

APPLICATION OF RESOURCE CONSUMPTION ACCOUNTING (RCA) IN AN EDUCATIONAL INSTITUTE

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Abstract

This paper introduces to readers “Resource Consumption Accounting -(RCA)” and its application in educational institutes/ universities . RCA is a comprehensive, fully integrated cost management system focusing on creating information for an enterprise’s optimization decisions. Consortium for Advanced Manufacturing- International (CAM-I) focuses on the theoretical capacity of resources. RCA breaks down this capacity of resources into productive capacity resource, non-productive capacity resource and idle capacity resource. RCA follows the principles of causality, responsiveness and work for modeling resource consumption and costs. These principles have been dealt with in detail in the paper along with their applications in educational institutions/universities.

JEL Classification: M0441

I. Introduction

Resources Consumption Accounting (RCA) is a management accounting approach focusing on creating reliable information to minimize costs and maximize revenues to enhance the productive capability of the business, aiming greater success in a highly competitive market. RCA combines German management accounting methods known as

“Grenzplankostenrechnung” or GPK which means “flexible cost planning and control” and strict form of Activity-Based Costing (ABC) for detailed process insights. RCA creates an integrated economic model of operations by breaking down the capacity of resources into productive capacity resource, non-productive capacity resource and idle capacity resource. RCA follows the principles of causality, responsiveness and work for modeling resource consumption and costs.

The principle of causality is the most important concept covering cause and effect relationship. Causality requires resource flows and their costs to be modeled from resource to consumers (support and direct) through the value chain on strict cause and effect basis. If a resource pool does not require output from another resource pool, it will not carry any costs from that resource pool. It means the final product and service will not reflect full cost as defined by generally accepted accounting principles. Full cost requires non-causal allocation of costs to the unit level of a product or service. The relevant term for a purely causal-based cost of a final unit of a product or service is the attributable cost. The term was established in 1963 by Professor Gordon Shillinglaw.

The principle of responsiveness ensures the compliance with the principle of causality in modeling the resource consumption with main focus on cost behavior. Responsiveness governs the fixed and proportional costs relationship between resource pools. The divisibility of cost achieved by applying the principles of causality and responsiveness supports an extremely wide range of decision and planning scenarios. The principle of responsiveness has a number of advantages -1. Allowing inverse relationship between total cost and total volume when manufacturing more complex products. 2. Providing managers specific insights into resources when they relate them to changes in product output. 3. Enabling the accurate modeling of an organization’s economic flow of goods and services regardless of its complexity.

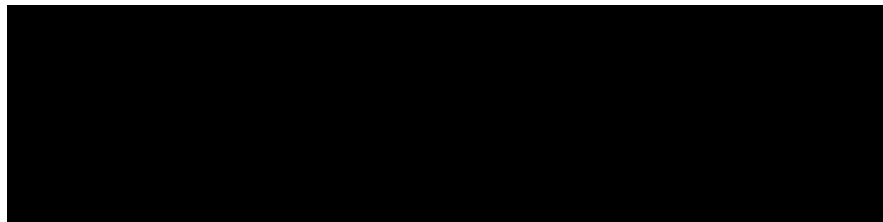
The principle of work (process) visibility is adopted from Activity-Based Costing (ABC) and is applied with quantity based drivers when needed for decision support or process improvements.

Sometimes tracing resource flows between cost objects does not yield sufficient information for managerial decisions while it is necessary to know what activity is executed in the resource consumption between resource pools. This principle applies to activity modeling by including such activities in the model which add critical and ongoing information that managers need frequently. The activities must have quantity-based drivers that provide capacity information and consume input in a quantitative manner. RCA creates a cost model that supports managers' decisions throughout the organization and aligns them with the organization's enterprise optimization strategy. RCA forms the cost model which starts by understanding the organization's strategy, its competitive position, the resource flows in the organization and their interaction to support each other to create products or services for sale. The following paragraphs describe principles, concepts and a variety of other technical aspects on RCA.

II. Literature Review

Cash is the dominant business resource which is primarily converted into operational resources to carry out business operations. These resources when consumed become cost. In case an enterprise is engaged in producing a single product, the allocation of operational resources to this cost object is a simple process. Physical and accounting flow of resources in this case can be traced easily as evident from the following flow diagram:

Figure 1 Accounting and physical flow of resource

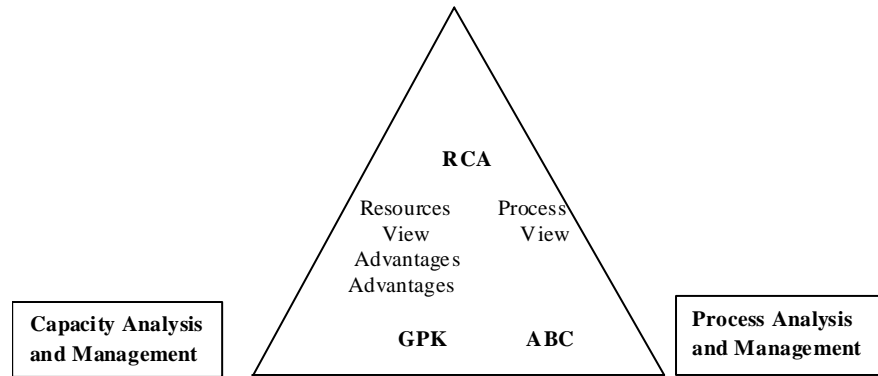


Accounting flows finally merge into final accounts, whereas physical flows fall within the ambit of management accounting. Now think about these flows in a complex organization with several product lines, a variety of raw materials, many production and service departments and massive direct and indirect costs. In such a complex process environment, accurate cost allocation to cost objects is a challenging and intricate job requiring a strong management information system which supports optimal business decision making by operation managers.

Management accounting techniques such as; the *Theory of Constraints* (TOC), *Lean Accounting* ² and *Activity Based Costing* ³ which have contributed valuable insights but have come up with different answers. TOC focused on constraint chock point, lean accounting focused on the production value stream and ABC models focused on activities without integration with day-to-day process systems in an organization. These models seem to be best suited for beginning fact-finding and general data analysis efforts. None of them incorporated the fundamental principles needed to optimize enterprise profit. An effective management accounting technique is, therefore, needed to generate forward looking information for making correct decisions by managers and employees to improve business results and to create value inside the organization.

Resource Consumption Accounting (RCA) is one of the management accounting techniques which combines German management accounting methods known as “Grenzplankostenrechnung (GPK)” (translated as “flexible cost planning and control.”) with best insights of ABC, TOC, and traditional management accounting thinking in a disciplined manner (Figure-2).

Figure-2 Resource Consumption Accounting



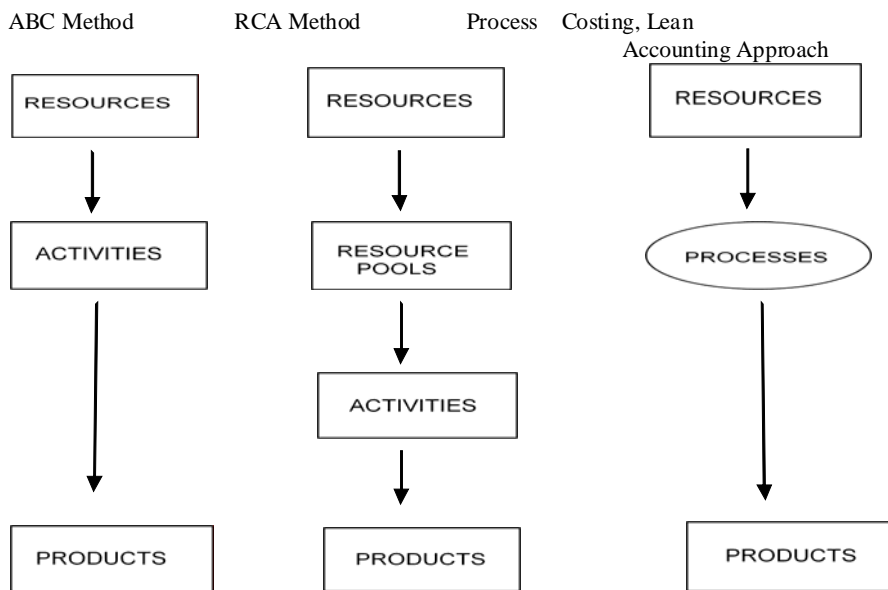
RCA provides financial information clearly linked to operational data, this yields clear decision making power encompassing all aspect of business and operations not restricted by design of the general ledger processes and chart of accounts. RCA focuses on resources with the help of activity based costing (ABC) and activity based methods (ABM), variable costing, absorption costing, actual costs, standard costs, segmented income statements, activity based resource planning, primary and secondary costs. RCA, is typically a part of an enterprise resource planning (ERP) system. It integrates the best combination of cost management principles for creating information for enterprise optimal decision. Benefits of an ERP-based, RCA approach over activity-based methods (ABM) include:

1. The RCA model automates gathering, and building the relationship, of actual financial and operational data into comprehensive, applied business model. The relationships between resources, cost drivers and cost objects are automatically updated in the course of work. In contrast, the ABC model relationships are often discerned through subjective interviews and other time-study snapshots.
2. RCA provides a forward-looking business model. This is in contrast to the activity-based system, which is generally

backward looking using historical information without recognition of current and future business changes.

3. RCA focuses on managing resource capacity as the basis for managing attributable costs, with costs driven by quantities of capacity demanded. ABC, using full absorption approach, drives all supplied cost through the business, regardless of the actual quantity of resource demanded by service receiver.
4. RCA recognizes resource interdependencies between the cost centers themselves and retains the transparency of the individual cost elements that make up the cost centre pool. ABC models are of a step-down nature, (from resource to activity to cost object) without recognizing fully burdened resource costs.

Difference between ABC and RCA methods.



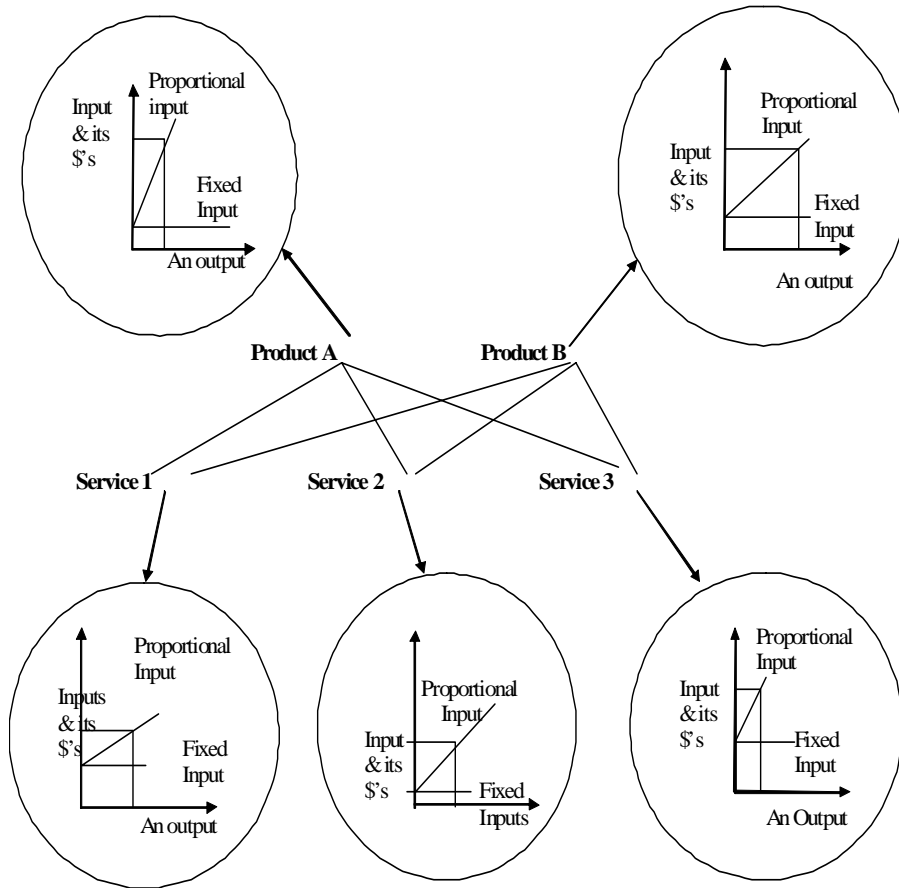
It is important to model cost flows since they are much more certain than revenues and typically must precede revenues. Resources are the cause of all costs. Resources need to be organized into relatively homogeneous workgroups or resource pools and each resource pool applies its input to produce an output that supports another organizational resource pool or produce a product or service for a customer. Resource costs are reflective of resource characteristics. Human resources have a pay rate, benefits and vacations allowance. Machines require maintenance, operators, energy, and floor space. Each resource pool or work unit combines characteristics of their resources and produces a homogenous output that transfers those costs to other resource pools or cost objects. Costs are fundamentally tied to the flow of resources and outputs of resource pools through the organization. If the operational resource flows are accurately modeled, accurate costs can be precisely allocated. The only option for modeling resource flows and their costs is the operational cost concept. Modeling costs, based on resource flows between resource pools with costs articulated as fixed and proportional based on their relationship to the resource pool's output, provides a highly divisible model that accurately reflects the operations and intermediate output that managers deal with for most of their decisions. The concept of resource divisibility allows two sets of cost concepts—operational and decision support to be effectively related⁴. The principles needed for managers to have a model that allows them to make correct decisions are:

1. Causality: It provides rationality, logic and responsibility to the model⁵. This principle demands that resource flows and their associated costs be modeled to reflect cause-and-effect relationships, eliminating arbitrary allocations between resource pools. Causality demands resource flows and their costs be modeled from resources to consumers (support and direct) through the value chain on a strict cause and effect basis. If a resource pool does not require output from another resource pool, it will not incur any costs from that resource pool. This means final products and services will not reflect the full cost defined by generally accepted accounting principles. The relevant term for a purely

causal – based of a final unit of product or service is the attributable cost⁶. which is the correct cost for management accounting focused on the objective of improving management decisions throughout the organization. This means final products and services will not reflect the full cost defined by generally accepted accounting principles.

2. Responsiveness: It ensures compliance with the principle of causality in modeling in resources consumption and cost behavior. Responsiveness governs the fixed and proportional relationships between resource pools. . The resource flows must be quantified precisely, not in percentage terms or allocations. Resource pools must be homogeneous- all resources producing a relatively discrete product or service for other resource pools. When these flows are modeled in a manner that reflects cause-and-effect relationships, the flow will clearly provide highly divisible information on cost attributable to unit-level, batch-level, product-or-service line, and organizational-level costs.(Figure- 4).

Figure-4. Responsiveness – Total Cost is the Sum of Individual Relations



1. Work: This is the guiding principle of activity based costing (ABC) integrated in RCA. Sometimes tracing resource flows between cost objects does not yield sufficient information for managerial decisions. Activities are therefore, identified on a periodical or continuous basis to know what activity is executed in the resource consumption between resource pools. The RCA accounting model applies the principle of work or activity modeling by identifying the activities, quantity based drivers that provide capacity information and quantity-based inputs.

RCA uses the Consortium for Advanced Manufacturing-International (CAM-I), which focuses on the theoretical capacity of resources⁷. The capacity is broken down into three categories:

1. Productive- The resource is producing or providing the service it was designed to accomplish.
2. Non-productive- The resource is engaged in maintenance, set-up, planned standby, waste (poor-quality production).
3. Idle- The resource is not employed in its primary activity because there is simply no work to do due to lack of demand or designed in excess capacity beyond current demand. This category also includes time that management decides or law/contractual agreements require that no work be done. For example, an office space is normally idle for 2-16 hours a day if only one shift works in the office or desk⁸

III. Methodology

Based on the understanding developed from the above literature survey, an effort is being made to develop a cost model for application in educational institutes. Educational institutions/universities serve the manpower requirement of the economy. Units operating in various sectors of the economy are the clients of educational institutions. It is, therefore, the responsibility of the educational institutions to produce and supply competent, hardworking, knowledgeable and competitive manpower within their available resources.. In an educational institution a student has unique characteristics. He/she is a source of revenue as well as a cause of expenditure. He/she is a raw material at the time of admission and final product when passing out of the institute.

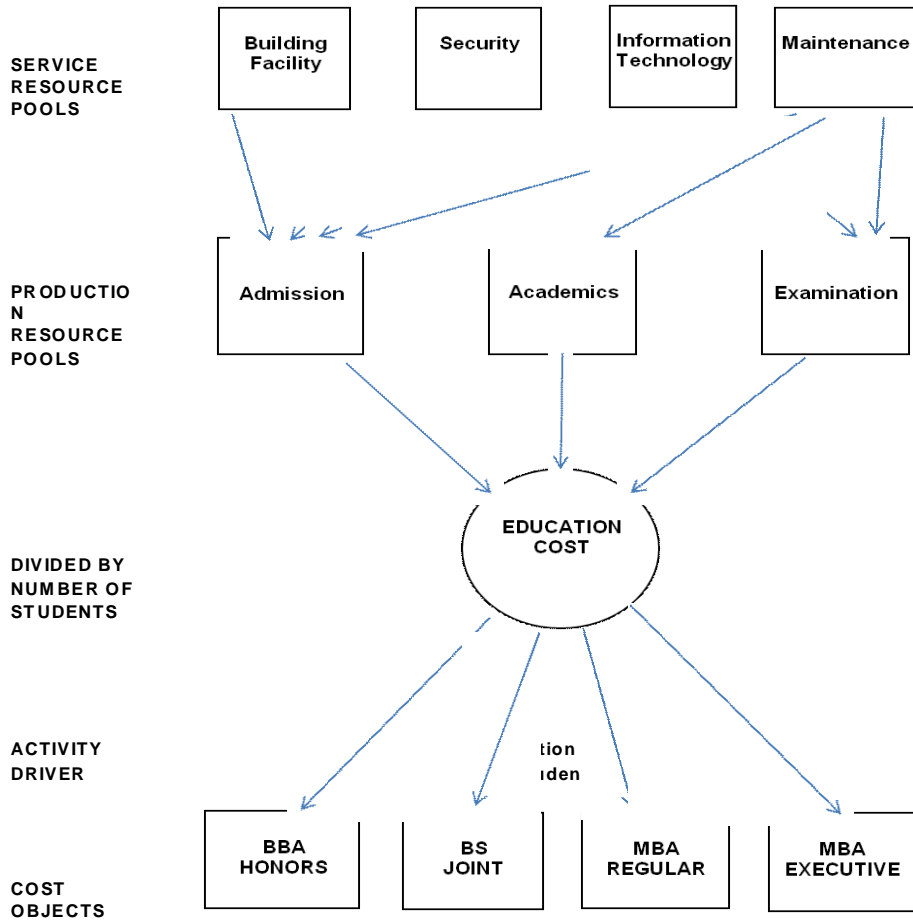
An educational institute consists of several departments. Some of them are synonymous to production departments in a manufacturing concern and are directly involved in the educational process and we may call them talent cultivation departments, while others are service departments which assist production departments in carrying out their operations smoothly.

The environment in which an educational institute operates is increasingly dynamic and complicated and as a result, it needs a proper cost management system for strategic planning and decision making. The three components; productive capability, competitive strategy and enterprise optimization create greater success in the highly competitive market place. An educational institute needs to have an adequate cost management system to achieve the following objectives:

1. Finding the precise education cost per student in each program and cost of the program. Financial accounting can only provide some basic cost information which cannot trace this cost.
2. Generating information and reports for various tiers of management to help them make decisions to minimize the costs and efficiently utilize the resources under their control.
3. Measuring the operating efficiencies of production and service departments and various cost centers within these departments.
4. Tracing those areas where resources remain idle, unutilized or wasted. For example, some costly books and materials purchased for the library remain unutilized or some costly equipment remains underutilized.
5. Implementing the budgetary control process in the organization for proper planning, coordination and control.

With the application of the following principles and concepts of RCA we have attempted to construct a model (Figure-5) for an educational institute on the basis of the following logical steps:

Figure-5 RCA Model for an Educational Institute



1. Division of all the departments into two categories; Production and Service departments.
2. Division of production and support departments into various resource pools or cost centers on the basis of activities each department is performing.
3. Identification of input capacity of each resource pool in quantity terms.
4. Identification of activities as productive, non-productive and idle.
5. Calculation of total input costs. This includes the cost incurred by each resource pool itself (primary costs) and the cost transferred to it from other resource pools (secondary costs) as a charge for its support services.
6. Identification of output cost drivers and determination of charging rate for allocation of cost to other resource pools or to the cost objects. The output capacity, in quantity, of a serving resource pool is equal to input capacities of the resource pools or cost object receiving the service. Therefore, charging rate of a serving resource pool is determined by dividing its total input cost by the input capacities of the resource pool being served. This method of process of allocation of input of a resource pool cost to other resource pool establishes the principle of causality (cause and effect).
7. Breaking up the input cost of each resource pool into fixed and proportional elements based on the principle of responsiveness.
8. Determination of cost of the cost object based on the actual resource utilization.

9. Identification of under utilized resources or idle capacities of the resource pools for fixing responsibilities and taking corrective action.
10. Taking operational decisions based on incremental and marginal cost and revenue basis.

Admission, teaching and examination departments are considered as production departments. Admission department acquires the raw material (new students), education department processes it and examination department tests the quality of the finished product (graduates). Security, IT, Maintenance and Building facilities are considered as service departments. Different activities performed by the departments are listed as resource pools or cost centers of the departments along with their input or theoretical capacity in terms of quantity and input cost thereof. The input costs of each resource pool include direct cost of its own activity and the indirect cost transferred to it from other serving resource pools. The cost driver determines an application rate, which is calculated by dividing the input cost of a resource pool by its output theoretical capacity in quantitative terms. This output capacity is the aggregate of input capacities in quantitative terms of the resource pools receiving the service (Figure-4). For allocation of input cost of a resource pool to other resource pools or cost object, the cost driver is multiplied by the actual input capacity of the resource pools or cost objects receiving the service. Application rates determined on the basis of theoretical capacity and applied on actual capacity may result in idle or excess capacity.

1. IT, maintenance and building facility departments are considered as service departments. Resource pools or activity centers of these departments are responsible for serving the resource pools of the production departments and other service departments. Activities of each of the service departments are transformed into resource pools. Volume of service to be rendered by each resource pool is based on their theoretical output capacities. Input costs of the resource pools include both direct and indirect cost which is divided by output capacities with different bases to determine cost drive rates which are multiplied with the actual output capacities.

2 The admission department is responsible for acquiring raw materials (students) for processing. Activities include preparation of admission tests, conducting the admission test and interviews and listing and announcement of eligible students for admission. Input capacity (practical capacity) of the department is worked out by taking the normal strength of staff members multiplied by the number of productive working days (excluding paid holidays) in the year. The input cost of the department includes all direct costs incurred by the department itself such as salaries of the staff in the department, and all other costs relating to admission including cost of admission test preparation, cost of conducting the admission test, cost of interviews etc. and indirect costs transferred in by other resource pools for the services rendered, such as IT, administration, security and building facilities. The input cost is divided by admission capacity (practical capacity in term of number of students' admitted) of the institute to arrive at the cost driver rate per student. This cost driver is multiplied by the actual number of students admitted to each program such as BBA-Honors, BS Joint-Honors, MBA-Regular, MBA-Executive etc. to allocate the cost to cost objects. In case the number of students admitted is less than the total admission capacity some of the cost of the admission department will remain unallocated indicating idle capacity.

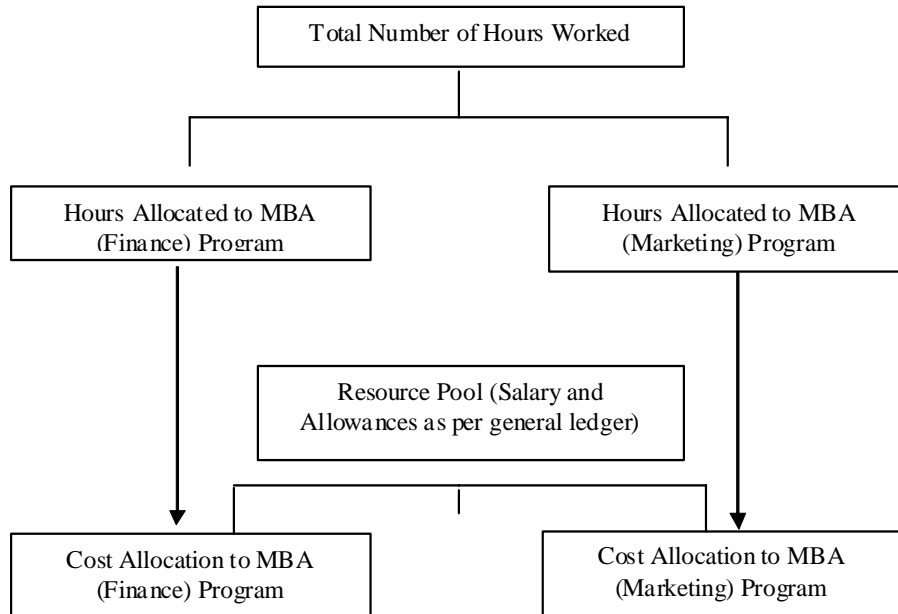
3 Academic departments are responsible for processing of raw materials (students) to produce quality finished product through talent cultivation. Resource pools or activity centers of each department include activities such as teaching, testing, counseling and guiding, evaluating performance of the students and research. The input capacity of each resource pool is determined by allocating number of hours per day a faculty member spends on each of the activities multiplied by the strength of faculty members and productive working days in the year excluding paid holidays. The input cost of the department includes all direct costs including salary, scholarships, poor student subsidy and other costs incurred by the department and indirect cost transferred to it from other resource pools. The input cost is shared by each resource pool on the basis of number of hours. The input cost of each resource pool is then

divided by output capacity in terms of number of students to determine cost driver rate per student. This cost driver is multiplied by actual number of students in each program to determine the education cost of each program. In case the number of students in the programs is less than the normal capacity, the resource pool is left with unabsorbed capacity due to excess capacity.

4 Examination department is responsible for assisting academics in quality testing of the students by conducting examinations. Functions and activities include preparation and announcement of examination time table, printing of question papers, conducting examination, maintaining records of answer scripts, compilation and announcement of results and student support work. Since all activities are connected with the same cost driver that is number of students, the department itself may be treated as a single resource pool. The input cost of the department includes all direct cost including salary of staff, cost of stationary, cost of maintenance and depreciation of equipment, and indirect cost transferred in from other resource pools such as IT, maintenance and building facilities. The input cost is divided by the normal output capacity in terms of number of students to determine the cost driver rate which is multiplied with the actual number of students in each program to determine the cost of each program. In case the number of students in the programs is less than the normal capacity, the resource pool is left with unabsorbed capacity due to excess capacity.

Following flow diagrams depict the process of allocation of costs under Activity Based Costing (ABC) and Resource Consumption Accounting (RCA):

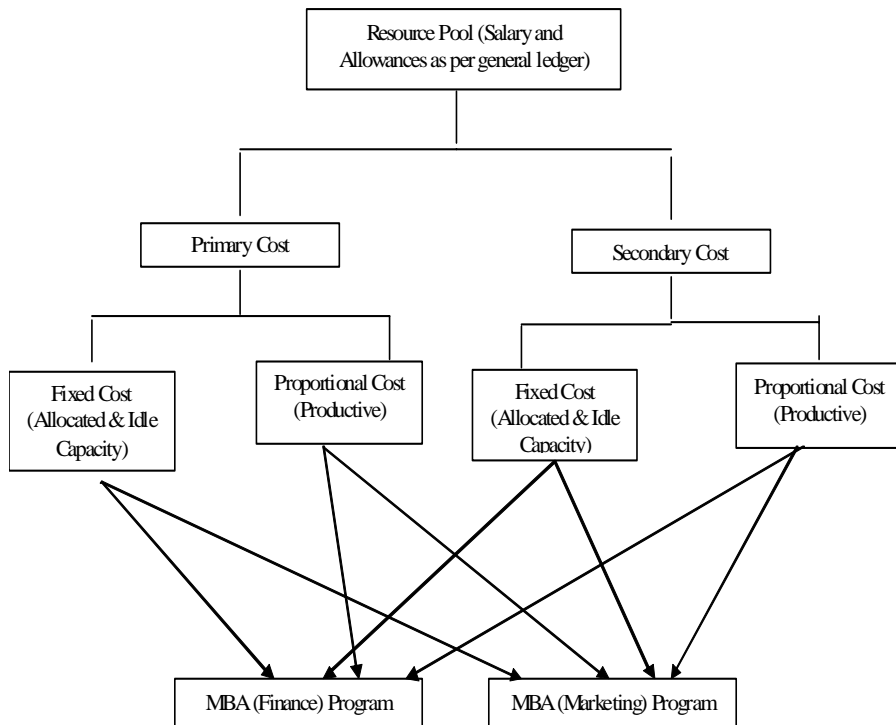
Figure 6: Cost Allocation through Activity Based Costing (ABC)



ABC falls short in three areas:

1. The approach does not adequately consider the fixed costs on unit-related activities. ABC assumes all costs of activities to be variable.
2. Because ABC does not use quantities in defining relationships in the cost model this results in a diminished ability to accommodate planned excess capacity.
3. Because of the view in ABC that resources are primarily monetary input into activities, insight into resources-specific demands due to a particular characteristics of the plan is lost.

Figure 7: Cost Allocation through Resource Consumption Accounting (RCA)



Advantages of RCA:

1. RCA properly accounts for excess/idle capacity.
2. RCA adequately reflects the nature of cost of the resource base.
3. RCA provides accurate projection of monetary equivalents for planning scenarios based on activities and output.
4. RCA enables to perform reconciliation of demand and supply of resources' outputs in a proactive manner.
5. RCA provides decision support for incremental investment decisions based on insights related to resource demand and nature of cost of the resource pool in question.

Determination of precise cost of the objects is a fairly difficult job since it depends on a justifiable and equitable process of allocation and reallocations of resources

from point of origin to point of destination and building up the business resource demands based on the requirements of the customer (the recipient) or service receivers instead of resource suppliers. The process as described above may still require further analysis and breakdown of activities in a department to create more resource pools but before doing so a comparison of cost of the efforts and benefits to be derived from them is necessary to avoid wastage of resources.

Notes

1. Theory of Constraints Dr. Eliyahu M Goldratt (1984)
The book titled “TheGoal” Theory of Constraints is an over all management philosophy that is geared to help organizations continually achieve their goal. The contention that any manageable system is limited in achieving more of its goal by a very small number of constraints, and that there is always one constraint. The TOC process seeks to identify the constraint and restructure the rest of the organization around it through the use of five focusing steps:
 - i. Identify the constraint (the resource or policy that prevents the organization from obtaining more of the goal).
 - ii. Decide how to exploit the constraint (make sure the constraint’s time is not wasted doing things that it should not do).
 - iii. Subordinate all other processes to the above decision (align the whole system or organization to support practices of the decision made above).
 - iv. Elevate the constraint (if required or possible permanently increase capacity of the constraint; “buy more”).

- v. If, as a result of these steps, the constraint has moved, return to Step 1. Don't let inertia become the constraint.
2. The purpose of Lean Accounting is to support the lean enterprise as a business strategy. It seeks to move from traditional accounting methods to a system that measures and motivates excellent business practices in the lean enterprise not using more resources than necessary.
 3. In a business organization, the ABC methodology assigns an organization's resource costs through activities to the products and services provided to its customers. It is generally used as a tool for understanding product and customer cost and profitability. As such, ABC has predominantly been used to support strategic decisions such as pricing, outsourcing and identification and measurement of process improvement initiatives
 4. The concept of resource divisibility refers to the ability to sell or terminate a resource that will no longer be needed due to outcome of a decision.
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