cost objects in a way similar to the one under traditional ABC-based model.

Idle Resources in TDABC and RCA Models

Under traditional costing models, allocation of resources is based on the assumption that all acquired resources are fully utilised in an organisation’s operation. Therefore, resource costs are allocated to other cost pools in full and resource capacity is employed as a denominator in the calculation of monetary amounts allocated to other cost pools.

The assumption of full utilisation of resources can be true for physical resources like production materials but is highly unlikely the case for intangible resources such as labour and IT services. TDABC and RCA acknowledge the fact that not all acquired resources are utilised and idle resources exist during normal course of business. The two models attach resource costs to unit of resources available. Resource costs are allocated to another cost pool only when consumption of resources by that cost pool is identified. Idle resources that are not utilised in the operations are recognised in the two models and costs associated with idle resources are not allocated to any cost pool.
Recognition of idle resources in TDABC and RCA models makes modifications of organisational costing model easier by changing the way that resource costs analyses are performed. One of the major tasks for the maintenance of cost management system is analysis of cost flows from resource pools to other cost pools. Under traditional costing models, the sum of resource consumption by all cost pools linked to a particular resource pool is assumed to be equal to all available resources in that resource pool. All cost pools linked to a particular resource pool are analysed collectively and the focus of resource costs analysis is to determine the percentages of resources consumed by a group of cost pools that are linked to a particular resource pool. Modifying organisational costing model is time-consuming as change in a cost pool cannot be made without influencing allocation of resources in all resource pools that the cost pool is linked to.

Under TDABC and RCA models, however, the assumption of equality of available resources and consumed resources does not hold. The amounts of resources consumed by each cost pool are determined individually in the resource cost analysis. The focus of resource cost analysis is to determine quantity-based resource cost allocation rates based on one-to-one relationships between resource pools and cost pools. It is easier to modify organisational costing model under individual resource cost analysis as change in one resource cost allocation rate has no impact on other resource cost allocation rates. Cost pools can be added to or removed from the costing model without making any change in other cost pools.

Collective analysis of cost pools in the traditional costing models enables management to conceal idle resources in a resource pool by adjusting percentages of resource cost allocated to cost pools to ensure the total percentages add up to 100 percent (Kaplan and Anderson, 2004). In contrast, management cannot conceal the amount of idle resources in individual resource cost analysis by manipulating resource cost allocation rates as the amount of idle resources in a resource pool is determined by the collective effects of all resource cost allocation rates that are linked to the resource pool and the effects of individual resource cost allocation rates to the allocation of resource in a resource pool are crystallised only after the allocation process is performed.
The change from collective resource cost analysis to individual resource cost analysis in the TDABC and RCA models not only simplifies modifications of organisational costing model but also ensures costs of idle resources to remain visible in the model. Recognition of idle resources in TDABC and RCA models also represent a different view on the nature of product cost. By assuming full utilisation of resources in production, traditional costing models recognise all costs accumulated to resource pools as product costs. Any difference between accumulated resource costs and allocated resource costs is regarded as error from allocation process and adjustments are subsequently made to eliminate the difference.

In contrast, calculation of product costs in TDABC and RCA models is based on amounts of resources consumed in the production processes rather than amounts of resources supplied to production. Resource costs that are attributable to resources consumed are allocated to other cost pools and unallocated resource costs are treated as period costs.

The primary objective of cost management system is to provide information to support management decisions and the type of information that a cost management system can provide depends on the costing model it adopted. TDABC and RCA models enable cost management systems to provide three types of information, namely (1) costs allocated to cost objects; (2) links between resource pools and other cost pools and; (3) amount of idle resources and their associated costs.

Information on costs allocated to cost objects enable management to manage product costs by changing quantities of production outputs. Under traditional costing models, costs associated with idle resources are allocated to cost objects. The product costs are inflated and the management may accidentally start the fixed cost death spiral by removing products or services that consume fewer resources than they appear (Van De Merwe and Keys, 2001). By removing the impacts of idle resources on product costs, TDABC and RCA models provide more accurate information on product costs (Van De Merwe and Keys, 2001, Kaplan and Anderson, 2004).

Traditional ABC model differentiate itself from traditional absorption and variable costing models by providing information on how production activities add value to production outputs. With this information, management can reduce product costs by reducing or eliminating non value-added activities. Both TDABC and RCA provide information on linkages between resource pools and other cost pools and management can use this information to identify non value-added activities.

While traditional ABC model enables management to eliminate non value-added activities by providing information on how production activities add value to production outputs, it provides little insights on how to manage value-added activities. Under TDABC and RCA models, information on idle resources fills this gap.

As idle resources are not contributed to production activities, their existence represents inefficiencies in an organisation’s operation. Management can improve operational efficiency by reducing the amounts of idle resources. Idle resources can be reduced by either increasing production outputs or reducing the amounts of resources supplied to production. By identifying idle resources in resource pools, TDABC and RCA models enable management to assess and improve an organisation’s efficiency in performing its value-added activities.

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<th>Relationship with other information systems</th>
<th>Time-Driven Activity Based Costing</th>
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<td>Composition of resource</td>
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pools variable fixed or variable
Cross-allocation of resource costs among resource pools No cross allocation among resource pools Cross allocation among resource pools
Allocation of resource costs to cost objects Activity-based cost allocation Both activity-based and volume-based cost allocation are allowed

Figure 4 Comparison of TDABC and RCA models

Conclusion

TDABC and RCA represent two different philosophies on developments of cost management systems. TDABC model is designed to simplify implementation and maintenance of ABC model by utilising quantity-based resource-activity cost drivers to achieve one-stage resource costs allocation. Service organisations with large proportions of human and IT resources and standardised operating activities benefit most from the model. In contrast, RCA model attempts to capture the complexities of contemporary manufacturing activities by recognising complex inter-relationships between resource pools and cost objects. It relies on integration with ERP system to manage the complexity of the model. It is more suitable to manufacturing organisations that employ multiple heterogeneous resources in their operations.

Despite the different philosophies underpinning the two models, the developments of TDABC and RCA models are strongly influenced by the traditional ABC model. It is not surprising that some similarities do exist between the two models. Recognition of idle resources in the resource pools is one of the common features of TDABC and RCA models that play a key role in both models. By recognising idle resources in the costing models, TDABC and RCA models make maintenance of costing models for cost management systems easier. Recognition of idle resources also enables cost management systems that utilised the two models to provide more relevant and reliable cost information to support decision making. This paper presents the first analysis of TDABC and RCA model in respect to their common feature and examined the implications of the two models on developments and applications of cost management systems.

Reference


