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SOSYAL BİLİMLER ENSTİTÜSÜ

İŞLETME ANABİLİM DALI
İNGİLİZCE MUHASEBE FİNANSMAN BİLİM DALI

APPLYING ACTIVITY BASED COSTING FOR CALCULATING COST OF MILITARY UNITS

YÜKSEK LİSANS TEZİ

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ABSTRACT

Activity Based Costing (ABC) is a simple concept that helps in decision making, continuous improvement efforts, and managing change. Managers use ABC to quantitatively understand their processes and to identify improvements.

ABC as used today is a method of measuring the consumption of resources by activities and the consumption of activities by services. ABC traces costs (resources consumed) to activities and then through those activities to products or services. The intent is to make "cost accounting" a tool for management decisions about cost efficiencies and effectiveness. ABC breaks installations services into activities that are necessary for providing the service. The advantage of the detail in ABC is to give the manager visibility to value added and non-value added activities. ABC is the manager's tool at the installation and garrison, assisting them in their daily business.

The U.S. Army Cost and Economic Analysis Center (USACEAC), a Field Operating Agency of Office of the Assistant Secretary of the Army for Financial Management and Comptroller (OASA (F&MC)), is the Army proponent for ABC implementation. USACEAC is responsible for developing policy and guidance, coordinating the development of ABC Models, and consolidating information on ABC initiatives. At present, efforts are focused on building an Army-wide framework for implementation through guidance, training, information, and ABC software. An ABC General Officer Senior Executive Service (GO/SES) Steering Committee has also been established to create a forum for Headquarters, Department of the Army (HQDA), Major Command (MACOM), and installation leadership to obtain consensus on management strategies and integration of cost methodologies.

ABC implementation is a voluntary, local decision. Across the Army, ABC is being implemented by many MACOMs and installations to support management decision making with better costing information.

ÖZET

Faaliyet tabanlı maliyetleme (ABC) karar vermede, sürekli gelişme çabalarında ve yönetim değişikliklerinde yardımcı olan basit bir konsepttir. Yöneticiler ABC' yi işlemlerini miktar olarak anlamak ve gelişmeleri tanımlayabilmek için kullanırlar.

ABC bugün kullanıldığı haliyle faaliyetlerle kaynakların tüketimini ve servislerle faaliyetlerin tüketimini ölçmenin bir metodudur. ABC maliyetleri (tüketilen kaynakları) önce faaliyetlere ve daha sonra bu faaliyetleri ürünlere ve hizmetlere ayırır. Burada amaç, maliyet muhasebesini maliyet verimliliği ve etkinliği hakkındaki yönetim kararları için kullanılan bir araç yapmaktır. ABC kuruluşun hizmetlerini hizmeti sağlamak için gerekli olan faaliyetlere ayırır. ABC deki detayın avantajı katma değerli ve katma değersiz faaliyetler için yöneticiye görüş vermektir. ABC birliklerde ve garnizonlarda günlük iş hayatlarında onlara yardım eden bir yönetici aracıdır.

A.B.D. ordusunun Maliyet ve Ekonomik Analiz Merkezi (USACEAC), ABC uygulamaları için orduya uygun olan bir saha operasyon ajansıdır. USACEAC ABC modellerinin gelişimini koordine etmede politika ve rehberlik geliştirmekten ve ABC girişimleri üzerine bilgilerin birleştirilmesinden sorumludur. Bugün çalışmalar rehberlik, eğitim, bilgi ve ABC yazılımı uygulamasının ordu çapında yayılması üzerine odaklanmıştır. ABC GO/SES Yönetim Komitesi HQDA ve MACOM gibi birimlere forum oluşturmak ve yönetim stratejileri ile maliyet metodolojilerinin birleşimi üzerine bir fikir birliği oluşturulması için kurulmuştur.

ABC uygulaması isteğe bağlı ve bölgesel bir karardır. Daha iyi maliyetleme bilgisiyle yönetim kararını desteklemek için ABC ordu çapında birçok MACOM gibi birlikler tarafından uygulanmaktadır.

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I. INTRODUCTION

Cost management is an extremely important subject these days. It is particularly important for the Army. Failure to operate efficiently will result in the excessive lose of mission capability and will prohibit the acquisition of new weapon systems.

The analogy of the cost war is quite apt. We face the loss of significant national strength if we do not learn to manage cost better and recognize the need for continuous improvement.

US Industry learned these lessons from foreign competitors. It was a painful learning experience. At the end of WWII US industry owned the vast majority of the world's undestroyed productive capacity.[1] Management could do no wrong, until the world changed and Japanese and other competitors rebuilt and began winning market share with better quality and lower pricers.

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[1] Aziz Akgül, **Dünyada Savunma Harcamaları ve Savunma Sanayilerinin Yapısı**, Ankara: Başbakanlık Basımevi, 1987, p.45

The end of the cold war found the U.S. Army in a similar position. Downsizing of combat capability has been greater than necessary had effective cost management processes been in place.

Since the U.S.Army is the greatest army in the world according to defense expenditures and is the only one which applies Activity Based Costing (ABC) to its some military units, we used U.S.Army as an example to explain how ABC can be applied to the military units for calculating costs of military units. Turkey is the tenth country in the world according to weapon produce.[2] There is not any ABC implementation of any military units in Turkish Army, yet.

The defense expenditures of the U.S.A. were $322 billion in 2001. This is more than total defense expenditures of other 11 countries which follows the U.S.A. in list of countries according to defense expenditures in the world. On the other hand the U.S.A. is the country which gives the most aid to the other countries in the world.[3]

The Department of Army incurs numerous costs in carrying out its primary mission of providing military defense for U. S. Citizens. An important part of these costs is related

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[2] Aziz Akgül, **Savunma Sanayi İşlemelerinin Yapısı ve Türk Savunma Sanayi**. Ankara: Başbakanlık Basımevi. 1986. p.117.

[3] Aktüel, **"A.B.D.'nin Yeni Ayısı"**, Sayı 610, 27 Mart – 3 Nisan 2003. p.18-19.

to installation support services. The primary objective of this thesis is to assess whether expected costs for Army installation services can be derived. If expected costs can be derived, it becomes possible to compare actual costs with the expected costs as a way of assessing whether a particular support service is being provided in a cost-efficient manner across Army installations.

In pursuing the primary objective of this thesis, it is important to understand the foundations underlying cost accounting concepts. *Cost accounting concepts*, often called *cost management concepts*, have evolved largely in the context of manufacturing firms. This does not mean, however, that such concepts are restricted to the manufacturing environment. Indeed, cost management concepts are equally important to non-manufacturing organizations as they are to manufacturing firms. Nevertheless, it is often helpful to first briefly review cost management concepts in a manufacturing environment before considering alternative environments, such as the Department of Army. *Activity Based Costing* (ABC), and its cousin concept of *Service Based Costing* (SBC), are among those topics for which a brief review of the manufacturing setting seems particularly relevant. These cost concepts, as well as a brief overview of standard service costing, will be discussed in the next section of this thesis.

In the third section of the thesis applying ABC in military units in the Army will be discussed. The fourth section of the thesis will discuss the basic hypothesis is related to the SBC argument, with particular emphasis on the argument underlying the use of the *expected cost* concept. The methodology for testing this hypothesis will be discussed in the fifth section. The sixth, and final, section of the thesis will provide summary comments, and conclusions.

II. COST CONCEPTS

The Commanders or managers in Turkish Army use cost accounting:

- To calculate and identify the expenditures of final goods
- To help controlling the expenditures of productions
- To help budgeting, planning ang programming
- To support managers for their decisions.
- To help for planning activities of military units.[4]

2.1. Producing vs. Service Departments

In a manufacturing setting, *producing* (sometimes called production or operating) *departments* are the ones which actually work on the product (i.e., transform direct materials into the product). *Service departments* are the ones that support the production of

[4] Lv.Mly.Ok.ve Eğt.Mrk.K.lığı. **Maliyet Muhasebesi Ders Kitabı**, Lv.Mly.Ok.ve Eğt.Mrk.K.lığı Matbaası, İstanbul, 1999. p.1-1

a product, but products do not actually flow through service departments (e.g., cafeteria, maintenance). Where the cost objective (i.e., the purpose for which a cost is being measured) is the final product, the costs of service departments are indirect costs. That is, the costs of service departments are, in essence, indirect costs with regard to the final product. Of course, for responsibility accounting purposes, an alternative objective is to determine the resources used to maintain service departments. The costs of service departments would be viewed as direct costs of those departments.[5]

2.2. Cost Finding

Costs are tools for accurate estimating and planning of the budget. Cost accounting supports the managers to make analysis.[6]

Normally, an organization that operates a formal cost accounting system will only use cost finding techniques to identify unfunded costs. However, even these organizations,

[5] Lawrence A.Gordon, **Expected Costs and Army Installation Support Services,** February 1998. p.2

[6] KKK 14–4. **Kara Kuvvetleri Komutanlığı Maliyet Analizleri**, Ankara, K.K. Basımevi, 1990, p.5

from time to time, and on special occasions, may have a requirement to use these techniques.

Cost finding is an approach used in the absence of a formal cost accounting system to estimate the actual costs incurred to provide a service, produce a product, or to obtain cost information for periodic decision making and information purposes. It is available for use by those Department of Defense (DoD) activities that do not have a formal cost accounting module as part of their accounting system, but who periodically provide reimbursable services or products to other DoD Components, Federal Agencies, or to the public.[7]

Cost finding may also be necessary when the cost of an item has not been recorded in the accounting system and the item is being transferred, sold, or recorded in the accounting system for the first time or when measuring productivity.

The proper application of cost finding requires knowledge of cost accounting and of the organizational functions associated with the final and intermediate cost objectives. Accordingly, personnel assigned to cost- finding projects should have cost accounting experience as well as an understanding of the organizations involved.

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[7] DoD. **Financial Management Regulation**, Volume 4, Chapter 22, 2000, p.461-463

The purposes of cost accounting in an installation are:

- To find unit costs.
- Help controlling to the activities of installation
- Help planning
- Help to the decisions.[8]

The application of cost-finding techniques shall be preceded by a clear requirements statement that describes:

- The cost objectives (both intermediate and final) to which cost finding techniques are to be applied.
- The organizations involved in performing the cost objectives and the tasks performed by each organization.
- The cost elements those are applicable.
- A plan that includes the specific cost finding techniques to be utilized and the criteria to be followed in selecting the specific cost finding technique to be used.
- A description of how those techniques will accomplish the cost objective.

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[8] K.K.Komp.D.Bşk.lığı. **Maliyetlerle İlgili Genel Açıklamalar ile K.K.K.lığında Personel Birim Maliyetleri, Birlik Yıllık İşletme–Bakım Maliyetleri ve Tasarruf Tedbirleri ile İlgili olarak Maliyetin Oluştuğu Yer ile Hizmet ve Ürün Üreten Yerlerde Tutulacak Maliyet Muhasebesi,** Ankara, K.K.K.lığı Yayınları, 1986, p.4

The statement and the work papers accumulating applicable cost elements shall be retained for review for the same length of time as documentation used in support of billings to the public.[9]

2.2.1. Identification of Cost Objectives

Cost objectives are defined as either functions or work units for which management decides to identify, measure, and accumulate costs. Cost objectives shall be sufficiently discrete and described in writing to such a level of detail to form a basis to identify the specific function or product to be costed. In a company's Billing Department we can define three cost objectives. For each cost object, we can determine the activities that are required to support demand for the object:[10]

- Labor hours ⇨ Account inquiry activity
- Letters ⇨ Correspondence activity
- Lines ⇨ Account billing activity

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[9] United States Armed Forces Institute. **Solutions Manual For Cost Accounting**, Volumes 1 and 2, War Department, 8 May 1944, p.299

[10] Fatih Yılmaz, Yakup Selvi, "21. Yüzyıla Girerken Muhasebe Denetimi Mesleği ve Teknolojik Gelişmeler", **IV. Türkiye Muhasebe Denetimi Sempozyumu**, Antalya,5-9 Mayıs 1999, İstanbul Serbest Muhasebeci Mali Müşavirler Odası Yayınları, p.208

Careful attention must be paid to identification of cost objectives. When the cost objective is identified as being at a macro (an organizational level, for example) level, the amount of effort required to determine the relevant costs and the associated quantitative data should be less refined than if the cost objective were identified as being at the micro (a specific function or operation) level. At the macro level, it is possible that the accounting system, through the use of coding structures and the general ledger operating program expense accounts listed in this Regulation, can provide much of the required financial data to establish relevant cost information. At the micro level, it probably will be necessary to use one of the methods to determine the time required to perform the cost objective and develop relevant cost information.

In addition, the classification of organizations as either direct or indirect (actually involved in performing the cost objective or performing as a support organization, respectively) is dependent on identifying cost objectives. At the macro level, as a general rule, all staff organizations will be classified as indirect, and all line organizations will be classified as direct. At the micro level, it is conceivable that a staff organization, or element thereof, could be classified as a direct organization. The distinction between the macro and micro levels will be an important consideration in complying with Office of Management and Budget (OMB) productivity requirements. The bottom line is that the cost accountant must be able to translate the measurement requirements into terms of source documents,

allocation techniques, and other such analysis techniques as may be necessary to meet the management requirement. Establishing a cost objective is a management decision and is essential to the proper application of cost finding techniques to a cost objective.

For cost finding purposes, identifying and describing cost objectives take on special importance. Within the Department of Defense, cost finding techniques will probably be used to compare costs of different organizational units or operations performing the same cost objective, or in measuring productivity, and to measure the cost of performing a particular operation, among other things. For example, the costs to issue a check at an accounting station might be compared with the same costs at other accounting stations. In such situations, cost-finding techniques serve as a tool in identifying more efficient methods of performing a given task. Cost objectives may also be used to compare organizational efficiency, for example, the costs for an intermediate objective, such as processing a personnel action at a personnel office, might be compared with other personnel offices.

2.2.2. Identification of Organizations Involved

The management & control of an organization to:

- Determine accurate costs, (cost measurement system to gather cost data & information)
- Improve business processes,
- Eliminate waste,
- Identify cost drivers,
- Plan operations, & set enterprise strategies.

Once the cost objectives have been identified, personnel assigned to identify the costs associated with the cost objective may proceed to the next step: identifying the organizational units contributing resources to the cost objective. Generally, the units will be within the activity itself (the installation level; and, within the installation, the supply unit, the transportation unit, administration, etc.).

The initial task is to classify the installation-level organizational units as direct or indirect. A unit that is responsible for actually performing the work is a direct unit. A unit that provides support or performs an administrative function is an indirect unit. Care must

be taken to assure that organizational units are not classified as both direct and indirect for the same cost objective:

- The process of classifying an organization as either direct or indirect may change as different cost objectives are identified and analyzed. Attempts to retain the same classification for different cost objectives may result in erroneous cost determinations, thus leading to misleading and faulty management decisions.
- An organization that is classified as indirect will not always be recognized in the computation of costs for a final cost objective. At the macro level, staff organizations generally will be recognized as an indirect organization and the related costs allocated among direct organizations. At the micro level, materiality and usefulness will be determining factors.
- The organizational units can be classified through use of an iterative process or through the use of organizational charts or tables, depending on the final cost objective. The iterative process consists of a series of questions designed to establish the relationship that each organization unit has with the product or service for which cost-finding techniques are being developed. First, the organizational units directly involved in the process are identified. Then the organizational units providing indirect functions to the direct organizational units are identified. This second category is also identified and arrayed through an iterative process consisting of a series of questions designed to establish the

relationship of supporting activities to direct line organizations. The procedure is repeated until all organizational units are classified as direct or indirect for all identified cost objectives.

- In order to determine which organizations are involved, it is necessary to identify the flow of actions related to the cost objective and the related intermediate cost objectives.
- It is important to understand that the organizational activities involved in a particular cost objective or interim cost objective can cross organizational lines of responsibility.

2.2.3. Identification of Cost Elements

An important aspect of any cost finding technique is identifying the direct and indirect cost elements applicable to the product or service. Both the direct and indirect activities may have the same cost elements. The difference is in the allocation of all applicable indirect costs (factory burden).

Care must be taken to assure that all cost elements are identified. The first step is to identify all possible cost elements and then to determine which cost elements are significant. After the potential applications are identified, a decision must be made as to which cost elements are sufficiently significant as to warrant separate consideration.

After developing the statistical cost data, the individual or group responsible for applying cost finding to the cost objective can make a decision as to the significance of each cost element in the final determination. It is important to remember that the information is, at this point, only raw data. Decisions must be made as to the relevance and materiality of each cost element to the cost objective. Materiality is associated with whether excluding the data could distort the computed value for the final cost objective.

2.2.4. Application of Prescribed Rates

The purpose of using cost-finding techniques is to determine that all applicable cost elements are addressed in computing the final cost. The following rules shall be applied when determining the individual costs of intermediate and final cost objectives:

2.2.4.1. Civilian direct labor costs are computed using the applicable pay grade for General Support (GS)- and General Merit (GM)-series personnel. Amounts included as direct labor costs shall recognize only productive time; that is, the time actually used to perform the function. All other time is indirect labor time, and is included in overhead (factory burden). Actual costs may be used, if known, provided appropriate documentation is available to support their substitution.

2.2.4.2. Civilian personnel benefits costs are computed using the rates.

2.2.4.3. Military personnel costs are costed using the rates for each applicable military grade at standard military composite rates.

2.2.4.4. Both military and civilian labor shall be analyzed as to productiveness. Productive labor (labor that is actually chargeable to jobs) shall be recorded as direct labor. Indirect labor (labor that cannot be charged to a specific job) shall be recognized in computing overhead (factory burden).

2.2.4.5. Direct material cost is determined using standard prices unless the actual cost of the material is known from vendor invoices.

2.2.4.6. Other costs that can be directly related to the cost objective are determined using documents such as vendor invoices, travel vouchers, etc.

2.2.4.7. Indirect costs are based on algorithms that are used to prorate the overhead costs to the cost objective based on factors such as the ratio of direct labor costs for the cost objective to total labor costs for the installation.[11]

Labor is the physical or mental effort expended in the production of a product. Labor costs may be divided into direct & indirect labor as follows:

- Direct Labor: All labor directly involved in the production of a finished product; that can be easily traced to the product; and that represents a major labor cost of producing

[11] DoD, p.464-467

that product. The work of machine operators in a manufacturing company would be considered direct labor.

- Indirect Labor: All labor involved in the production of a product that is not considered direct labor. The work of a plant supervisor is an example of indirect labor.
- Factory Overhead: This is all costs – other than direct material & direct labor – of producing a product. Cost of any product equals the cost of direct materials, direct labor and factory overhead.[12]

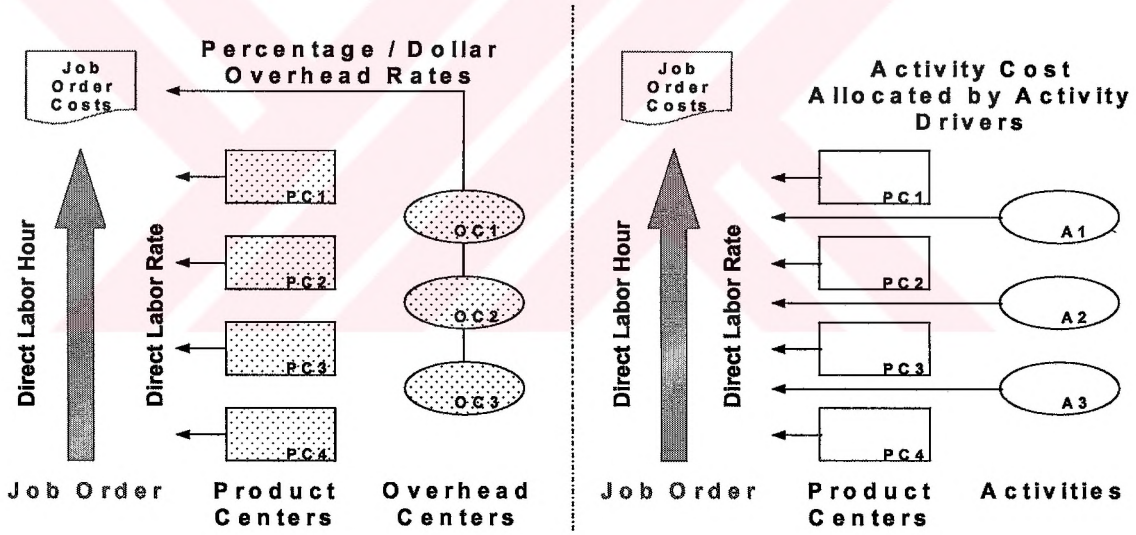

Figure 2.1. Overhead Allocated By Direct Labor vs. ABC

[12] Necdet Şensoy,. **Selected Topics On Turkish Tax Accounting,** M.Ü. Yayın No: 550, İ.İ.B.F.Yayın No: 397, M.Ü. Teknik Eğt. Fakültesi Döner Sermaye İşletmesi Matbaası, İstanbul, 1994. p.101.

2.2.5. Identification of Source Documents

2.2.5.1. Before the values for each cost can be determined, the source documents for the required data must be identified and copies obtained, together with the locations at which the documents are maintained. In addition, it will be necessary to determine the quantities of documents involved, especially if the cost objective is to determine average unit costs for a certain action.

2.2.5.2. When the final cost objective is to determine the cost of performing one single event, the specific documents involved must be identified. When the cost objective is much broader (for example, determining the average cost of issuing checks without regard to whom they are issued), identification of the specific documents involved may not be as significant as the operating costs (including the materials and supplies used) of the organizational units directly involved in the process.

2.2.6. Selection of the Appropriate Cost-Finding Technique.

The development of a final cost for the cost objective can be made using one of several different techniques or a combination thereof. The decision as to the method used will often depend on the purposes for which the cost objective has been established. Those cost objectives established to determine costs to meet a statutory or a recurring use need could require the use of cost-finding techniques with a higher degree of precision than those cost objectives established to meet an internal management need.

2.2.7. Cost-Finding Techniques

2.2.7.1. Observation

2.2.7.1.1. The observation technique is normally used when the specific effort to be costed or a similar effort is currently in process. The first step is to complete the

requirements statement. The observer then physically follows the product or service through the various performing organizations, documenting the following:

- Various events incident to performance.
- The grade levels of personnel directly working on the effort.
- The length of time spent on the activity.
- Direct material used.
- Indirect material used.
- Types of support received from other organizational units.
- Any other factors that have an impact on the cost of producing the product or performing the service.

A traditional flow chart of the entire process may be helpful in organizing, visualizing, and understanding the particular process under review.

2.2.7.1.2. The observer then lists all of the identified cost elements and computes the cost of each element using the general ledger expense accounts.

2.2.7.1.3. Any other assumptions shall be carefully and accurately documented so that users of the resulting information will have a better understanding of the process used.

2.2.7.2. Statistical Sampling

2.2.7.2.1. This technique is normally used when there is a large volume of similar type work being performed on a continuous task basis. An example of the use of this technique is packing, crating, and handling costs incurred at the depot level. A random sample of items is selected and a special job order tag is attached to each item selected when it is initially placed into the performance cycle. All personnel who come into physical contact with the items are required to record their organization, pay grade, length of time involved, and type and quantity of material or supplies used. Completed tags are returned to the personnel conducting the study who ensure that all tags have been returned and properly completed.

2.2.7.2.2. All of the cost elements identified to the cost objective are assigned a cost.

2.2.7.2.3. Resulting cost estimates shall be annotated to disclose the confidence level of the resulting estimate within a specific range.

2.2.7.3. Independent Appraisal

The independent appraisal technique is normally used when the cost determination is made after the cost objective has been completed, and there is no similar product being produced. Normally, the effort would be accomplished by an engineer or an individual who is an expert in the production process. Under this procedure, a list of all resources involved in fabricating the product or performing the service is made. Each resource is then analyzed to establish a reasonable input cost. The total cost of the applied resources represents a reasonable estimate of costs incurred in the cost objective.

2.2.7.4. Commercial Cost

This technique is normally used in connection with incidental activities carried out during a DoD mission requirement. In these circumstances, the application of normal full cost to the production of a product or provision of service would not be representative of the incurred cost. An example would be a Navy carrier transporting a disabled foreign aircraft to a repair facility incident to the performance of its normal mission. In this case, a determination of the commercial charge to transport the disabled aircraft might be more representative of the allocable cost incurred by the Navy vessel.

2.2.7.5. DELPHI Technique

This technique is useful in those instances when the more traditional cost estimation techniques cannot be applied to a cost objective. Accordingly, it is probably the least precise estimating technique, but one that is still useful if another technique is not available.

2.2.7.5.1. This technique uses a series of estimates made by a group of experts that is refined as subsequent estimates are made. For example, five construction experts might be given the task of estimating the costs associated with a new construction technique. These experts would be given the initial parameters of the project such as location; required specifications; geographical, environmental, time, and political constraints; and, any other known relevant data at the time of project initiation. Each group member would then develop an initial estimate of component costs and reconvene to discuss their individual analyses. After discussion, each expert would be asked to refine their estimate based on what was learned at the meeting. The evaluation process would be repeated by each participant to arrive at a revised estimate. The process would be repeated as often as necessary, until the group achieved consensus that the estimate at hand was the best available, given the uncertainty of the nature of the project and dissimilarity with other efforts in their experience.

2.2.7.5.2. This technique is probably more useful in determining what some new product or service should cost rather than determining the actual cost of an existing product or service. However, some of the principles involved may be helpful.

2.2.7.6. Memorandum Records

This technique is an informal method for gathering cost data and should only be used in those cases when the value of the cost data is of little significance. It involves the preparation of memoranda documenting estimates of costs for a specific product or service. It should not be used when significant decisions are to be based on the cost estimates derived or when other more accurate methods are available. It is useful as a cost accumulating tool for those low priority, low value projects or products when it is known that some cost data may be required in the future. However, in this case, a traditional cost accounting system is too costly or too cumbersome relative to the underlying effort.

2.2.7.7. Analysis of Responsibility Center/Cost Center

This technique can be helpful in those cases where good organizational costs are available through some responsibility center or cost center organizational structure. Costs

associated with the center can be allocated to a product or service of the center as a way to estimate at least part of the cost of that product or service.[13]

2.2.8. Combination of Cost-Finding Techniques

Nothing prevents the use of more than one of these techniques, if such a use results in a more cost-effective or more accurate estimate of the cost information requirement. The techniques can also be used to augment data that is generated by a conventional cost accounting system. It is important to remember what the cost data requirement is and to generate or utilize the cost accumulation system or method that gives the highest quality cost data at the lowest information accumulation cost. A cost finding technique that is not described here can also be used, as long as it conforms with the general requirement for reliability in relation to the value of the cost data.

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[13] Dale R Geiger,. **Managerial Cost Accounting,** California, California State University, 1997, p.95

2.2.9. Determination of Time and Cost

2.2.9.1. After the required time to perform each element of the final and intermediate cost objectives is determined, the costs associated with each element must be determined. In addition, since real and capitalized personal property is involved, the contribution of these assets must also be determined. The extent to which the computations are necessary will depend on the accuracy measured in performing each action.

2.2.9.2. Personnel costs are obtained from the following sources:

- Civilian Personnel. Pay scales issued by the Office of Personnel Management.
- Military Personnel. Standard military composite pay rates issued by the Military Departments. These standard rates recognize fringe benefits.
- Civilian Personnel Fringe Benefits. These are determined using the add-on factors

2.2.9.3. Depreciation and Amortization of Capitalized Personal Property.

2.2.9.4. Depreciation and Amortization of Real Property.

2.2.10. Use Of The Price Mechanism To Adjust Demand And Set Quality Levels For Services Delivered At Army Installations

2.2.10.1. Free Goods Problem:

At present many installation services are provided free. Customers do not pay a price for the quantity or quality of services used. Even when the customer is charged a fixed fee for the service, once the fee is paid, demand for the service is no longer rationed and thus again becomes free goods.

2.2.10.2. Solution:

Present a methodology that can be used to price installation services based on actual cost of:

- Customer demands for service quantity.

- Customer preference for service quality (cycle time, availability, and accuracy).

2.2.10.3. Why Charge A Price?

Free goods have infinite demand. Offering a free good can drive up the demand and consumption for services since there is no incentive for the consumer to conserve. By charging a price based on the amount of use, the amount of service demanded, the quality of service provided, and the associated cost of providing the service are aligned by the price system.

2.2.10.4. Economic Concept:

Charging a price for a service is supported by the economic principle that a customer who uses a particular service at a given quality level should pay for the service. By paying full cost for the quantity and quality of service consumed, the consumer will adjust demand for the service in proportion to the value the customer sets on the service and their available budget. The adjusted demand can communicate to government managers the type, quantity, and quality of installation services consumers want, need and can afford. The key for charging a price for a service is the ability to identify and charge the specific

user for the service at the given quantity and quality levels and the ability to exclude customers who do not pay the price.

2.2.10.5. Pricing Policy:

Unlike the private sector where a price is set to maximize profits, a price is set in the government sector to recover the cost of providing a service. The selection of a cost methodology to determine the costs that must be recovered is an essential step in determining a price for a service. Two practical approaches to arrive at the cost for pricing a service are presented. A bottom-up approach using the Activity Based Costing (ABC) methodology and a top down approach using the Standard Service Cost (SSC) methodology are presented. The ABC approach derives a Marginal Cost (MC) to set a price (P) and the SSC approach uses Average Cost (AC) to set a price (P).[14]

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[14] U.S. Army Cost & Economic Analysis Center, **White Paper,** 14 April 1997.

2.3. Standard Service Costing

U.S. Army installations have 122 support services, grouped into eight functional categories, funded by the Department of Army (see Appendix A). These services provide indirect support, and thus represent indirect costs, to the ultimate mission of the Army. The methodology for linking the costs of the installation services to the output (i.e., performance) of the support service is referred to as Standard Service Costing (SSC).

SSC is a costing methodology that can be used as part of a decision system. Its main goal is to calculate an "expected cost" for providing an Army installation support service at a specified level (standard) of service. To do this, SSC uses input on services, standards, and historical costs from existing Army initiatives and systems and generates an "expected cost" estimate using proven statistical techniques. Because SSC generates "expected costs" estimates based on servise standards, SSC can be used as an analytical decision making tool for executing trade-off analysis, conducting "what-if" scenario inquiries, and assisting in resource allocation determinations.

SSC is a costing methodology developed to tie service performance to cost in the Army installation support arena. It does this by using service and performance data from

on-going Army initiatives combined with proven statistical techniques to calculate expected costs. After applying the SSC methodology to historical service cost and performance data, a commander, manager, or analyst can determine the "expected cost" to provide a service at a given standard. Once the "expected cost" is known, cost trade-off analyses and "what-if" scenarios can be conducted and performance standards can be set that correspond to available resources and policy.

SSC has three primary components: services, standards, and costs. SSC does not define services, set standards, nor collect historical data – it is strictly a costing methodology that computes "expected costs". SSC's foundation is in service definitions, standards, and historical costs from other Army initiatives. Although any source with appropriate data could be used, this methodology has been developed using Installation Status Report (ISR) standards and Army Service Based Costing (Army SBC) services and historical costs.

ISR and Army SBC share the same service definitions – a set of 122 installation support services that cover everything from services provided by the Chaplain's office to services provided by the Staff Judge Advocate. The service definitions are not tied to any given installation, organization or mission, so they are transferable from installation to installation.

Service performance standards are developed and measured by the Assistant Chief of Staff for Installation Management (ACSIM) through ISR. These standards are based on observed best practices internally (within the Army) and externally (outside government and commercial agencies).

Historical costs come from Army SBC which collects cost by service and captures the true, full managerially controlled cost of providing installation support services. Cost data are based on Defence Finance and Accounting (DFAS) 218 Report data and functional expertise at the installation level.

Using service definitions, standards, and historical costs from existing sources as input, the SSC methodology can be used to calculate the "expected cost" of providing a service at a given performance standard. The SSC methodology is comprised of five main steps:

- Define service requirements,
- Establish standards for effectiveness measures,
- Develop cost estimating relationship,
- Distribute cost estimating factors, and
- Evaluate and refine the cost estimates process.

The service requirements and standards for effectively meeting those requirements (i.e., steps 1 and 2 above) are set by the Department of Army in conjunction with Major Commands (MACOMS) and Army installations. Given these service requirements and standards, the next step (i.e., third step above) is to derive appropriate "expected costs". It is the process of estimating these expected costs that is the primary concern of this project. In this step, data analysis and the engineering and parametric cost estimating methods are combined to develop a cost estimating relationship (CER) between quality (service performance), quantity, and cost. The CER is then refined through probability analysis and distributed for use (step four). In step five, variance analysis and supplemental probability analysis are done with additional cost and performance data. Cost estimates are refined whenever new data or information are available. The end result is the "expected cost" of providing an installation service at a prescribed performance level. Since the "expected cost" was calculated using proven statistical methods, it can be replicated and easily validated.[15]

Once an installation commander, manager, or analyst knows the "expected cost" of providing a service at a given level of quality, resourcing, policy and other managerial decision support analysis can begin. The effect of budget increments and decrements on quality of life can be seen immediately. The resources necessary to meet a policy

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[15] U.S. Army's Cost and Economic Analysis Center, **SSC Handbook**, CALIBRE Systems Inc., 1996, p.36

requirement affecting service standards can immediately be calculated. Managerial accountability can immediately encouraged, consistent with the Government Performance and Results Act and the National Performance Review, because resources consumed can be tied to expected service performance.

The SSC costing methodology can be used as part of a decision support system that will help commanders, managers, and analysts make more informed, effective resource allocation and service quality decisions.

SSC leverages work done in other Army initiatives and systems. The services, standards, and historical cost data used in SSC have been adopted from existing efforts. While the inputs are not new, the way in which they are used together with statistical analysis is. This new technique answers the question "what resources are required to meet a specified performance requirement for an Army installation support service?" Answering this question allows an installation commander, functional manager, resource manager, or cost analyst to make more informed decisions about policy changes, resource allocation, and business process changes. Answering this question also helps to ensure that managers accurately quantify the resources needed to meet service goals and determine the impact if sufficient resources are not provided to meet service goals. This approach exposes

managers to accountability and performance measurement consistent with the Government Performance and Results Act and the National Performance review.

There are many benefits gained from knowing what it will cost to provide a designated level of service at an installation. SSC is a methodology to estimate this cost. To understand how SSC works, it is best to look at its three components and the five main steps that bring them together.

Controlling and decreasing the costs is very important. But, satisfying the customers with the least cost is more important for managers. Decreasing the costs shouldn't prevent improvements. Installations are for satifying customers not to decrease the costs to zero.[16]

[16] Jeff Olson, **Maliyet Düşürme, Atak Yöneticinin Rehberi**, İstanbul, Hayat Yayıncılık, 1999, p.13

2.3.1. Concepts and Components of SSC

SSC's main goal is to provide an "expected cost" estimate for providing uniform installation support services at Army installations. For SSC to work, three things must happen:

- A set of installation support services must be identified and defined;
- A performance standard must be established for each service; and
- An "expected cost" for that service must be calculated.

The services provided and their corresponding performance standards are subject to change periodically in accordance with changes in Army mission, priorities, and available resources. Changes to either the service will, in turn, affect the cost. To compute the "expected cost" for each service, statistical model are applied using past performance and cost data.

2.3.1.1. Services

An installation service is defined as a group of activities that come together to create a product or serve a customer. There are currently 122 services typically provided at

installations across the U.S.Army. These are services that are resourced, expensed and controlled by the installation commander (e.g., Custodial Services, MILPO Services, Center-Based Child Care Services). In addition, there are about 30 other services that are influenced by the commander, but not under his direct control (e.g., AAFES, Family & Community Health programs, Bank/Credit Unions).

The 122 services are mutually exclusive and inclusive; no activity is included in more than one service area and every activity typically accomplished by an installation is included in one of the 122 services. The services cover everything from the services provided by the Chaplain's office to those provided by the Staff Judge Advocate. Regardless of the installation mission type or primary appropriation funding, these 122 services are generally performed as part of the day-to-day support role any Army instllation.

Service definitions evolve and are refined each time they are applied in an Army initiative. But, the basic set of services remains unchanged from the original taxonomy. The set of 122 services remains effective because it is based on customers and products rather than an installation's mission or organizanional structures.

A set of common installation support services is a necessity. Without uniformity and consistency across the Army in terms of service definitions, analysis is limited. Without consistent data collection methods, data is suspect and statistical reliability impossible. Without the ability to continually view service levels and their associated costs, business process reengenering is handicapped, external benchmarking limited, and resource management decision making difficult and somewhat ineffective. Additionally, new services or performance standards cannot be easily transferred between installations and good business practices cannot be shared. The set of 122 generic installation support services is the first component of SSC.

In Turkish Army we can define some services:

- Salaries
- Equipment
- Food service
- Education
- Maintenance
- Fuel
- Other overhead costs.[17]

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[17] K.K.K.lığı. **K.K.K.lığına Bağlı Bazı Birliklerin 2000 Yılı Birim Fiyatlarıyla Yıllık işletme, Bakım ve İdame Maliyetleri Broşürü**, Ankara, K.K. Basımevi, 2000, p.1-21

2.3.1.2. Standards

A standard is an expected level of performance in delivering a service to satisfy customer needs. Performance of service delivery can be measured in terms of effectiveness (quantity and quality of output), efficiency (unit cost), or outcome (result). A service standard provides a practical way to measure performance. Without standards, comparisons are not possible, nor is there a way to gauge improvements. How do you know what is expected unless you're told? Performance must be measured against a standard. To highlight this principle, consider that a performance measure without a standard is like a jump contest without a bar. Which high jumpers really cleared seven feet? Which high jumper jumped higher? You can guess, but really don't know.

Standards act as an objective mark that differentiates between success and failure. Establishing standards as a management tool also fixes accountability throughout the chain of command for delivering a given level of service. It is important for there to be provided by installations to soldiers, their families and other customers.

2.3.1.2 1. Types of Standards

SSC uses standards jointly developed by Headquarters Department of the Army, Army Major Commands (MACOMs), and function proponents for a particular service. There are three types of standards used in SSC: policy, historical, and discreationary. Policy standards are those standards set forth by law or directives. Child Care and Environmental Compliance standards are excellent examples of policy standards. Policy standards are usually established to ensure the service is consistently provided. Policy or directive standards also serve as the minimum level of requirements for a given service. Army commanders have limited flexibility in these areas. They must comply with the law and/or directives of higher headquarters.

Historical standards are established by tradition, past performance, economic market fluctuations, and/or the operating environments. Examples of services with historical standards are electricity and law enforcement services. In these cases, there is a wide-spread expectation for a given level and quality of service. The installation commander has some discretion but is limited in his ability to affect these areas. Since electricity is generally purchased at prevailing, negotiated rates set by the local utility company that is the rate that must be paid. Additionally, consumption can only be moderately affected. As an example, the commander dictate summer work hours during the

peak air-conditioning season in an attempt to lower the use of electricity, but this will only moderately affect the total service cost. Law enforcement services are primarily driven by the installation's mission. A safe environment is required and little can be done to control the required level of service. A major change in the performance standard (e.g., increasing the level of installation security) would require a major shift in funding or current business practices.

The last type of standard is discretionary. As the name implies, discreatinary standards are most flexible. They are standards of performance that are generally accepted as a best practice. The most obvious examples are: morale, welfare, and recreation; master planning; and internal review services. Installation commanders have the authority to make changes to these service standards and are held accountable if standards are set too law or too high.

2.3.1.2.2. Establishing and Measuring Against Standards

SSC requires that standards for expected performance be established and that performance be measured and reported against the standard. The Installation Status Report (ISR) system currently being developed by the office of the Assistant Chief of Staff for Installation Management (ACSIM), along with functional proponents from HQDA and

MACOMs with installation management responsibility. They are reviewing the performance indicators currently used to measure the quality of service provided. When their evaluation is complete, the criteria for Army-wide performance standards for services will be established.[18]

Performance will be measured and reported annually. ISR coordinators will evaluate the services provided on every installation. Each installation service will be measured against performance standards established for the service. Depending on how well the standards are met, installation services will be rated green, amber, or red.

Without the ISR data, SSC would have to find other ways of collecting installation performance data.

2.3.1.3. Cost

Cost is the final component of SSC and probably is the most difficult to understand and calculate. It is relatively easy to capture the "did cost" of providing a service by extracting historic data from the DoD accounting system. Service Based Costing (SSC) and Activity Based Costing (ABC) currently use accounting data as a source of costs. The

[18] Headquarters Department of The Army, **Personal Financial Readiness and Deployability Handbook.** Washington DC, 17 November 1997, p.31-35

challenge is transforming the "did cost" into "expected cost" by incorporating performance standards of quantity and quality into the cost estimate for a service. SSC may use different cost estimating methods that quantify the relationship between performance and cost. These methods provide the capability to estimate the proper level of funding needed to meet the Army's service standards, transforming the "did cost" of a service into an "expected cost" for a service.

2.3.1.3.1. Did Cost

"Did cost" data are collected to establish a cost baseline by service for the subsequent computation of "expected cost". Most cost methodologies use "did cost" as a primary input to calculate a cost estimate. There are two primary techniques for capturing did cost: SBC and ABC

2.3.1.3.2. Expected Cost

"Expected cost" is much more difficult to derive than "did cost". To develop or estimate an "expected cost", a relationship must be found between resources consumed ("did cost") and the performance measures of quantity and quality. In order to quantify this relationship of cost and performance, the "expected cost" is expressed as a dependent

variable and the performance measures are expressed as one or more independent variables. The SSC analysis basically reverse engineers the calculations to determine the resources needed to achieve a stated level of performance. In other words, "how many resources will be required to accomplish an established quantity and quality goal?"

There are four generally accepted cost estimating methodologies: engineering, parametric, analogy, and expert judgement. Theoretically, each methodology can be used to estimate costs, but in practicality engineering and parametric methods tend to work better with SSC data because they use historic data while analogy or expert rely primarily upon opinion. There are two primary "expected cost" methodologies: engineering and parametric analysis. They focus on resources and performance.

Each installation base support service is unique. It has its own set of inputs, outputs, and performance goals or standards; therefore, each service area's "expected cost" must be calculated separately. The type of performance standard (policy, historical and discretionary) and the resolution of available cost data will dictate which methodology should be used. Policy standards will almost always require using the engineering method, while services with a historical standard will lean toward the parametric method. Discretionary standards may use either method; the type of cost data available will prescribe the particular method to be used.

In the Army, actual indirect costs are allocated to the installation support services based on the type of expenditure (program element) and by the resource category (e.g., civilian labor, materials, equipment, and contracts). Hence, the primary focus of Standard Service Costing (SSC) is not on figuring out how to allocate the actual costs to the various installation services (although that would be an interesting issue by itself), but rather on seeing whether a particular service is being provided in a cost-efficient manner across installations given parameters of cost, quantity, and quality. Accordingly, since the standards for operating a service (in terms of quantity) are set, the key objectives of SSC are to derive expected costs for various services and to see if different Army installations are cost-efficient in terms of established standards.

The argument underlying the concept of an *expected cost* for a particular service is as follows. Given the similarities in services provided, it is reasonable to expect cost variations for a particular service across installations to be directly related to the variations in the quantity and quality of services provided. Of course, to the extent other installation factors (e.g., within or outside the continental U.S., metropolitan vs. rural location region within continental U.S.) affect the cost structure of a service; these factors also need to be considered. These other factors will be viewed as control variables affecting the expected costs of a service.

Once an expected cost for a specific service at a particular installation is derived, a comparison can be made between expected and actual costs. Assuming expected costs are based on a statistical model, the difference (variance) between expected and actual costs can be assessed in statistical terms. As such, the expected cost argument should permit the identification of the more efficient, relative to the less efficient, installations with respect to a particular support service.Further, if the relative efficiency of one installation compared to another installation could be identified; it opens up the idea of having some installations (i.e., the most efficient) provide support services to other installations. Indeed, it is possible that, for certain services, economies of scale may argue in favor of having various installations (i.e., centers of excellence) specialize in particular services.

As discussed above, the primary focus of SSC is on deriving the expected cost of a particular support service and assessing whether such a service is being provided in a cost-efficient manner across Army installations. A complicating factor which needs to be considered in this regard is the fact that cost-efficiency should be associated with a particular level of quality. This is, assuming that the level of the quality of service will affect the level of costs, an efficient cost structure at a high level of quality could be inefficient at a lower level of quality (and vice versa).

The expected cost, and in turn the cost-efficiency, of a particular service can be derived via two primary approaches. First, it is possible to do an "engineering" type study of the inputs making up each service at all installations. As illustrated in Figure 2, this approach requires an in-depth analysis of all the activities which help produce a service. In addition, the accuracy of the approach would depend on the way actions are grouped to make up activities. Based on the analysis of the activities (inputs) driving the service costs, a model of expected service costs would be developed. The implementation of this approach would essentially require the equivalent of a comprehensive ABC system across all installations, which currently does not exist.However, even if such an ABC system were in place at all installations, this approach would be at a level of detail that would likely make the idea underlying "expected cost" to be cost inefficient, if not totally unmanageable. In other words, given the large number of activities making up a particular service, the costs of deriving the "expected cost" of a service based on the inputs would likely exceed the benefits.

The second approach to deriving the expected cost, and in turn assessing the cost-efficiency, of a particular service is to look at the outputs of the service, rather than the inputs. Under this approach, which can be considered the SSC approach, the expected cost of an installation support service would be based on the relationship between the output (in terms of the quantity and quality) of the service and the overall costs of the resources

consumed to produce those outputs. This approach assumes that the cost of a service is, in essence, driven by the outputs of the service. The argument that costs are driven by their outputs, rather than inputs, is subtle, but important. To understand this argument, consider the costs of operating a cafeteria. Are the costs of the cafeteria driven by the number of meals served and customers eating those meals (i.e., the outputs), or the quantity of materials going into the meals and the number of hours worked by the cafeteria employees (i.e., inputs)? The SSC approach essentially takes the output side of the argument, whereas the engineering approach essentially takes the input side of the argument. By relating costs to outputs, the SSC approach takes a more aggregated view of expected costs related to installation services than the engineering approach. As such, the SSC approach has the decided advantage of being more desirable from a benefit-cost perspective. In addition, taking the output approach toward expected costs has the advantage of being consistent with the way standards are being set by the Army for services. Given these advantages, this study followed the output approach toward deriving and assessing the expected cost of an installation service.

The notion of expected cost is best viewed in terms of an acceptable cost for a given level of output (i.e., the way standard costs are used in the private sector), and not as an ideal cost for a given level of output. Of course, as an installation gets closer to an ideal

cost for a given service level, the more cost efficient the installation is with regard to that service.

In Turkish Army at the military schools we can define such services which effect to calculate military students' costs:

- Food
- Equipment
- Dressing
- Salaries
- Education
- Tasks
- Health
- Foreign languge expenditures
- Shooting
- Personnel[19]

[19] K.K.Komp.D.Bşk.lığı, **K.K.K.lığına Bağlı Askeri Okul Öğrencilerinin Öğretim ve Eğitimleri Süresince Tazminata Esas Maliyetleri Broşürü,** K.K.Basımevi, 2001, p.1-2

2.3.1.3.3. Service Based Cost (SBC)

SBC methodology can provide the "did cost" for SSC. Procedures used for cost accumulation in SBC are consistent with Federal Accounting Standards Advisory Board (FASAB) managerial cost accounting standards. Cost data are collected in an organized way – captured by type of expenditure (program elements) and by element of resource (e.g., civilian labor, materials, equipment, and contracts). Therefore, the cost data are reliable and supportable, making the data well suited for estimating purposes. Furthermore, the "did cost" data captured under SBC can be used by SSC to calculate the "expected cost" and ultimately determine future funding requirements.

SBC uses Defense Finance and Accounting Service (DFAS) accounting data, normally from DFAS 218 Report, supplemented with manpower data. Functional experts, using allocation techniques, match the amount of resources consumed to the services produced. SBC reports these "did costs" with a quantity of output that acts as pacing measures. Pacing measures represent the level of effort for related sets of multiple activities of a service. For example, the pacing measure for the MILPO Services is the number of active duty military supported by an installation. The resulting unit cost for the pacing measure is an excellent measure of efficiency.

Currently, an Army SBC study is being implemented at all Army MACOMs by the ACSIM supported by the CEAC. Because Army SBC data will be available in the near term, it will be used for obtaining initial "did costs" for SSC.

The purpose is to identify high cost services or those services which "drive" installation operating costs. The highest cost drivers are the services that consume the largest portion resources and, therefore, may be the first logical candidates for re-engineering or other efficiency reviews.[20]

2.4. ABC/SBC Relationship

Traditional cost accounting systems allocate indirect costs in three stages (see Figure 2.3). First, indirect costs (IC) are allocated to service and producing departments. Second, service departments' costs are reallocated to producing departments. Third, the indirect costs of the producing departments are allocated to products. Of course, it would make sense to allocate producing departments' indirect costs to the final products via

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[20] Army SBC, **Training Handout**, Virginia, Calibre Systems Inc., July 1997, p. 1-1.

multiple cost drivers, especially where there are several service departments. Unfortunately, many traditional cost accounting systems ignore this multiple cost driver concern and, instead, allocate the producing departments' costs to the final products based on a single cost driver (e.g., direct labor hours). Accordingly, traditional cost accounting systems are often criticized for resulting in inaccurate product costs.

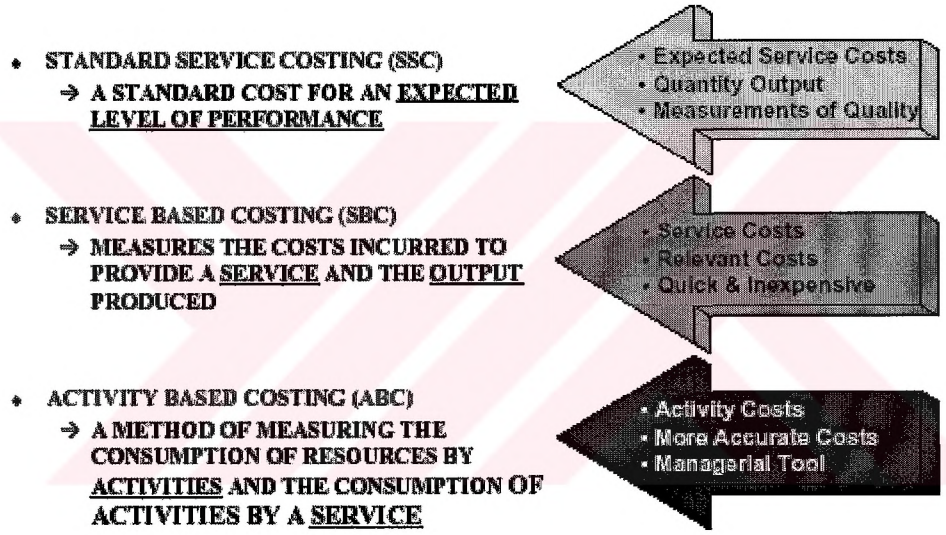


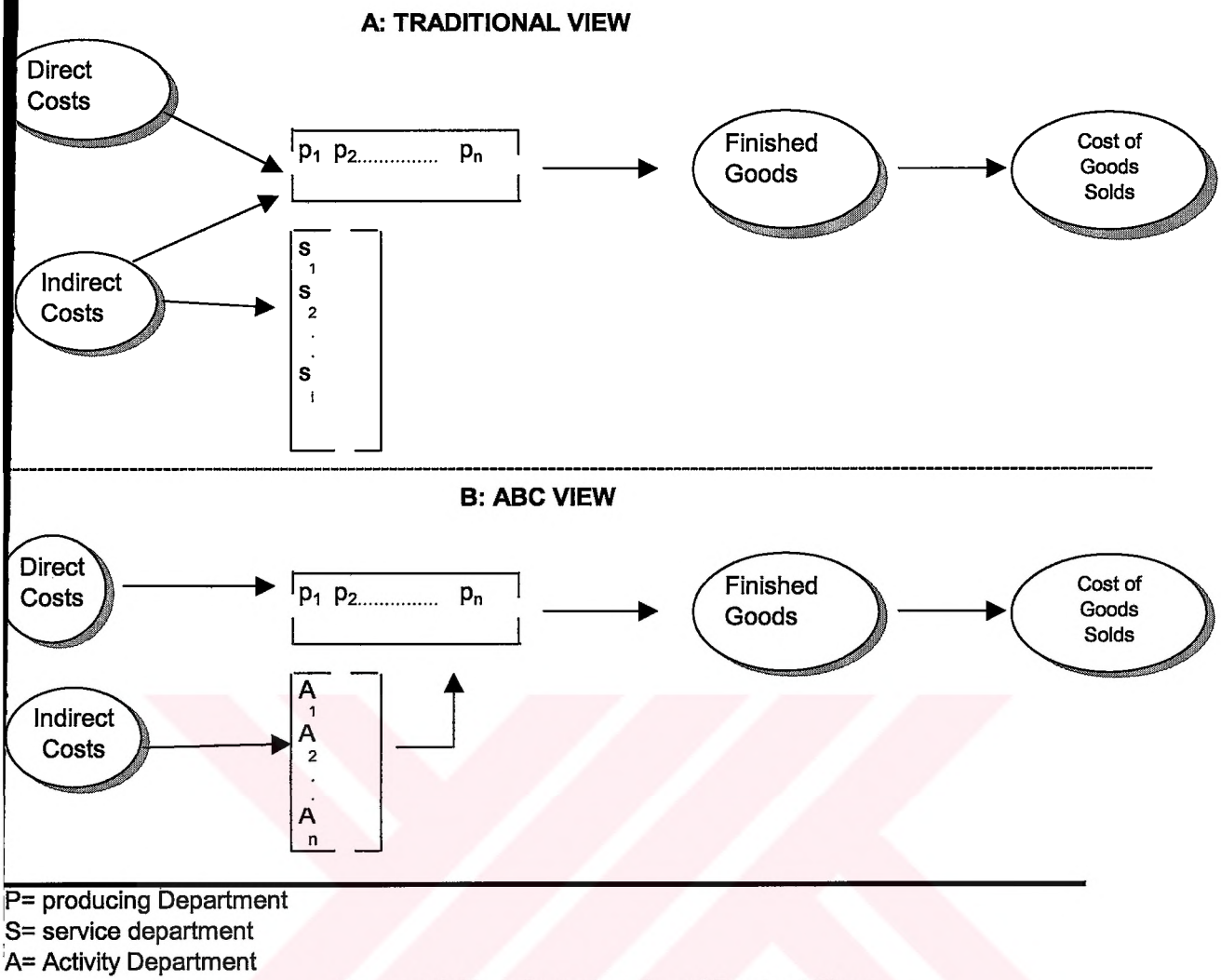
Figure 2.2. Costing Methods

ABC and SBC are complementary costing approaches. They each have different levels of management focus; they both use the same standard installation services and their definitions. Both approaches also allocate indirect costs – SBC to services and ABC to activities (accounting for indirect costs ensures the true cost of providing a service or

activity is being calculated). Because ABC works at a more detailed level than SBC, ABC activity analyses can easily be "rolled together" to the service level of detail (e.g., services are comprised of activities). Both approaches can be used to support SSC because the "did cost" required for SSC analysis must meet two primary criteria:

- The "did cost" must be capable of being organized by service
- The "did cost" must represent the true cost of providing a service.

Both SBC and ABC meet this criteria.



P= producing Department
S= service department
A= Activity Department

Figure 2.3 Manufacturing Cost / Product Flow

2.5. Activity Based Costing

2.5.1. Limitations of Traditional Cost Accounting Systems

Traditional product costing assigns only manufacturing costs to products. Assigning the cost of direct materials and direct labor to products poses no particular challenge. These costs can be assigned to products using direct tracing or very accurate driver tracing, and most traditional cost systems are designed to ensure that this tracing takes place. Overhead costs, on the other hand, pose a different problem. The physically observable input-output relationship that exists between direct labor, direct materials, and products is simply not available for overhead. Thus, assignment of overhead must rely on driver tracing (and perhaps allocation). In a traditional cost system, only unit-based activity drivers are used to assign costs to products. Unit-based activity drivers are factors that cause changes in cost as the units produced change. The use of only unit-based drivers to assign overhead costs to products assumes that the overhead consumed by products is highly correlated with the number of units produced, measured in terms of such factors as direct labor hours, machine

hours, or material costs. These unit-based activity drivers assign overhead to products through the use of either plantwide or departmental rates.[21]

Activitiy-based costing/cost management (ABC/M) has attrached high levels of interest from both academics and practitioners since its emergence in the late 1980s.[22] ABC is essentially a method for allocating costs, with particular emphasis on allocating indirect costs, to the final products (either physical goods or services) of a firm. The focus of ABC is a two stage process (see Figure 2.3, part B). First, indirect costs are assigned to the individual activities. Second, the costs of the various activities are allocated to the final products based on an individual cost driver per activity. Thus, given the presence of multiple activities, ABC represents a multiple cost driver approach to allocating indirect costs to final products. Among the advantages often associated with ABC, as compared to non-ABC systems are the following:

- it results in more accurate product cost information,
- it results in better pricing decisions,
- it has greater ability to assess the value added by an activity.

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[21] Don Hansen and Maryanne Mowen, **Cost Management**, Cincinnati, Ohio, U.S.A., South-Western College Publishing, 1997. p.301.

[22] Trond Bjornenak and Mitchell Falconer, **The Development of Activity –Based Costing Journal Literature, 1987-2000**, The European Accounting Review, Volume 11. Number 3, 2002, p.481

Among the disadvantages often associated with ABC are the following:

- it tends to treat all indirect costs as if they are variable costs,
- it is unclear as to what level of aggregation an activity should be defined, and
- the empirical evidence related to its net benefits is mixed.

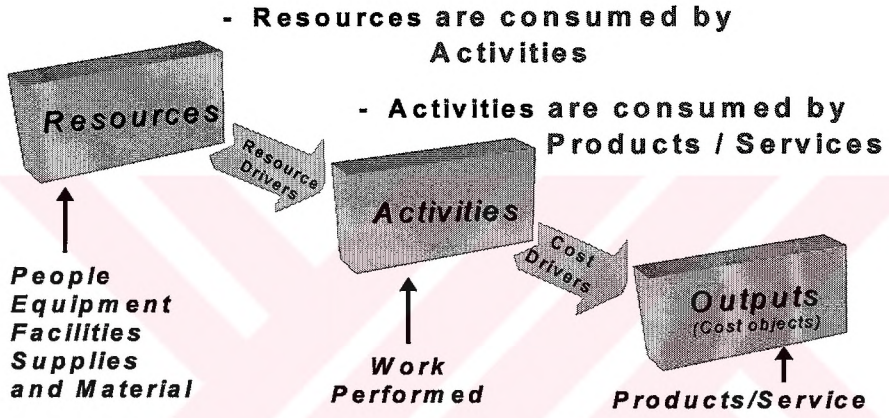


Figure 2.4. ABC Concept

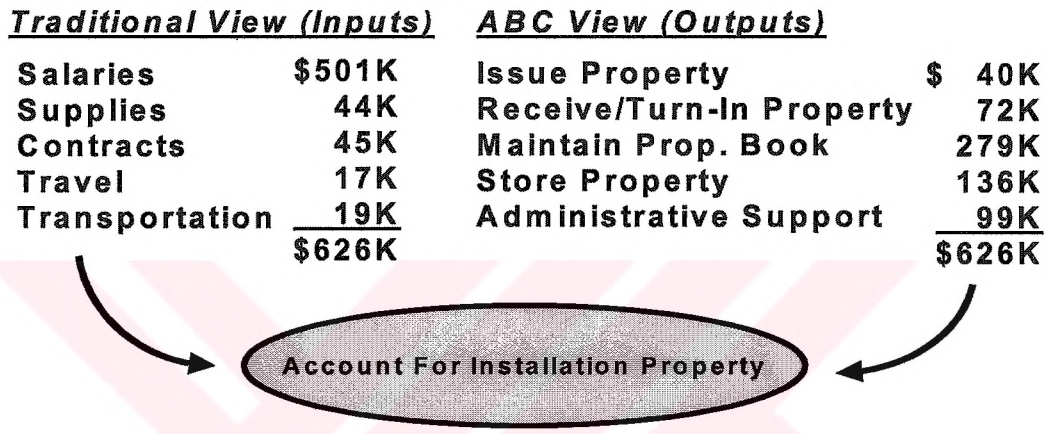
ABC is a cost management tool which:

- Identifies the activities and processes performed in an organization
- Determines the costs of these activities and processes
- Links these activities and processes to products or services and to customers
- Establishes performance measures
- Determines activity attributes

ABC identifies costs for work being performed and links the work performed to products.

Table 2.1

Traditional Vs ABC View



ABC is different than traditional cost allocation by being the most efficient way to allocate costs to units. It helps those using it to identify clearly the costs in manufacturing a product, making it easier to assign prices.The four general levels of activity in a company are as follows:

- Unit-level activities-these are when each unit is produced
- Batch-level activities-these are when a batch of goods are handled or processed
- Product-level activities- these consists of those activities associated with sustaining the product
- Facility-level activities-general activites done to maintain the facility.

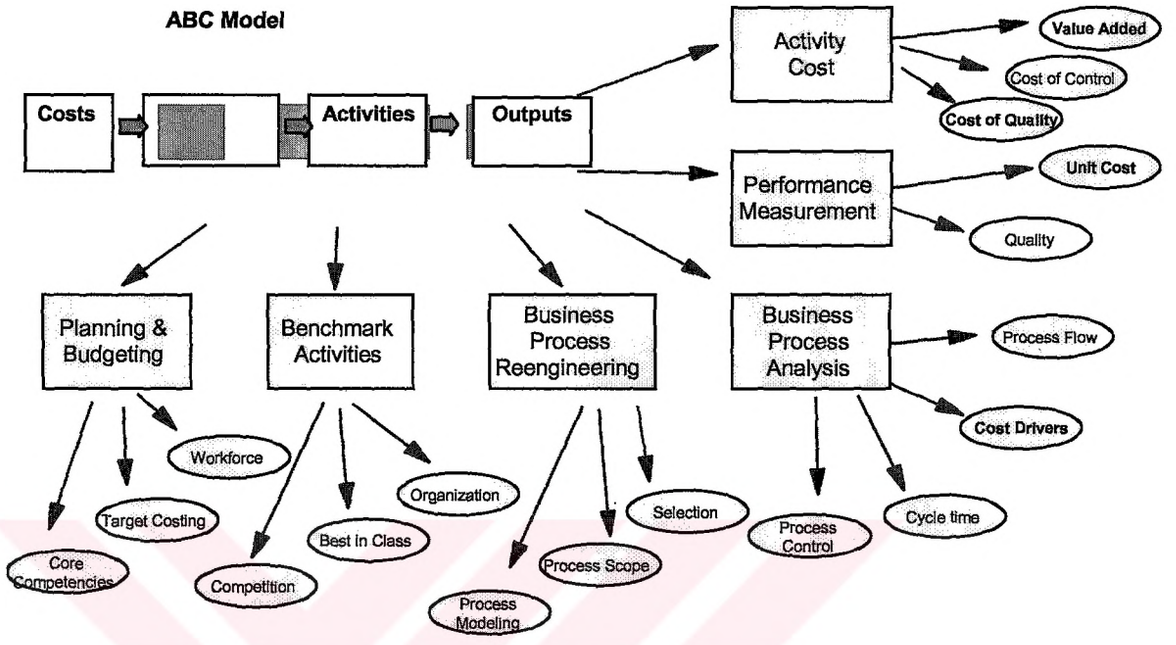


Figure 2.5. Using ABC as The Basis For Decision-Making

Overhead costs, with ABC, are shifted to low-volume products because those are typically responsible for a large amount of overhead costs, including special handling and equipment management. A company has poor distribution of quality cost when most of their quality costs are focused on failures (internal and external). The most effective way to reduce total quality cost in a company is to focus more on prevention activities because they eliminate defects.[23]

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[23]http://www.lib.lehigh.edu/wcb/schools/LEHI/bus/ksinclai/8/forums/forum5/messages/22.html#followups

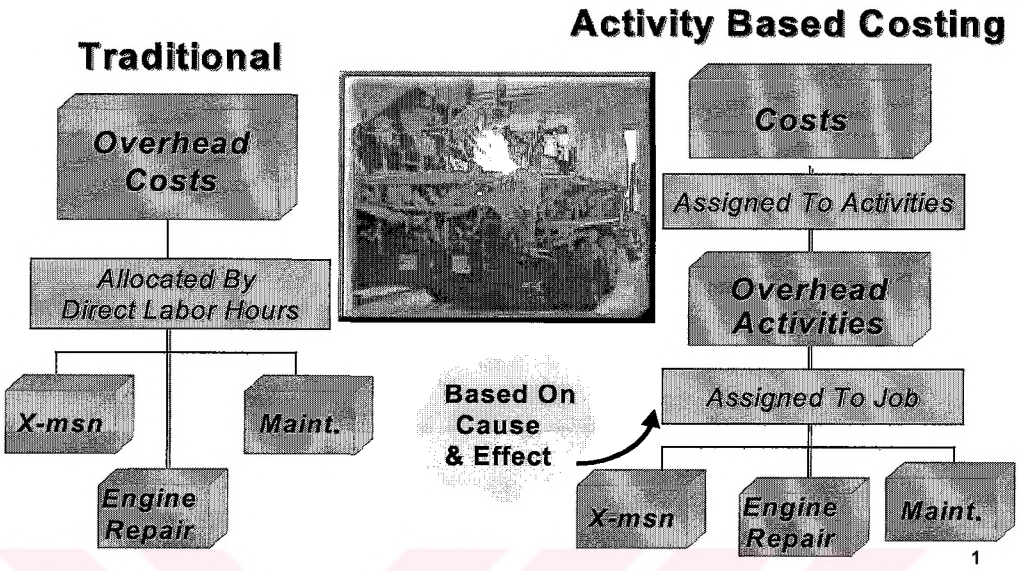

Figure 2.6. Strength of ABC Allocation

2.5.2. Activities vs. Services

A fundamental concern of ABC is the notion of an activity. An activity can be thought of as a self-contained set of actions (i.e., effort levels) that lead to an accomplishment of a particular task or outcome. At a more macro-level, a service can be thought of as a set of activities which lead to an intermediate product or service that

supports the final product of the organization. Since services are actually sets of activities, and activities are actually sets of actions, how an organization defines and utilizes these concepts is, in effect, an aggregation decision. This aggregation decision needs to be made in terms of the benefits and costs associated with too much, or too little, aggregation. Thus, an activity in one organization may be viewed as nothing more than a non-directed set of actions in another organization or as a service in yet another organization. The relationship among actions, activities and services for the Department of Army can be viewed in terms of Figure 2.7.[24]

2.5.3. The Role and Capabilities of the Activity Accountant

This subject addresses the role and capabilities of the activity accountant and activity accounting that are not specific to the functional process improvement and ABC processes. These are considerations that are tantamount throughout the current and follow-on projects.[25]

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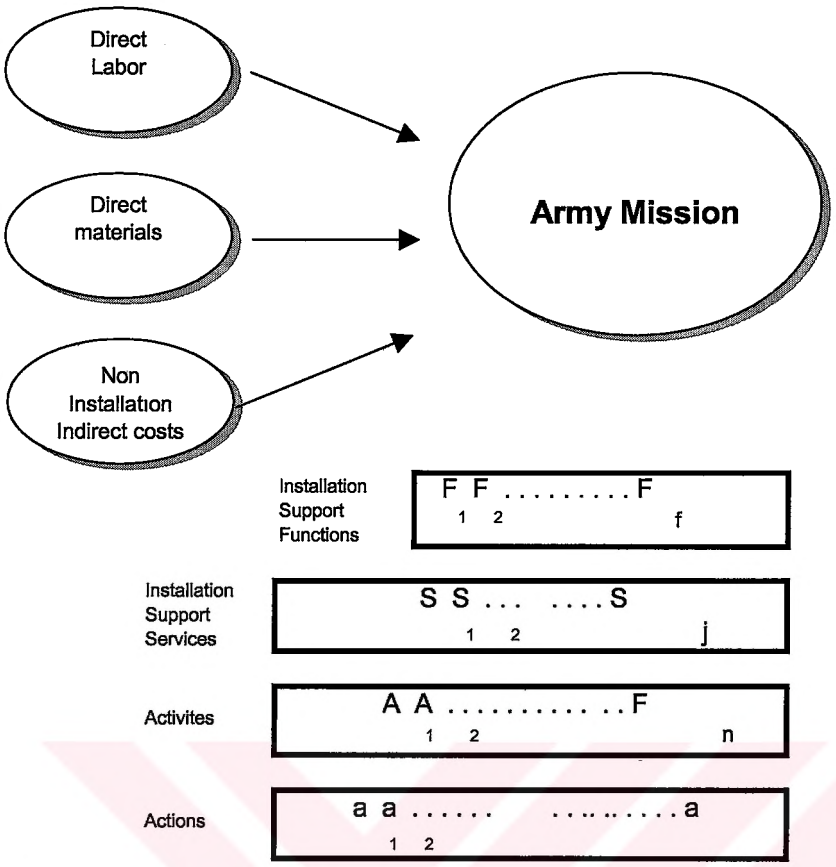
[24] Gordon, P.6

[25] Department of Defense, **ABC Guide Book, Final Thoughts, Topic(s): Activity Based Costing & Management**, 06 September 95, p.15



a = Action = effort level, which is part of a goal directed process
A = Activity = set of actions leading to a micro - level outcome
S = Service = set of activities leading to an intermediate level product or sevice that supports the final product of the organization
F = Installation Support Function = set of services which directly support the final product (i.e., mission) of the army

2.5.4. Standards

The activity accountant is a critical player during all stages of the functional process improvement project. Beyond the more obvious technical tasks, there are a set of responsibilities which are required to ensure the integrity of the process and analytical data.

These are standards of performance and excellence for the quality of the technical data:

2.5.4.1. The activity accountant establishes and maintains a high standard of professional reliability and discipline for the ABC process, existing data, and resulting projections. Cost data and estimates must be recorded and retained with sufficient documentation to meet acceptable audit requirements. This cannot be overlooked even under the pressure of timeliness and turnaround.[26]

2.5.4.2. The activity accountant is responsible for providing the appropriate data to fully support the identified needs of the project and team members. This implies that the information required will be located, purified, interpolated, or derived to fulfill the

[26] http://www.mijuno.larc.nasa.gov

condition. It is never expected, nor should it be expected, that data will be created or manufactured to support a conclusion or option.[27]

2.5.4.3. The activity accountant should be the single source of all cost related information. The consistency of credibility and content of information is a professional judgement that can become skewed when different sets of options or assumptions are used. This does not preclude additional assistance or opinions from being included, but the final decision and evaluation should come from only one person.

2.5.5. Skills

ABC translates the existing cost data from the organization to the new activity model. This seemingly simplistic process is in reality imbued with a multitude of judgement calls and policy decisions. This type of "soft" skill requires hard technical ability, knowledge and understanding.

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[27]http://www.acq-ref.navy.mil

This becomes even more important when projecting the impact of potential changes and estimating investment costs. The individual chosen to fulfill the role of activity accountant should have a diverse background with strong accounting skills. It is highly desirable to have management, modeling, and analytical experience along with a technical accounting background and training. If this cannot be found in a single individual, it might be important to have more than one person work on this aspect so that the interactive experience will yield an acceptable result.[28]

[28] http://www.abctech.com

III. APPLYING ACTIVITY BASED COSTING IN MILITARY UNITS

3.1. What Is The Reason For Using ABC In The Army?

According to a research in the U.S.A. in 1980 the ratio of overhead costs in total costs increased highly in industrial companies. Direct labor costs decreased at the same ratio at that time. For this reason managers tried to decrease overhead costs instead of direct labor costs for saving and increasing efficiency. Managers thought that traditional cost accounting was not accountable because:

- Current cost accounting systems confused product costs
- Mismatching products and resources
- Poor investment analysis
- Failure for internal reporting
- Using ledger price instead of real price
- Overworking on direct labor
- Failure of integration of costing and production systems.
- There was no associate working between sections[29]

[29] Burak Arzova, **Faaliyet Tabanlı Maliyet Yönetimi**, İstanbul, Türkmen Kitabevi, 2002, p.3

Everything has a price tag: every rifle, bullet, artillery piece, and ultimately every operation. The financial manager's function is to ensure that his commander receives the financial resources (e.g., obligation authority, dollars) when and where he needs it for mission accomplishment. This applies in peace as well as during all operations.

The financial management vision is of effective financial management support to the commander. This support provides a significant combat and logistics multiplier. Financial management is comprised of the mutually supportive core processes of finance operations and resource management operations. Commanders on tomorrow's battlefield will not have the burden of a large logical tail. The Army will conduct operations in austere environments, and in many cases at great distances from home station support. Requirements for contracting, subsistence (to include fresh fruit, water, etc.), billeting transportation, communications, labor, and a myriad of other supplies and services will be necessary for successful mission accomplishment and survival.

Financial management operations provide the commander with many necessary capabilities, from contracting and banking support to cost capturing and fund control. The operational commander must integrate his financial managers into all patterns of operations

to fully accomplish the mission. The financial management force is capable of providing modular and tailorable units which can and will deploy along with the supported force.[30]

Management means making the best of a bad situation. Management is not needed or important if resources are plentiful. Limited fiscal resources make cost management critically important.

According to Chief Financial Officers Act billions of dollars lost each year through mismanagement of Army budget. Losses could be significantly decreased by improved management. There was a great need of fundamental reform in financial management. Current practices did not provide timely information required for efficient Management. The goals of Government Performance Results Act are:

- Improve the confidence of the American people by holding agencies accountable
- Improve effectiveness & accountability by focus on results, quality and customer
- Help managers by requiring they plan and by providing information
- Improve congressional decision making
- Improve internal management

[30] Headquarters, Department of the Army, **Financial Management Operations (FM 14-100),** Washington, DC, 7 May 1997, p.1-1

The Commanding Officer's view is to establish financial accountability. The Army commandant said: "We've got to get our overhead down. There are two ways to do this. One is to use the Soviet method and that means central planning. I'll make all the decisions. I'll tell you what to do and you will do it.This approach didn't work very well in the Soviet Union and I don't think it will work well here. The alternative method is to use free market economics. Activity based cost accounting will tell you what resources really cost and I will look to you to make the right decisions. Which do you want?"

There is a memorandum of Secretary of the Army for principal officals of headquarters, department of the army and MACOMS for using ABC in the U.S.Army installations and instructions for the use of ABC illustrated below.

Cost management requires cost measurement. Cost warriors must have cost measurement to fight cost war. Cost measurement;

- informs cost warriors of financial implications of management decisions
- prerequisite to cost reduction
- eliminates free goods
- facilitates best use of limited resources.

SECRETARY OF THE ARMY
WASHINGTON

10 November 1999

MEMORANDUM FOR PRINCIPAL OFFICIALS OF HEADQUARTERS,
DEPARTMENT OF THE ARMY
MACOM COMMANDERS

SUBJECT: Strategic Plan for Implementing Cost Management/Activity Based Costing (ABC)

In response to the USD(A&T) Memorandum on Defense-Wide Implementation of Activity Based Costing/Management (ABC/M) dated July 9, 1999, the Army has developed the enclosed Strategic Implementation Plan. We fully endorse Cost Management, using ABC where appropriate, as a process of continuous improvement. The Army will pursue ABC as a tool for the local manager to better understand operational cost and performance. We have an aggressive goal to complete implementation in 11 major business areas that support mission readiness within three years.

To meet this challenging timeline, we will provide ABC software and sustainment, establish a Cost Management/ABC course to rapidly train each business area, conduct prototypes in business areas as needed, and provide Cost Management/ABC training material. Each business area will prepare and submit detailed implementation plans through the Army Managerial Costing Steering Committee. The Army Cost and Economic Analysis Center will provide detailed instructions to each functional proponent in preparation for the upcoming steering committee meeting in December 1999, with information briefings available upon request.

Cost Management is not a one-time event; it is a long-term, continuous process solution to control cost and improve operations. This is an important culture changing event within the Army and must have leadership commitment from each business area. We expect the fullest participation throughout the Army and will monitor progress through the Quarterly Army Performance Review.

Louis Caldera

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY COST AND ECONOMIC ANALYSIS CENTER
5611 COLUMBIA PIKE
FALLS CHURCH, VIRGINIA 22041-5050

FOREWORD

These instructions are provided as a guide for Business Areas to develop detailed Cost Management / Activity Based Costing (ABC) Implementation Plans.

1. The Army's Strategic Plan for Implementing Cost Management / ABC was submitted to the Under Secretary of Defense for Acquisition and Technology (USD (A&T)) on 12 October 99 and approved by the Defense Systems Affordability Council on 16 November 99.

2. The US Army Cost and Economic Analysis Center (CEAC) developed the Strategic Implementation Plan in response to the 9 July 99 memorandum from the USD (A&T) directing the Military Services to aggressively pursue ABC to improve Cost Management. The purpose of the plan is to institutionalize Cost Management in the following Business Areas throughout the Army, using ABC where appropriate, to drive continuous cost and productivity improvement.

- Depot Maintenance Operations
- Test and Evaluation
- Civilian Human Resources
- Contracting Process
- Research & Development Labs
- Base Operations and Support / Facilities Management
- Supply Management
- Information Support
- Institutional Training
- Acquisition Process
- Ordnance

3. Each Business Area is responsible for preparing a detailed plan for implementing Cost Management / ABC in accordance with these guidelines and will address both Strategic and Operational components. The plans will be reviewed by CEAC and submitted to the Army's Managerial Costing Steering Committee.

4. Detailed plans from individual Business Areas are required within 60 days from the 02 December 99 Managerial Costing Steering Committee and should be submitted to CEAC. Point of Contact at CEAC is Steve Barth or Dave Comings (comindt@hqda.army.mil) at (703) 681-3340.

Robert W. Young
Director

Poor cost measurement can be dangerous for the Army. Inaccurate measurement can create distortions and cross subsidizations that lead to bad decisions. Detailed measurements can easily cost more than the benefits they provide. Even accurate measurement can stimulate undesired behaviors.

In order to get accountable unit costs in ABC we can determine activities such as:

- Unit level activities
- Order level activities
- Product level activities
- Factory level activities.

Managers have to search why different cost objects are high or low. If we know activities and cost drivers well, we will see the costs that we accept as indirect costs are in fact direct costs and the costs that we accept as constant costs are in fact variable costs. This is very important for managerial accounting. For this reason the quality of the managerial decisions will increase.[31]

ABC is a self made tool for managerial cost accounting. ABC seeks to understand true economic cost;

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[31] Cudi Tuncer Gürsoy, **Yönetim Muhasebesi,** p.239-241

- based on cause-effect relationships
- reflecting drivers of resource consumption
- with reasonable, but not precise, accuracy

ABC promotes better resource management;

- eliminates free goods
- stimulates behavioral change
- enables accountability for cost management

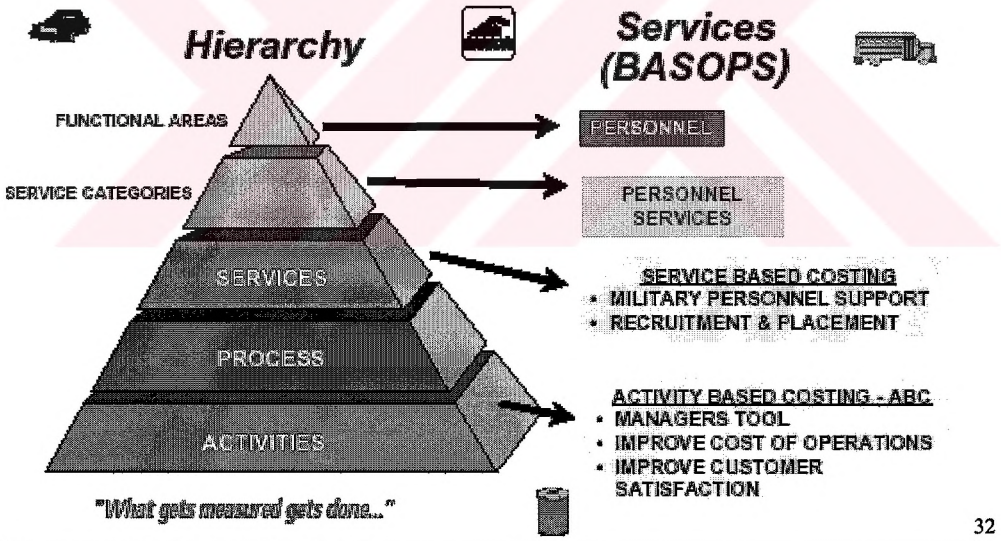

Figure 3.1. Hierarchy of Services

[32] Department of Defense, **ABC Guide Book, Final Thoughts, Topic(s): Activity Based Costing & Management**, 06 September 95, p.25

The commanders of the Army ask: What would happen if;

We found a new Iraqi Armor Threat?

- Determine best possible intelligence
- Develop systems and tactics
- Consider best strategic response

What would happen if; We recognized the new cost threat?

- Determine best possible intelligence
- Develop systems and tactics
- Consider best strategic response

Accounting systems usually measure input or source costs:

- Labor, overhead, materials,
- Salaries, benefits, supplies, contracts.

Contracts are important for DoD, because the developments in weapon system technologies are very important for the armies. Almost all weapon systems with complex technologies (For Example: Fighting planes, Tanks, Tomahawk, Cruise systems etc.) are

developed by civilian companies (e.g. General Dynamics, McDonnell Dougles, United Technologies, Boeing, Lockhead, Grumman).[33]

The contracts that depends on reimbursement are very commonly used between private sectors and government sectors. If both sectors are not government sectors then, the details about cost measurements should be in the contacts. The mission of cost accountant is to describe the costs of contracts in the contact accounting. Generally, government sectors must apply some rules which are prepared before and contains all kinds of contracts.[34]

Managers want measurements based on output or consumption:

- Product, service, project,
- consuming organization, customer.

Cost pool is an aggregation of incurred or source costs to be distributed. Examples:

- Salary and benefits, supplies, travel, etc. in airfield operations center,
- utility bills for garrison.

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[33] Aziz Akgül, **Dünyada Savunma Harcamaları ve Savunma Sanayilerinin Yapısı**, Ankara: Başbakanlık Basımevi, 1987, p.50

[34] Necdet Şensoy, **A.B.D.'de Maliyet Muhasebesi Standartları ve Üniversiteler**, Finansal Yönetim, Haziran 1997, Yıl: 1, Sayı:1, p.7

The method of distribution is the mechanics of deriving management information from the cost pool. Example: Determine unit cost by adding all input costs and dividing by number of units.

Cost object is a view of cost needed by management. Examples:

- 120 mm tube product cost,
- morale, welfare, recreation cost,
- armor school cost

In Turkish Army the factors which effect the cost accounting systems of an installation are:

- Technical structure of the installation
- Production policy
- Capacity
- Informations which managers want from cost accounting.[35]

Turkish Army also needs ABC for it's military units for the same reasons as we explained for the U.S. Army.

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[35] K.K.Komp.D.Bşk.lığı, **Maliyetlerle İlgili Genel Açıklamalar ile K.K.K.lığına Ait Bazı Birliklerin Yıllık İşletme–Bakım–İdame–Maliyetleriyle İlgili Hesaplar,** Ankara, K.K.K.lığı Yayınları, 1987, p.1

3.2. ABC Implementations In The Army?

Managers can obtain the needed view of cost in several ways

- Guessing: Good feel of cost distribution
- Direct costing: Detailed record keeping of all incurred cost transactions by every cost object
- Allocation: Distribution of costs pool in the same proportion as a cost driver.

Table 3.1.

The Comparison of Distribution Methods

	Cost of Method	Accuracy	Flexibility
Guessing	cheap	poor	good
Direct	very expensive	good	poor
Allocation	reasonable	reasonable	reasonable

Allocation is a method of distribution that distributes cost pool to cost objects in the same proportion as cost driver. Example: Distributing the cost of utilities to occupants in the same proportion as space occupied.

Detailed record keeping applications:

- Labor cost can be accounted for by product through time and attendance reporting
- Project costs can include supplies and services charged by job order
- Product material costs can be determined through bill of materials[36]

We can not use detailed record keeping for all cost. There are two reasons for this:

First, it may not be practical. Because it;

- Will be more expensive
- May not be necessary
- Probably less flexible

Second, it may not be possible. Because joint costs and overhead costs often consumed by more than one cost object. Examples of detailed record keeping: Bill of materials system, time and attendance reporting, job order charges.

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[36] United States Armed Forces Institute, **Practice Set No1 To Accompany Cost Accounting**, Volume 1, Washington, War Department, 1944. p.73

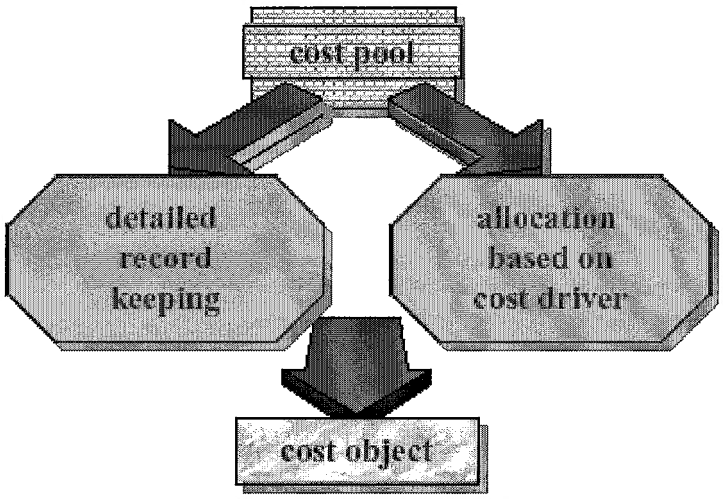

Figure 3.2. Cost Pool

To choose a distribution method:

- Use guessing for simple decision making
- Keep detailed records when accounting cost is low and high accuracy useful
- Allocate overhead, support, and indirect costs when appropriate
- Consider management's needs for precision and timeliness

There are two allocation methods. Rate method uses a computed rate per driver unit. Proportion method computes proportional share of total cost based on driver usage. Both methods yield same result and represent the same underlying algebra.

Rate Method $\frac{\text{Total Cost Pool}}{\text{Total Number of Driver Units}}$ **X Number of Driver Units Used**

Equals

Proportion Method $\frac{\text{Number of Driver Units Used}}{\text{Total Number of Driver Units}}$ **X Total Cost Pool**

Equals

$$\frac{\text{Number of Driver Units Used X Total Cost Pool}}{\text{Total Number of Driver Units}}$$

3.2.1. U.S.Army Tank Automotive Research, Development & Engineering Center (TARDEC). ABC/ Management Implementation Plan

The U.S. Army Tank-automotive Command (TACOM), a subsidiary of the Army Materiel Command, is the world leader in developing, acquiring and supporting munitions, armaments, tracked and wheeled vehicles. The Tank-Automotive Research, Development and Engineering Center (TARDEC), one of TACOM's two research laboratories, is the world's foremost developer of main battle tanks, tracked fighting vehicles and other

military automotive products. It also develops bridging, logistics equipment, fuels, lubricants and mechanical countermine apparatuses.

The TACOM-TARDEC will use ABC as a tool for functional manager use in making smart decisions about resource allocations, as well as other decisions. Since ABC traces historical costs (resources consumed) to activities and then, through those activities, to products or services, TACOM-TARDEC objective is to use ABC to:

- Provide a management too for fact-based analysis.
- Identify strengths and weaknesses.
- Incorporate value analysis of activities.
- Provide decision-makers with accurate information on what existing processes actually cost.
- Identify how resources are used.
- Tie performance measures to the cost of achieving that performance.

While this is an implementation plan, the operational goal includes having ABC actively used and updated by the EXCOM and Commander. ABC may assist the manager evaluate performance and make resource and process improvement decisions. The ABC model developed and built by TACOM-TARDEC may leverage current and future

automated information systems and may be readily maintainable by TACOM-TARDEC staff within current resources. If the level of detail is too great relative to the value of the information gained by local management, the ABC model will not be properly maintained. Sustaining ABC data may ultimately become as routine and managerially important as preparing as preparing and submitting civilian timecards and evaluations. Managing cost to improve productivity is a basic responsibility for every TACOM-TARDEC manager and must be performed on a continuous basis. Therefore, data in ABC model will require updating on at least a quarterly basis to maintain information sufficiently current for decision-making. Over time, as model and its use mature, the data in the model may be updated monthly to increase its real time value to managers actively using the information for process improvement.[37]

37 http://cost.tacom.army.mil/Downloads/ABC/TARDEC's%20Implemetation%20Plan.doc

3.2.2. TACOM Base Operations And Support/Facilities Management Implementation Plan

3.2.2.1. Objectives for the full implementation of ABC:

- To leverage resources based on ABC/CM analysis and workload in the Acquisition Center.
- To assist in the identification of cost to support our major customers.
- To develop cost performance measurements tied to our Acquisition Center business.
- To identify potential areas to review for business process improvement studies and potential cost improvements.

The main user of the ABC/CM data will be the director, division chiefs and business management office. Secondary use will be at the Command and AMC budget planning and management levels.

Creating a cost management culture. ABC will be a useful tool in identifying potential activities that may lend themselves to streamlining, process improvement, and better utilization of resources.

3.2.2.2. Short term goals:

- short-term goal is to create a rapid prototype ABC model that focuses on the repair parts procurement in particular and includes all other major activities within the Acquisition Center at the macro level.
- The next step will be to develop activities and outputs for major item and R&D type procurement, which represent the vast majority of our business. The major difference amongst the various types of procurements will be complexity, and we plan to calculate complexity factors when assigning activity costs to our final cost objects. It has been difficult in the past to quantify this major piece of our business adequately.
- From there we'll develop the activities and outputs for the remainder of our business -- installation services, non-standard procurement, industrial preparedness planning and competition advocate/ombudsperson.

3.2.2.3. Long term goals:

- Establish new performance objectives and measures based on efficiencies and effectiveness.
- Establish methods for collecting labor hour activity data on an ongoing and unobtrusive basis.
- Maintain an active Acquisition Center ABC model in the Business Management Office for reports, updates and studies as appropriate.

3.2.2.4. Specific products, services and customers for applicability of ABC data.

Services:

- Contracting services by procurement type; i.e. major items, R&D, repair parts, installation services and non-standard procurements.
- Industrial preparedness management
- Competition advocate/command ombudsman [38]

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38 http://cost.tacom.army.mil/Downloads/ABC/TACOM "**Base Operations and Support Facilities Management Implementation Plan**.24 April 2002.

3.2.3. Directors of Finance Best Value Working Group

Directors of Finance Best Value Working Group includes consideration and evaluation of 3 year budgeting and Activity Based Costing (ABC).

The Guidance has taken 9 months to develop, and represents the culmination of extensive consultation with practitioners from local authorities, as well as in depth discussion and analysis through the use of a focus group drawn from representatives from a range of Scottish local authorities.

An important part of this Guidance document are the **case studies** that take the reader through typical ABC issues in as simple language as possible. The two topics used in the examples cover an Adult Training Centre and Non Domestic Rates. This 'step by step' guide is designed to act not only as a useful reference guide for practitioners, but also as an 'aide memoire' covering many of the fundamental principles of ABC.

ABC is not a new initiative. It has been used successfully in manufacturing and service industries for many years. In some ways, it is a common sense approach to the gathering of all relevant costs in a form designed to ensure a clear understanding of the true cost of an activity. The Guidance defines commonly used terms such as Activities, Cost

Pools, Activity Drivers and Cost Objects and is designed to aid an understanding of this often confusing aspect of ABC.

It is also important to stress that ABC is not viewed by the Working Group as an end in itself, but can be an **integral** part of a service review process as required under the developing best value regime. Without a clear definition of the activity to be reviewed as well as the total cost (including overheads) of that activity, any outcome from such a review may be fundamentally flawed.

The Guidance was subject to a 6 week consultation period, and all constructive comments on the applicability and feasibility of the document have been integrated into the paper.

The Group are aware of consultation paper on 'A Modernised Framework for Local Authority Accounting for Best Value' in England and Wales. It is intended to review the applicability of the Guidance document once a similar consultation exercise has been undertaken in Scotland.[39]

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39 http://www.ipf.co.uk/Pubs/pub1/contents.htm

3.2.4. Rapid Prototype Roles & Responsibilities

This is an implementation overview of the Rapid Prototype (RP) process and identifies some key and essential tasks to be completed as a prerequisite to initially deploy the CEAC modeling training team. The outcome objective for a RP effort is an effective and sustainable macro level ABC model supporting a Cost Management (CM)/ Periodic Evaluation of Productivity (PEP) decision process.

The purpose of constructing an Activity-Based Costing (ABC) RP model is to provide relevant CM information to business activity managers. They can then use this information along with other management inputs during the PEP meeting process to identify productivity improvement candidates to reduce costs and/or improve the quality of products and services.

The process begins by providing, preferably a month in advance of the RP session, on-site CM and ABC modeling training to individuals who will participate in the RP session. The process then continues with the modeling training team contacting the organization's Point of Contact (POC) and requesting essential "read ahead" information. This data call starts a dialogue with the unit and enables the modeling facilitator to gain a

preliminary understanding of the unit's key and essential processes, outputs, structure and strategy. During this "front end" work, the modeling facilitator also tries to identify participants and the purpose of the model – the organization's expectations and desired outcome that will drive model design.

The actual RP session covers a five-day period. Day 1 is training on CM, Army's intent on establishing a productivity culture and participant identification of Essential Elements of Information. The facilitator and modeler then guide the participants on a three day ABC model building effort which includes training on the ABC and RP methodology, identification of key processes and activities as well as organizational outputs. The model structure is finalized and cost data is flowed from resources, through activities and then to outputs. The third modeling day is targeted to Activity-Based Management (ABM) techniques, which identify potential candidates for productivity improvement. The fifth day is a PEP meeting where activity managers brief model results, key activities and improvement candidates. PEP inputs include not only ABC data but may also include essential management information from other sources such as Service Base Costing and Installation Status Report.

The organization is then scheduled for two follow-up visits to assess and assist the organization's efforts concerning model refinement, ABM initiatives and PEP meetings.

The purpose of these visits is to provide modeling training/assistance and assess ongoing and proposed productivity improvement efforts and initiatives.[40]

3.2.5. ANAD–Cost Management (CM)/Activity Based Costing (ABC) Implementation Plan

3.2.5.1. Purpose: To establish a proposed plan of action to implement CM/ABC in depot maintenance operations.

3.2.5.2. Goal: To develop a focused approach to affect changes in our processes that will reduce overall costs of operations through process improvements.

3.2.5.3. Background:

The primary purpose of ABC within the Army has been to provide local managers with cost measurement information to manage operations and improve efficiencies. It is recommended to utilize internal expertise and knowledge to develop plans for not only measuring inputs and outputs, but to also measure outcomes.

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[40] http://cost.tacom.army.mil/ABC_guidance.htm

As the implementing agency, US Army Cost and Economic Analysis Center (CEAC) will review all plans submitted by the individual Business Areas and will provide the Army-wide guidance and oversight of the Strategic Plan for Implementing Cost Management/ABC. CEAC will provide ABC software and support, conduct initial Business Area staff training, establish a Cost Management Course, provide Army-wide Cost Management/ABC training materials, and support limited on-site rapid prototype efforts.

3.2.5.4. Existing Cost Accounting Systems:

ANAD uses the Standard Industrial Fund System (SIFS) for cost accounting. SIFS is the cost accounting system utilized by ANAD since the late 1980s. It has four modules, Cost Accounting, Methods and Standards, Internal Operating Budget, and General Fund and Financial Inventory Accounting. Its primary function is the collection and comparison of actual and standard costs. SIFS methodology is the recognition of revenue and expenditures during the period incurred regardless when revenue is received or expense paid. Software loaded to personal computers such as Monarch and Datacom is used to extrapolate data from within the SIFS systems and present in formats defined by the request for information.

3.2.5.5. Use Of ABC:

ABC will be used primarily to detail costs and identify efficiencies in overhead functions and organizations. Indirect organizations as a rule do not have clearly defined activities and cost drivers. ABC will provide managers a methodology for identifying value and non-value added tasks. Lean Manufacturing will be the primary tool for process improvement in direct functions. At the depots, direct costs are captured at task level via operational code reporting. Therefore, the primary focus for increasing efficiencies in direct functions will be process re-engineering. This is why Lean Manufacturing is a better tool in direct functions/organizations. Where applicable, ABC will be used in a supporting role in the re-engineering process. The data derived from ABC will be used at all levels of management to manage costs and improve processes.[41]

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[41] http://cost.tacom.army.mil/Downloads/ABC/ANAD_Impl_Plan.doc

3.3. Facilities Case

An Army installation has four companies that occupy five buildings. Incurred costs include utilities, building maintenance, and miscellaneous facilities related expenditures. New policies require the installation to charge its costs back to companies.

Using the allocation and the following information, prepare a cost allocation:

	Company A	Company B	Company C	Company D	Total
Number of Buildings	2	1	1	1	5

Is this a good method of distribution?

- Some of the buildings are small?
- One of the buildings is the Pentagon?

Not surprisingly, the Company Commanders were not pleased to hear about the facilities assessment. However, the Company B brought up a valid point: Why should his organization, which occupies a small building, receive the same allocation as Company D, which occupies a substantially larger building? Taking this into consideration, the facilities

manager decided to re-allocate the $100.000 on the basis of square footage occupied by each organization.

	Company A	Company B	Company C	Company D
Square Footage	20000	1000	9000	20000

Is this a better method of distribution? Identify cross subsidizations and free goods created by the case A method. The total cost will not change. A change in distribution means:

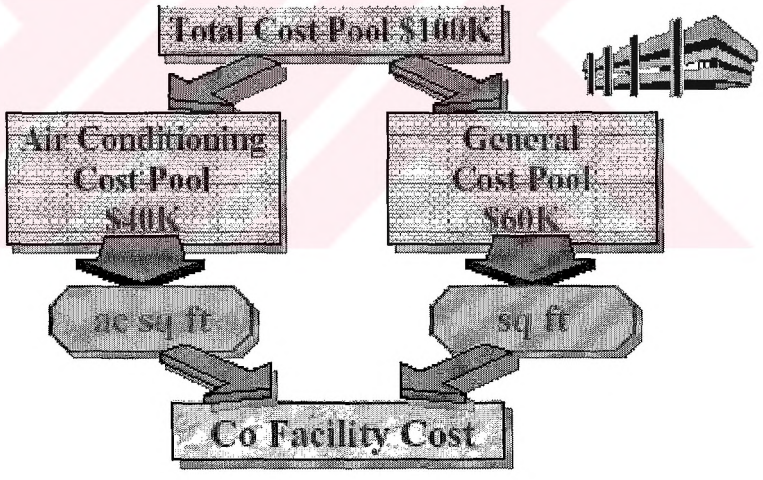
- If one command's allocation goes down by $1000 then…
- Someone else's allocation has to go up by $1000
- Zero sum game requires support of top management in order to succeed

At this point, the manager of company D protested. Yes, he did have a large building, but it was not air conditioned. By his estimates, which were reasonably accurate, forty percent of the facilities expenditures were air conditioning related. These expenses included the additional electricity, maintenancand repair needed to keep the air conditioning units running.

Company D proposed dividing the facilities costs into to separate costs pool: one for air-conditioning related costs, and one for general facilities costs. The general cost pool

would be allocated on the basis of square footage, just as before. The air-conditioning cost pool would be allocated on the basis of air conditioned square footage.

	Company A	Company B	Company C	Company D
Square Footage	20000	1000	9000	20000
A/C Square Footage	10000	1000	9000	0



Is this a better method of distribution? Why might this method not reflect true cost?

Case A is a good method if all buildings are the same.

Case B is a good method if all square feet are the same.

Case C is a good method if all general square feet are the same and all air conditioned square feet are the same.

What undesired behavior is encouraged with allocation by number of buildings?

- Combining buildings by one roof
- Expanding buildings when new building might make more sense.
- Rejecting assignment to small building
- In-fighting to occupy large air conditioned buildings.

3.4. Choosing Activities Efficiently

Allocation methods implicitly assume sameness or homogeneity. This assumption allows the use of average cost:

- To simplify the allocation process
- To minimize the cost of measurement
- To avoid detailed record keeping for every cost object

However, averaging can lead to significant measurement distortion. Averaging really means that:

- While average cost is precisely correct on average
- It may be completely wrong for each individual cost object
- Think of this as being precisely wrong

The cost object is a view of cost useful to management;

- Emphasizes relevancy to management
- Disputes "one size fits all" thinking
- Permits great variety in cost objects
- Suggests possibility of multiple cost systems

Managerially useful information = cost object

Different cost warriors need different views. Maintenance supervisor needs project detail. Director of Logistics (DOL) manager wants responsibility, unit, and process costing. Garrison commander needs responsibility & customer cost. Installation commander interested in total cost of various missions.

Traditional accounting provides the elemental data on input or source cost. ABC pools cost data into activities and develops drivers based on consumption of the activity.

Raw accounting data ⇨ **c ost pool** ⇨ **activity**

Activity aggregation is necessary in ABC systems. Too many things happen in a complex organization for every activity to be considered in an ABC system. Some level of aggregation in pooling is a practical necessity. Deciding the activities is an important design consideration.

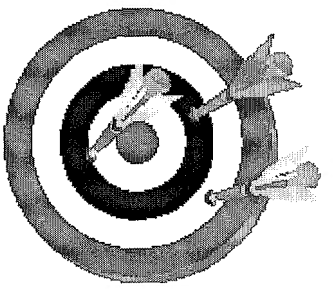
Cost of the system increases with number of activities. Cost of bad information decreases with number of activities. Many pools don't meet test of materiality.

Homogeneity determines activity cost pool's fitness for use:

- Good homogeneity allows aggregation of activities
- Poor homogeneity requires disaggregation

Cost of precision in the cost system is directly related to:

- Number of cost objects
- Level of precision attempted



Goal: Be on the Target, but Hitting the Center may be Too Expensive

Law of Diminishing Return: U.S. Army decreased tank destroying weapon missiles costs by increasing the number of hits per rounds fired. In World War II 17 tank missiles were shot to destroy a tank. In the First Gulf War 1.2 tank missiles were shot and today it decreased to 1,025. In the Second Gulf War with Iraq in 2003 U.S. Army hit the targets with 99% success.

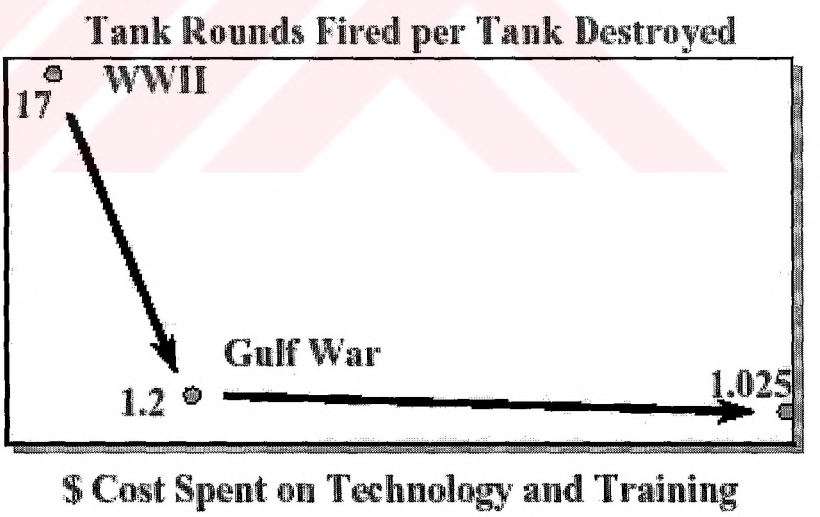


Figure 3.3. Cost of Tank Missiles

Most organizations have thousands and thousands of things that could be measured and thousands of ways to measure them. How does one decide which things and ways to systemize?

Figure 3.4. Managerial Costing Terms

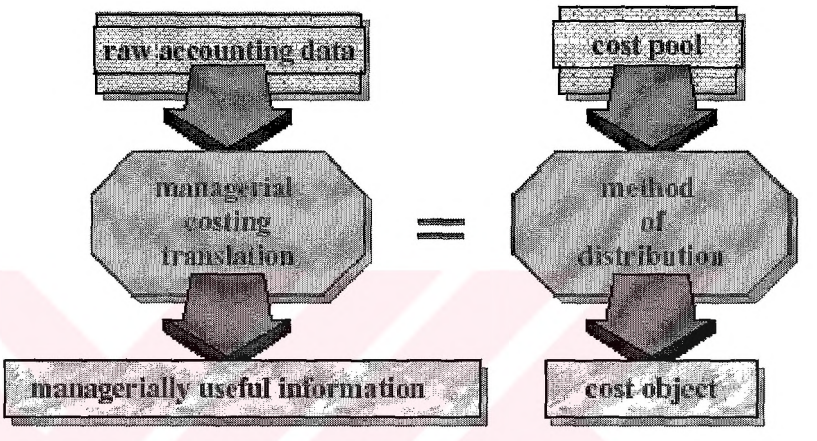
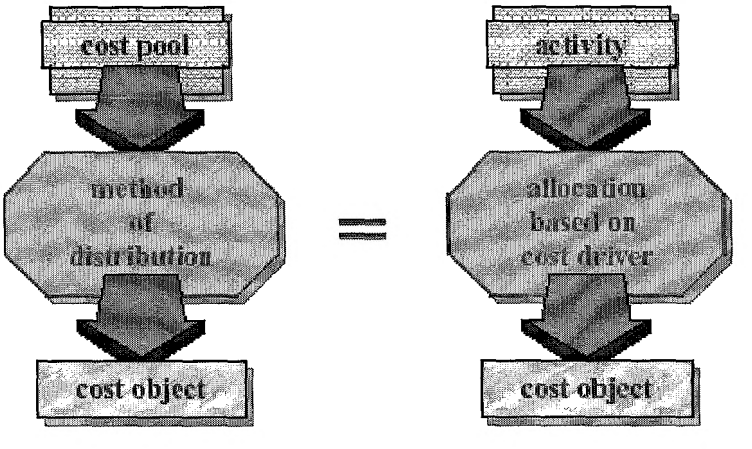
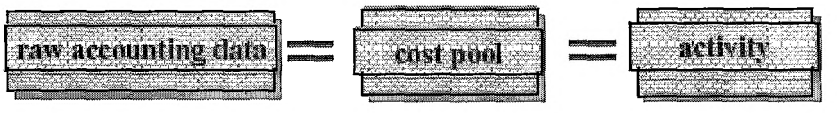


Figure 3.5. Activity Based Costing Terms



Traditional accounting provides the elemental data on input or source cost. Activity Based Costing pools cost data into activities, develops drivers based on consumption of the activity.



Too many things happen in a complex organization for every activity to be considered in an ABC system. Some level of aggregation in pooling is a practical necessity. Deciding the activities is an important design consideration.

Cost Tradeoff Story:

- Cost of the system increased with number of activities
- Cost of bad information decreases with number of activities.

Willie Sutton Law: Many pools don't meet test of materiality.

Homogeneity determines activity cost pool's fitness for use:

- Good homogeneity allows aggregation of activities
- Poor homogeneity requires disaggregation.

If there is homogenous:

- Then the average can be used for management purposes
- The cost of the measurement process can be minimized by reducing pools.

If there is non-homogenous:

- The average is non-representative
- Aggregated data could be misleading if significantly non-homogeneous

Homogeneity's importance is driven by intended use of the cost object.

3.5. A Practical Example of ABC Cost Allocation

Code 038 is a General and Administrative (G&A) function. For FY 94, code 038's share of the budgeted G&A costs amounted to $43 per burdened labor hour. For FY 94 there were 3,367K burdened labor hours. Code 038 costs totaled $1,462. This means $1.5M in management.

The current cost allocation process is based upon burdened labor hours. While this method may be appropriate for some of the functions, it is not the case for most of them. Cost should be allocated to the consumer of the goods or services.

First Step: Aggregate actions into major activities.

Support mandated requirements for:

- Site Wide facilities and buildings
- Hazardous material and waste
- Training/inspections/material/and medical surveillance.

Second Step: cost out the activities:

FY94 Cost Allocation Process

Code 038 Functions	Actual Rate	Total Costs ($000)	Percent
Site Wide Facilities/ Buildings	$.19	$656	44.9
Hazardous Material and Waste	.18	599	41.0
Training/Inspections/ Material/Medical	.08	207	14.1
Total	$.43	$1,462	100.0

Third Step: Determine the Basis of Allocation

	Activities	Allocation Basis
1.	Site Wide Facilities & Buildings	Net Square Feet
2.	Hazardous Material & Waste	# of Inventory Items, Lbs of Waste
3.	Training/Inspection/ Material/Medical Surveillance	# of People Trained/ Net Square Feet/ # of Items Issued/ # of Exams

Fourth Step: Calculate

(000's)	00	01	02	03	30	40	50	70	80	Tenants	Total
Site Wide Facilities and buildings	$24	$11	$ 69	$14	$19	$ 93	$ 90	$ 94	$108	$ 134	$ 656
Hazardous Material & waste	0	0	13	22	0	2	383	57	63	59	599
Training/inspection/ material/medical	3	1	25	9	3	28	57	25	37	19	207
Total Dollars	$27	$12	$107	$45	$22	$123	$530	$176	$208	$ 212	$1.462

Fifth Step: Evaluate

Total Costs (000's)	00	01	02	03	30	40	50	70	80	Tenants	Total
Burdened Labor hours method	0	10	14	2	175	405	249	305	302	0	1,462
ABC allocation	0	0	0	0	25	141	609	203	240	244	1,462
Difference	0	10	14	2	150	264	-360	102	62	-244	0

Code 50 Was Being Grossly Undercharged

Tenants Were Getting Free Goods

Sixth Step: Action

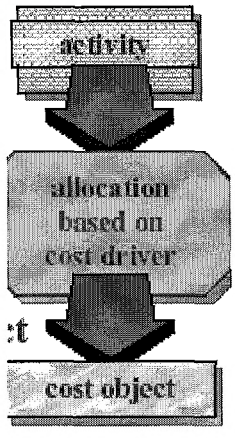
Recovered incurred costs from tenants

Reorganized, redirected code 50

Re-emphasized the costs of Hazardous materials.

3.6. Choosing the Right Cost Drivers

Allocation translates the activity cost pool to the cost object. Allocation uses some other measurement to establish a rate or proportion related to object that other measurement is the cost driver.



Typically there are many possible drivers to choose from. Each cost driver represents a potentially different:

- Distribution of costs
- Challenge in measurement
- Underlying assumption of resource consumption
- Opportunity for cost reduction through driver reduction

The wrong cost driver will:

- Create cross-subsidizations
- Distort true cost
- Encourage undesired behavior

The right cost driver will:

- Give a true picture of cost
- Enhance rational decision making
- Promote desired behaviors

Practical goals are:

- Seek reasonable distribution of costs based on cause and effect relationships
- Look for drivers that reflect cost object consumption of the cost pool

A cause and effect relationship means:

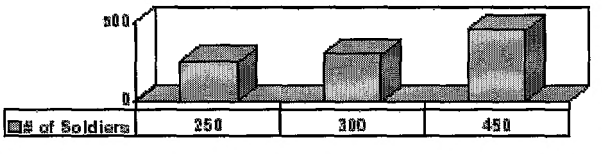
- Increasing driver usage will cause more consumption of resources
- Decreasing driver usage will cause less resource consumption
- Allocating cost based on this driver will reflect underlying economics of costs consumption and approximate true cost.

3.7. Contracts Office Case

The Contracts Office at Fort Apache incurs annual costs $1 Million. These costs are currently distributed to companies A, B, and C on the basis of their number of soldiers.

How much is each company allocated?

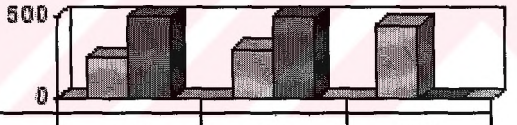
	Company A	Company B	Company C
Number of Soldiers	250	300	450



Allocation mechanics should be simple to us at this point. The difficulty of ABC and the reasons for its success or failure lie in the design choices. Is "Number of Soldiers" a good cost driver? Will decreasing soldiers decrease consumption of contracts resources? What undesired behaviors might be encouraged by this method of distribution?

Company C's captain finds his allocation unacceptable. He rejects being charged $450K when he does not have any contracts and suggests using number contracts as the cost driver. How is the cost allocated with this cost driver?

	Company A	Company B	Company C
Number of Contracts	50	50	0

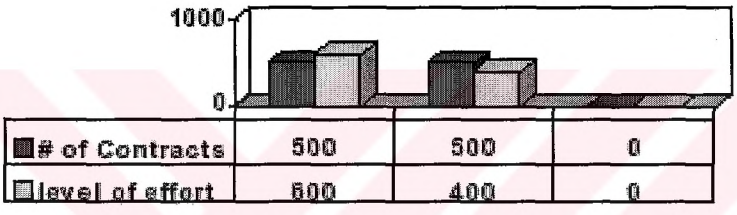


# of Soldiers	250	300	450
# of Contracts	500	500	0

Company A's cost doubles. Company B's cost increases 67%. Total cost remains unchanged. Who "wins" this zero-sum game? Is the "Number of Contracts" a good cost driver? Will decreasing number of contracts decrease consumption of contracts resources? What undesired behaviors might be encouraged by this method?

Company B labels these results wrong and points out that it's contracts are relatively simple and that it always complies with contracts' procedure and lead time requests. The company CO suggests that a survey of contracts' efforts be used as the cost driver. How are costs allocated on this basis?

	Company A	Company B	Company C
Level of Effort	60%	40%	0

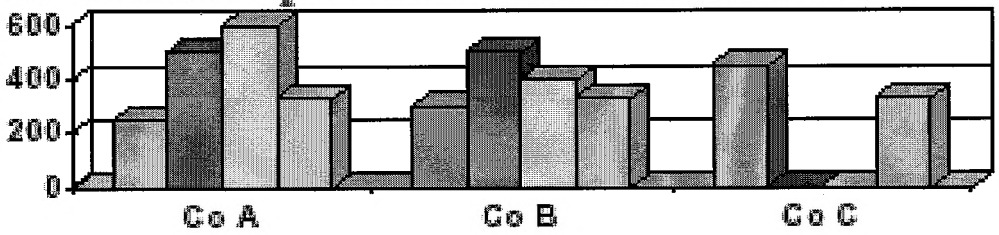


# of Contracts	500	500	0
level of effort	600	400	0

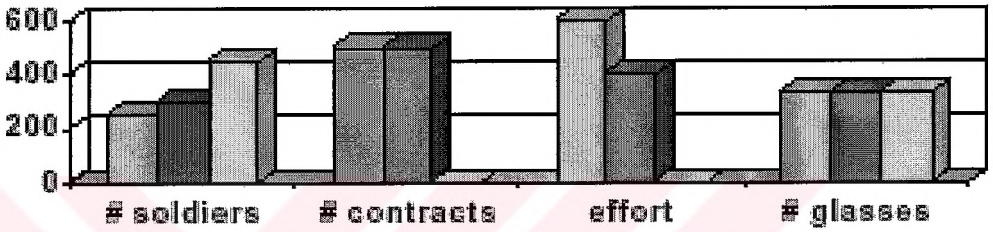
Company A argues strongly that it cannot afford $600K for contracts without compromising its mission. The company CO, the most senior and forceful of the company CO's, demands that "something fair, like the number of soldiers wearing glasses" be used. How are costs allocated on this basis?

	Company A	Company B	Company C
Soldiers With Glasses	15	15	15

Cost Consumption Method Results:



Cost Driver Distribution Profiles:



Is "Number of Soldiers Wearing Glasses" a good cost driver? Accountants are trained to deal with nonsense. Which driver would you recommend?

- If you are any of the company commanders?
- If you are the installation commander?

Does the proposed driver correlate with resource consumption?

- Less driver causes less resource
- More driver causes more resource

Does the proposed driver motivate desirable behavior?

- Cost conscious managers will work to reduce the driver

The lessons we learned from this case are:

- Using cost driver to allocate is easy
- Choosing the right cost driver may be hard
- We cannot ignore behavioral implications so, we count on them and design system to motivate desired behavior
- True economic cost usually motivates the right cost management behavior.

3.8. Using Level of Effort Analysis (LOE) to Develop Customized Cost Drivers

Many costs are not easily correlated with cost objects:

- Less true in manufacturing
- Very true in service

Level of effort analysis technique easily produces a customized driver of reasonable accuracy. Overhead areas often use LOE since:

- Work usually specialized and not consumed uniformly by line organizations
- Like the contracts office

Lack of consumption homogeneity may mean that common drivers are poor (i.e. square feet, direct labor hours, mileage, etc.,

Precision and LOE:

- Activity manager will only be able to make rough estimates
- Estimates get better over time
- Random estimate errors tend to offset
- Systematic error can include bias
- Saliency can include bias

Level of Effort Example:

Effort Makers

	A	B	C	Total
Ted	10%	50%	40%	100%
Bob	30%	40%	30%	100%
Sue	50%	50%	0%	100%
Linda	25%	25%	50%	100%
Average	29%	41%	30%	100%

Staff manager has good idea of where people work and who they support. The bottom line represents a "proportional" method allocation basis for the staff function.

Implicit assumptions:

- Effort costs the same for each person
- Other costs proportional to people.

If Ted is a lawyer and others are paralegals, the level of effort is biased:

- Use weighting factor or
- Make two separate activities if bias is siginificant

Random error:

	A	B	C	Total
Ted	10%	40%	50%	100%
Bob	25%	50%	25%	100%
Sue	40%	60%	0%	100%
Linda	30%	30%	40%	100%
Average	26%	45%	29%	100%
Old Average	29%	41%	30%	100%
Error	-3%	4%	-1%	0%

Random error tends to offset. This error is probably not significant. Both LOE estimates capture the major effects. Bias is possible due to "saliency":

- Recent problems are fresh in mind
- Suppose C had a big problem last month
- Produces significantly more error

	A	B	C	Total
Ted	10%	40%	50%	100%
Bob	20%	30%	50%	100%
Sue	50%	40%	10%	100%
Linda	20%	20%	60%	100%
Average	25%	33%	43%	100%
Old Average	29%	41%	30%	100%
Error	-4%	-9%	13%	0%

3.9. Pitfalls About Choosing Cost Drivers

Good costing yields:

- Desired behavior
- Economically rational decision making

Poor costing yields:

- Undesired behavior
- Over consumption of under costed goods
- Under consumption of over costed goods

Behavioral aspects of cost systems are critically important:

- Managerial costing influences management
- Management influences behavior
- Therefore, managerial costing influences behavior

ABC systems give cost warriors two targets:

- Activity cost reduction
- Cost driver reduction

Example-1:

- Reduced square footage
- Should lead to reduced utilities, maintenance, etc.

Managerial costing systems motivate managers to reduce cost drivers. A system with wrong design can:

- Reduce consumption of the wrong thing
- Inadvertently increase consumption of costly resources that now appear to be free goods.

Industry commonly allocates many overheads on the basis of direct labor. Labor appears much more expensive than it really is resulting in:

- Over spending on industrial engineering
- Over automating
- Excessive off shore development
- Wrong outsourcing decisions

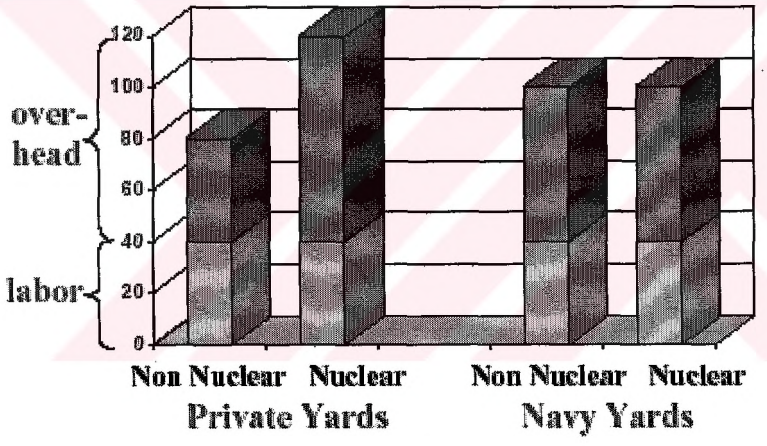
Example-2:

- Navy evaluation of ship refurbishment
- Nuclear and non-nuclear
- Navy shipyards vs private shipyards
- Navy uses single pool based on labor

Assumptions

- Costs are identical in both shipyards
- Overhead for nuclear exceeds non-nuclear

♦ Real Costs	Non Nuclear		Nuclear
– Labor	40		40
– Overhead	40		80
♦ ABC Process			
– Activity Pool 120	= 40	+	80
– Driver Proportion	50%		50%
– Overhead Distribution	60		60



3.10. Pitfalls About Motivating Under Consumption

Typically we want to cut cost by:

- Determining and allocating true costs
- Encouraging cost reduction behavior

Occasionally we don't want true cost:

- If reduction of activity cost undesired
- If reduction of the driver is undesired
- When over emphasis of some other behavior is wanted

We may not want to reduce some drivers. Imagine the potential for undesirable behavior if the ABC system allocated:

- Safety program costs based on number of times safety equipment issued
- Patent legal staff based on patents issued
- Hazardous materials overhead based on materials turned in for disposal
- Maintenance based on preventative maintenance costs

Sometimes we don't want the activity cost reduced:

- Sometimes a higher level view decides it would be undesirable to sub optimize
- Perhaps an investment is being made for the future
- Maybe it is desirable in the long run to provide a capability or encourage a change that would be discouraged by true cost

3.11. ABC Implementation Issues

"Don't Want Budget Cut". Overhead managers worry that visibility will lead to budget cuts:

- Top management mandate
- Assign overhead manager to personally present output to top management
- Position presentation as opportinity to show accomplishments and cost consciousness

"Too Hard to Do". Overhead will inflate the complexity and difficulty of costing all they do:

- Emphasize big picture, major activity focus
- Pareto-ize and apply willie Sutton law
- Recommend an evolutionary approach

"Unwanted use visibility". Cost object managers don't want visibility to their consumption: Top management must insist that consuming managers manage their consumption.

"Infinite detail required". Consuming managers demand infinite detail to justfy allocations:

- Emphaisize reasonableness goal
- Limit accounting resources available
- Keep deadlines tight
- Permit consuming managers to spend own resources on more detail

"Wrong driver". Consuming managers will object to assumptions made in cost driver and activity design:

- Make consuming managers team the sign off on metedology
- Emphasize reasonableness and relevance
- Top management involvement should ensure driver meets organization needs

"Allocation is unaffordable". Consuming managers claim they can't afford what they are consuming:

- Consider putting consuming organization "out of business" if it can't reduce.
- Offer temporary "consider subsidization" to help inefficient organization transition to new environment.

"I can't control that cost". Consuming managers claim that overhead cost is really fixed:

- Point to cause-effect nature of the cost drivers they have approved
- Remind that no cost is fixed in the long term
- Seek action to reduce cost drivers and activity cost

"Accounting problems". Accounting managers will need direction on:

- Activity cost and basis frequency of update
- Linkage of cost update with basis update

Response:

- Remind that there is no absolute method
- Reinforce reasonableness and relevance
- Evolve complexity if value indicates

IV. HYPOTHESIS

ABC traces costs to activities and further delineates the costs to specific products and services. ABC is also an accounting technique that determines the cost of activities. The basic theory is that organizational activities are responsible for all cost occurrences, but not all organizational activities contribute to the production of every service or product. Each service or product should be charged for its appropriate share of the costs incurred by the activities contributing to its performance.[42]

A classic manufacturing example is used to illustrate ABC: A furniture manufacturer produces 20 desks and 20 chairs. Both items go through the same finishing department (activity). It takes one hour to finish a desk and two hours to finish a chair. Typical cost accounting would attribute the cost of finishing department on a per unit basis. The desks and chairs would bear an equal share of the cost (50/50) because an equal number of desks and chairs were produced. ABC attributes the finishing cost on a per hour basis – the amount the activity accually consumed. The desks and chairs would assume a

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[42] Headquarters, Department of the Army, **Financial Management Operations (FM 14-100),** Washington, DC, 7 May 1997, p.2-1

fair share of the cost (1/3 to 2/3) because the chair uses twice the finishing hours as the desk.[43]

ABC is particularly concerned with tracing indirect costs. Indirect costs are such things as overhead and general and administrative (G&A) expenses that must be incurred to maintain the support structure needed to produce a product but cannot be directly attributed to a specific product. Material and labor costs of the line workers in the furniture plant are direct costs because they can be directly tied to a product (each chair requires $50 in materials and three hours of labor to produce). The labor cost for the supervisor in the furniture plant is indirect because it is not specifically consumed by a single product (how much a supervisor's time is needed to produce a single chair?) ABC's biggest benefit is that it calculates indirect costs, links them to measurable outputs, and allocates the appropriate portion to each product or service; thus supporting management decision making at the lowest level.

Although initially applied to manufacturing firms, the usefulness of the ABC allocation procedure is not limited to such an environment. The importance of allocating indirect costs to final products is equally important to non-manufacturing organizations, including (but not limited to) retail firms, health care organizations, banks, governmental organizations,

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[43] K.K.Komp.D.Bşk.lığı, **A.B.D.'nin Avrupa'daki Kara Kuvvetleri Komutanlığında Mali Yönetim Sistemi Oryantasyon Eğitimi Notları**, F.Almanya, 9-15 Ekim 1983, p.36

and consulting firms. Indirect costs are also of key importance to the Department of Army. Not surprisingly, therefore, the Department of Defense has been installing ABC systems on a selective basis. However, if an organization's (including the Department of Army's) traditional costing system used a multiple base approach to allocating indirect costs to products in the producing departments, the difference between an ABC system and the traditional cost accounting system would be largely one of aggregation (i.e., at what level of activity or set of activities, such as a service, should costs be accumulated and allocated).[44]

ABC initiatives are currently being used at many locations throughout the Army. Our hypothesis is; as the use of ABC expands, it can incrementally replace SBC data for services in support of SSC.

[44]U.S. Army Cost and Economic Analysis Center, **Army Managerial Costing Training Material**, p.25

V. METHODOLOGY OF IMPLEMENTING ABC

In this chapter of thesis a regression model done by U.S. Army Cost & Economic Analysis Center will be introduced. A commonly used statistical procedure for examining the relationships among costs and outputs is regression analysis. This procedure allows for testing of statistical associations among the designated dependent variable and independent variables (although cause and effect relationships cannot be proven). Accordingly, the basic hypothesis stated in the previous section was examined via a multiple regression analysis model, based on the ordinary least squares approach. The model, for each support service department, takes the following form:

$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} \ldots \beta_k X_{ki} + \in_i$ Eq. 1

where, Y_i = the ith observation of the support service's cost, where i = 1, 2 … n observations.

$X_1 X_2 \ldots X_k$ = the k output and control variables associated with the service

β_0 = the intercept (or fixed component of cost)

$\beta_1 \ldots \beta_k$ = the coefficient (parameter values for the k output and control variables)

$\in_i$ = the ith error term

In essence, for each support service, a model was developed based on the observations available for 77 Army installations. The study is cross-sectional in nature based on data from Fiscal Year 1995.[45] The derived model is intended to provide preliminary results on the expected cost of service in a particular installation.

Once the model was derived, standard statistical analyses were conducted to examine the significance of each independent variable, as well as the overall ability of the model to explain the variation in a service's cost. This part of the analysis provided a preliminary examination of the general hypothesis related to the development of a model which explains the expected cost of services across installations. After a final model was developed, the expected cost was compared to the actual cost of the support service in each installation. The difference between the actual and expected costs was statistically analyzed in terms of the standard error of the expected cost. This comparison provided a preliminary examination of the cost-efficiency of a support service at various Army installations.

In an ideal situation, the output variables would include a measure of quality as discussed above.One approach to considering quality is to include a series of dummy variables for different levels of quality (e.g., two dummy variables assuming quality is rated on a three-scale approach of red, amber, and green) for each service at an installation. An alternative approach is to separate the installations, for each support service, in terms of

[45] Army FY95, **Army Service Based Costing,** Baseline File V2.0, May 1997

their quality rating and then to assess the relationship between cost-efficiency and quality by comparing across groups. Unfortunately, data related to the quality of a service at an installation is currently not available (i.e., only quantity related measures of output are currently available). Hence, the quality aspect of a service was not considered in this study.

The primary data used in this study was derived from a service base costing initiative launched by the Assistant Chief of Staff for Installation Management (ACSIM) and the U.S. Army Cost and Economic Analysis Center (USACEAC). In essence, this initiative has identified 122 Army funded services at various installations (see APPENDIX A). This initiative also resulted in cost and output data, for each service across each installation, for the fiscal year 1995. For purposes of this study, data on seven (7) services were provided and analyzed. The approach taken in this regard was to do a detailed analysis of a small number of services to see if a general model of expected cost for a service could be developed, as well as to see if comparing cost efficiency across services is a workable idea. The services selected for the preliminary analyses (i.e., the analyses are considered preliminary in that data on the quality of each service provided is not yet available and only one year of data is thus far available) were chosen to represent an array of services in multiple functional areas and consisted of:

- food service,
- military personel operations,

- refuse removal,
- building maintenance (administrative and training buildings),
- retail supply,
- asset management,
- substance abuse.

5.1. General Approach

The argument underlying the data is that the costs of services are driven by the outputs of those services. The outputs considered were essentially limited to quantitative measures, since measures of quality are not yet available. "Army SBC: Data Collection Guide" (September 1996), which was prepared for the Headquarters Department of the Army Assistance Chief of Staff for Installation Management and Army's Cost and Economic Analysis Center (see Exhibit 5.1). This provided an excellent starting place for analyzing the data because the primary and alternative output measures are the ones which, on *a priori* grounds, are most likely to drive the costs of the services. Thus, the approach is

grounded in the notion of testing a theory rather than "hunting" through the data to find the best (in a statistical sense) model.

A regression model was developed for each of the seven services across all those installations for which data were available. In each case, the first step was to test a model which the dependent variable was the total cost of providing the service and the independent variables were the primary and alternative (where appropriate) outputs. The second step was to insert into the model other output variables based on some reasonable assumption that these factors could also be viewed as drivers of the service's costs (data was collected to reflect general installation information such as total square feet, total military assigned, etc.). For example, although the total square feet of an installation was not considered to be either a primary or alternative driver of food services, it seems reasonable to assume that the physical size of an installation could have an effect on the total cost of food services. The third step was to insert into the model some dummy variables to control for such factors as whether an installation is located within or outside of the Continental U.S. (i.e., CONUS/OCONUS) or whether an installation is considered to be in a metropolitan or rural location. The fourth step was to insert into the model, using the stepwise regression technique, all of the variables for which data was provided, as long as it was not counter-intuitive (from an economic perspective) to use a particular variable. Finally, much of the analysis was repeated using logarithmic models in order to take into

consideration the wide variations in the measurements of variables and the presumably exponential nature of some of the variables. In all, approximately 60 different models were considered in connection with each of the seven services under examination.

5.2. Caveats

Before discussing the results, a few caveats need to be noted. First, only one year of data (i.e., 1995), was available for the analysis. Second, although data was collected for a total of 77 installations, data was not available for all variables in the 77 installations. Thus, in running the models, wherever data was missing, that installation was dropped from the analysis. As a result, the number of installations included in the analysis for each service ranged from around 52 to 77. (However, it should be noted that the number of installations considered in this study represents the most extensive comparison across installation of its kind.) Third, to the extent the efficiency of a service is linked to the quality of that service, not having a measure for quality poses a serious impediment in terms of drawing any definitive conclusions from the analysis. All of these concerns strongly suggest that the results discussed below are best viewed as preliminary in nature. These concerns

notwithstanding, it will become apparent that the results of this study do provide encouragement for further work in this area.

5.3. Results

In terms of the general hypothesis underlying the analyses of the data, it would appear that useful models can be developed for some, but not all, of the services provided by the Army installations. For example, it seems reasonable to claim that food service (Table 5.1) lends itself to such a modeling exercise. Based on data from 56 Army installations (i.e., the remaining 21 installations were missing data), a model consisting of two variables (besides an intercept) is able to explain 62% of the overall variation in costs (see Part A of Table 5.1). The variables included in the model are the number of meals served and square feet of the installation. These variables are intuitively related to the total cost of food service, as well as statistically significant (see Part B of Table 5.1). Given that the analysis does not include a measure for quality, only includes one year of data, and only includes 56 of 77 installations, the results seem stronger than expected on *a priori* grounds. One explanation for these strong findings may be that the quality of food service is, in essence, comparable across installations due to the adherence to strict health standards.

SERVICE	DESCRIPTION	PRIMARY OUTPUT/WORKLOAD MEASURES DESCRIPTION	ALTERNATE OUTPUT/WORKLOAD ALTERNATE OUTPUT/WORKLOAD MEASURES DESCRIPTION
Food Services	Provide installation retail food services (food service management and operations) to customers.	Number of meals served: (Total number of meals service in dining facilities)	Military population served: (Average annual number c military personnel)
MILPO Services	Provide personnel management support and administration of military and family members. Process military personnel actions (strength reports, evaluations , promotions, ressignments, other special personnel actions). Provide in-and out-processing services for military personnel assigned to/from installation units and organizations. Maintain military personnel records and databases. Operate Transition Point. Provide authorized personnel wiht idendification documents. Provide reenlistment services for their next of kin. Provide other military personnel services not covered in other categories (i.e., passort services, financial services, operate the Retiree Services Office). Provide personnel management services for retried military personel. Provide administrative support to Military Personel Directorate/AG. Conduct military personnel-related surveys, Coordinate operations of DoD Dependent Schools.	Number of active duty military suppordet: (Average number of active duty military members support)	Number of SIDPERS trancastions: (Total numbe of SIDPERS trancastions during the year)
Refuse Removal	Collect and dispose of installation refuse, does not include hazardous materials. Includes operation of landfills and disposal sites.	Number of tons of refuse removed: (Total number of tons of refuse removed during the year	

Exhibit 1. Installation Services

Bldg Maintenance-Admin.& Trng	Provide maintenance and repair of all installation administration and training facilities. Includesall Standing Operationg Orders (SOO), Individual Jop Orders (IJF), Services Orders (SO), and Preventive Maintenance (PM) work performet inside or within five feet of a facility. Excludes facility infrastructure (utility service components, roads, grounds) and environmental protection services.	Thousands of square feet of type facilities: (*Tousands of square feet of supported administrative and training facilities)*	
Retail Supply	Provide installation retail support services (receipt, storage and issue) to customers.	Number of customer requests/turn-ins for material: (*Total number of requests/trn-in documents processed during the year)*	Number of issues and receipts for material: (*Total number of issues and receipts processed during the year)*
Asset Management	Provide installation non-expendable property accountability and related asset sustain ment actions. Includes preparation and maintenance of hand receipts and associated transaction process integrity and security.	Number of lines on property book: *(The average number of different line numbers maintained in each property book during the year)*	Number of hand receipts: (*Total number of hand receipts processed in a year)*
Substance Abuse Program	Administer installation alcohol and drug abuse programs. Conduct installation drug and alcohol abuse prevention activities. Provide for alcohol and drug abuse counseling. Conduct counternarcotics programs.	Number of clients receiving service: (The total of the number of clients served in each program during the year)	Number of contacts: (*Total number of incidents for drug and alcohol program support, to include urinalysis, during the year)*

Exhibit 1. Installation Services (Continued)

In looking at Part C of Table 5.1, it is worth noting that only four of the installations had residuals (i.e., the difference between the actual and predicted costs) that were more than two Standard errors. Of these four cases, three are positive (i.e., the actual costs are significantly greater than the predicted costs) and one is negative (i.e., the actual costs are significantly less than the predicted costs). In light of the data limitations, it is unwise to infer too much from these results. Nevertheless, the findings do suggest that nearly all (i.e., 52 of the 56) of the installations operate within a comparable band of costs in regards to providing food services. In other words, rather than suggesting that three installations (i.e., the ones with higher than expected costs) are inefficient and one installation (i.e., the one with lower than expected costs) is efficient, it seems more reasonable at this stage of the preliminary analyses to note that food services apparently can be modeled and that most installations seem to be handling this service in a comparable manner. Of course, the addition of more data in terms of years and number of installations, as well as a measure of quality, may lead to even more convincing claims regarding food service.

A cursory glance at tables 5.2 through 5.7 reveals that the analyses explaining the other six services are presented in a similar manner to the one for food service. In each case the model is presented in Part A of the table, the coefficients and significance of these coefficients are presented in Part B, and the installations which are statistical outliners (in terms of two standard errors) are presented in Part C (referred to as casewise diagnostics) of

the tables. Key points related to these tables are as follows. The preliminary models explaining the total cost of military personel services (see Table 5.2) and substance abuse service (see Table 5.7) seem reasonably good. For military personnel services, both the number of SIDPERS transactions during the year and the number of active duty military members supported seem to be important drivers of the total costs. Interestingly, however, the CONUS/OCONUS variable is significant (at the .053 level) in a negative fashion (i.e., being outside the continental U.S. lowers costs). Possible explanation for this latter finding are that OCONUS installations have few retired military personnel to serve and/or provide far fewer personnel services relative to those installation within the continental U.S. The findings for substance abuse service show that the number of contacts (i.e., the alternate output measure shown in Exhibit 1) is a key driver of the total cost. In contrast, the models for the other four services (i.e., refuse removal, building maintenance, retail supply, and asset management) leave much to be desired. However, even where the adjusted R^2s are quite low, it is interesting to note that, in all but refuse removal, key cost drivers (in a statistical sense) are identified. Further, for all but the building maintenance service and the asset management service, only a few installations are statistical outliers in terms of having actual costs exceed expected costs. In the cases of building maintenance and asset management, there were no outliers. Of course, any conclusions drawn in regard to outliers must be done with extreme caution due to the fact that the standard errors of the estimates are all quite large.

Overall, the findings from the preliminary analyses suggest at least five things. First, it seems possible to develop useful models of the expected cost of some services provided by the various installations. However, other services seem far less amenable to such a model building exercise. Second, even though the models for expected costs may be less than desirable, it seems quite feasible to identify many of the significant (in a statistical sense) output measures that drive the costs of these services across installations. Further, most of these drivers are the ones which, on *a priori* grounds, were identified as either primary or alternative output measures in the report entitled "Army SBC: Data Collection Guide" (September 1996). Third, in contrast to the second point, many of the output variables which were expected to be key drivers of the costs of services, on *a priori* grounds, were found to have little (in a statistical sense) explanatory value. For example, the number of tons of refuse removed per year does not seem to be a key driver of the total cost of providing refuse removal (a rather curious finding). Of course, it may be that the key driver for this service is quality (e.g., cycle time) which has yet to be measured. Fourth, the claim that many installations are far less efficient than other installations in providing services may be greatly exaggerated. Indeed, based on the preliminary analyses, it would appear that very few installations are way out of line relative to the group. Of course, all four of these points need to be tempered by the data limitation concerns raised at the beginning of this section.

Table 5.1.

Food Service

(A) Model: $y=859{,}091 + 1.28X_1 + .07097X_2$

where= total cost for food service

X_1= number of meals served

X_2= square feet of installation

Adjusted $R^2 = .620$

(B) Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std.Error	Beta	t-value	Significance
1 (Constant)	859091.0	357213.3		3.452	.001
No. Of meals served	1.281	.153	.722	2.405	.020
square	.07097	.032	.194	2.247	.029

(C) Casewise Diagnostics

Case Number	Std.Resid	Total Cos	Predicted Value	Residual
32	4.103	10089639	2691216	7398423
45	2.377		9378754	4285600
47	-2.671	13664354	7491068	-4816771
69	2.524	2674297	3667400	4551657

Table 5.2

Military personel Service

del : $y=725187.7+ 5.818X_1 + .809940X_2 + 51.671X_3$

ere,. y= total cost for military personnel service

X_1= total number of SIDPERS transactions during the year

X_2= inside or outside continental U.S.

X_3= average number of active duty military members supported

justed R^2= 0.466

efficients

Model	Unstandardized Coefficients		Standardized Coefficients	t-value	Significance
	B	Std. Error	Beta		
(Constant)	725187.7	208595.7		3.477	.001
) Total mber of DPERS ansactions uring the year	5.818	2.279	.405	2.553	.014
) InOut	-80994.0	407635.1	-.219	-1.987	.53
M) Average umber of active uty military iembers upported	51.671	26.641	.305	1.939	.059

. Dependent Variable: (L) Total Cost

(C) Casewise Diagnostics

Case Number	Std. Residual	Total Cost	Predicted Value	Residual
36	-2.300	1,348,291	3,937,131	-2,588,840
51	3.778	6,084,854	1,831,359	4,253,495
57	2.053	5,579,560	3,268,222	2,311,338

Table 5.3

Refuse Removal

(A) Model: y=1,273,761.031 + 8.196X

where,y = total cost for refuse removal service

X= total number of tons of refuse removed during the year

Adjusted R^2 = 0.005

(B) Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t-value	Significance
	B	Std.Error	Beta		
1 (Constant)	1,273,761.031	385,769.90		3.302	.002
Total number of tons of refuse removed during the year	8.196	7.130	.136	1.150	.254

(C) Casewise Diagnostics

Installation Number	Std.Residual	(L) Total Cost	Predicted Value	Residual
64	5.926	19,343,335	1,828,936.8143	17,514,398.1857
68	3.644	12,459,532	1,690,704.3227	10,768,827.6773
70	2.896	10,073,091	1,514,842.1028	8,558,248.7310

Table 5.4

Building Maintenance Service (Administrating and Training)

(A) Model: y= -6,744,022.733 + 8,901.688X

where,y = total cost for building maintenance service

X= thousands of square feet of supported administrative and training facilities

Adjusted R^2 = 0.225

(B) Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t-value	Significance
	B	Std.Error	Beta		
1 (Constant)	-6,744,022.733	3,117,885.566		-2.163	.034
Total number of tons of supported administrative and training facilities	8,901.688	1,865.612	.485	4.771	.000

Table 5.5

Retail Supply Service

(A) Model: $y=6,529,761.161 + 858.925X_1 + 28.884X_2$

where,y = total cost for retail supply service

X_1= total workforce

X_2= total number of requests/turn-in documents processed during the year.

Adjusted $R^2 = 0.281$

(B) Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t-value	Significance
	B	Std.Error	Beta		
1 (Constant)	-6,529,761.161	2,536,548.412		-2.574	.012
Total number of request/turn-in documents processed during the year	28.884	12.849	.228	2.248	.028
Total Workforce	858.925	194.322	.448	4.420	.000

(C) Casewise Diagnostics

Installation Number	Std.Residual	Service Total $	Predicted Value	Residual
33	-2.075	$2,161,433.6364	$32,906,651.888519	-$30,745,208.252119
35	-2.284	$4,025,832.4700	$37,872,267.465932	-$33,846,434.995932

Table 5.6

Asset Management Service

(A) Model: y= 1,096,100.138 + 546.232

where,y = total cost for asset management

X= total number of hand receipts processed in a year.

Adjusted R^2 = 0.38

(B) Coefficients: y = 1,096,100.138 + 546.232

Model	Unstandardized Coefficients		Standardized Coefficients	t-value	Significance
	B	Std.Error	Beta		
1 (Constant)	1,096,100.138	907,463.737		1.208	.231
Total number of hand receipts processed in a year	546.232	280.308	.227	1.949	.055

Table 5.7

Substance Abuse Service

del : y= -442171.110 + 78.345X

ere, y= total cost for asset management

X = total number of hand receipts processed in a year.

usted R^2= .0480

efficients

Model	Unstandardized Coefficients		Standardized Coefficients	t-value	Significance
	B	Std. Error	Beta		
(Constant)	-442,171.110	219,660.207		-2.013	.048
tal number of cidents for drug d alcohol ogram support, ring the year.	78.345	9.542	.698	1.949	.000

assewise Diagnostics

stallation umber	Std. Residual	Service Total	Predicted Value	Residual
8	-2.162	$ 1,415,102.00	$4,870,044.850743	-$3,454,942.850243
14	-2.058	$ 1,174,912.00	$4,462,961.683837	-$3,288,049.683837
27	-2.334	$ 67,000.00	$3,996,100.907934	-$3,729,100.907934
35	-3.410	$ 665,310.322	$6,114,327.925569	-$5,449,017.605569
70	3.341	$ 472,777.00	$5,812,149.369997	-$5,339,372.369997

VI. CONCLUSION

The ultimate goal of the initiative under way is to better understand how an Army installation can.provide high quality support services in a cost-efficient manner. The notion of developing useful models of the expected cost of services provided by Army installations seems to be a worthwhile endeavor. It would appear that some services lend themselves to developing models that explain a large portion of the overall variation of the services' total costs. In contrast, other services probably do not lend themselves to such an.approach. Nevertheless, for most services it seems fair to argue that economically meaningful output (pacing) measures that drive the total cost of the services can be identified and tested in statistical terms.

Ultimately, two further extensions, which go beyond the Department of Army, are possible. One possible extension of this project is to transfer the ideas and concepts related to the expected costs of support services developed for the Department of Army to other branches of the military (e.g., the Air Force). This approach would allow for a comparison of the cost-efficiency of support services across installations from different branches of the U.S. military. Another possible extension of this project is to do some sort of limited, but

not necessarily scientifically rigorous, comparison of the cost of providing support services in the Army with the cost of providing roughly the equivalent services via outside sourcing. This extension would bring into the analysis the discipline of the external marketplace. For example, it might be determined that even the most efficient Army installation is not providing a particular service in the most efficient manner relative to the private sector. Further, it might help to explain why modeling particular services across installations are especially difficult. In this latter regard, the inability to find any meaningful relationship between the total cost of refuse removal and the number of tons of refuse removed may well be the result of market conditions for such services (i.e., refuse removal is essentially an external sourcing service). Of course, these extensions are not mutually exclusive and could be pursued based on a subsample of services (e.g. 20 of the 122 installation services).

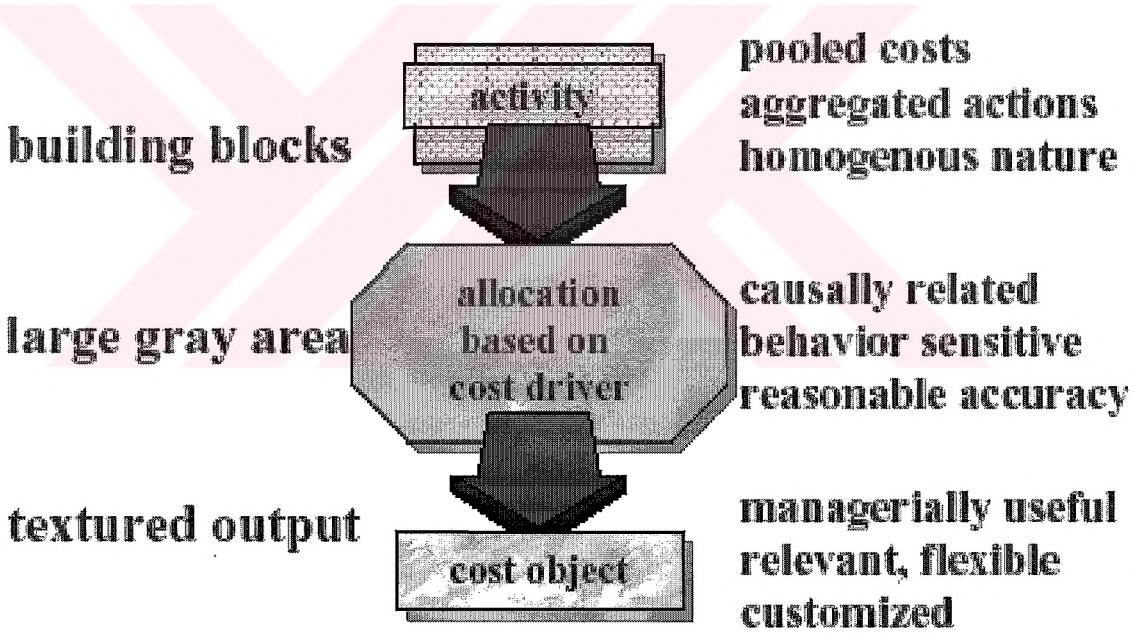
6.1. ABC Approach:

ABC is a bottom-up costing process that tracks costs from the general ledger cost accounts in a two stage process going first to the activities that are involved in the production process and then to the service or products that emerge from the production process.

At Army installations, cost accounts are captured in a chart of accounts called AMSCOs and are defined by object classes that represent things such as civilian pay, equipment, materials, and contracts. The cost accounts are then assigned to various activities based on the unique cost driving characteristics of the production process. Activities may represent a wide range of diminutive tasks that consume resources. Activities can be related to direct production, policy compliance, or undistributed management overhead. For example, a direct production activity may be recording invoices received by a contracting office at a given accuracy rate, and the cost driver used to assign cost accounts to the production activity may be direct labor hours used. Also note, quality performance metrics (i.e. accuracy) are focused on the activity production process with the view that the quality standards established for specific activities will deliver a service at a required quality level.Once all activities are assigned costs, the activity costs are subsequently assigned to each service by means of a second method that assesses the use of activities to deliver the service. In the above example, each customer is treated as a distinct service since different amounts of activities are required to deliver the homogenous service to each customer. For example, the cost of specific activities related to processing contracts is assigned to each customer. The cost of delivering a homogeneous service to Customer 1 may be greater than to Customer 2 because Customer 1 may consume more of a certain activity than Customer 2. The second method used to assign activity costs may be based on the number of purchase orders processed. The difference between the first and second

methods is that the cost drivers focus on resources used by activities in the first and on resources required by the service in the second.

This detailed two step process of assigning all "did cost" costs (direct, policy and overhead) to a service allows ABC to derive a pure marginal cost. By knowing the historic marginal cost to deliver a service to each customer, the provider can estimate a price tailored to the specific quantity and quality desires of each customer.



6.2. SSC Approach:

SSC is a top down costing process that uses statistical methods to predict the expected cost of delivering a service for anticipated levels of output at a given quality level ("should cost"). SSC's foundation is in service definitions, standards, and historical costs from accounting reports. Although any source with appropriate data could be used, this methodology has been developed using Installation Status Report (ISR) standards and Army Service Based Costing (Army SBC) services and historical costs. ISR and Army SBC share the same service definitions for installation support services The service definitions are not tied to any given installation organization or mission, so they are transferable from installation to installation. Service performance standards are developed and measured by the Assistant Chief of Staff for Installation Management (ACSIM) through ISR. These standards are based on observed best practices internally (within the Army) and externally (outside government and commercial agencies). Historical costs come from Army SBC which collects costs by service and captures the true, full managerial controlled cost of providing installation support services. Cost data are based on Defense Finance and Accounting (DFAS) 218 Report data and functional expertise at the installation level.[46]

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[46] B.D. Graver, **Military Text**, London, Oxford University Press, 1976, p.42

The "should cost" of a service is derived through regression analysis. Regression analysis quantifies the historic relationship between cost, quantity and quality into a mathematical equation that predicts "expected cost" of delivering a service based on given amounts of quantity and quality. The derived "expected cost" of delivering a service is an average cost of all activities to include overhead.

Implementation of SSC is simple, direct and requires only five basic steps: Define the service, establish service standards, formulate the cost estimating relationship for expected costs, apply the equation to build service requirements, and validate and refine the estimate based on execution experience.

6.3. The Price Assumptions:

In theory, the marginal cost of a service reflects the real cost to society of an additional output of government services. If prices are set less than at the marginal cost, then customers are not paying enough to cover actual production costs which presents an incentive to demand too much of the service. In this case, the deficit must be subsidized by

other customers. If prices are set greater than marginal costs, prices exceed real production costs which present a negative incentive to demand. Thus, customers will demand too little of the service.

As a practical matter economists have never been able to substantiate the extent that private sector providers actually use marginal costs to set retail prices. Instead, the private sector provider establishes a price for a service or product based on the lowest attainable average cost. For example, Visa and MasterCard lose $8.5 billion to deadbeat customers, but easily cover their losses from solvent customers by setting interest rates based on the average loan experience of all customers. Determining in advance which customers will pay off their loans is considered more expensive than it is worth.[47]

When a price is less than average cost, production is encountering diseconomies of scale and all customers will demand too much of the service. In this case, a deficit must be subsidized by additional funding authority or under-funding another service. If a price exceeds the average cost, required output is limited by existing production capacity and too little of the service will be consumed. Thus, while average cost may be correct for pricing a homogeneous service for installation reimbursement purposes, it may distort the real cost of providing the service to a specific customer.

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[47] Peter Huber, **Junk Credit Cards**, Forbes, 24 March 1997, p.10

6.4. Cost Comparison Of Each Approach:

The cost of operation consists of two components, the cost of implementing the price system and the ongoing cost of operating the system.

6.4.1. Cost of Implementation:

The cost to implement ABC depends not only on the number of assignments made, but also the methods used to make the cost assignments. In general, there are three cost categories related to implementing ABC. A low cost assignment method may use the expert judgments of functional managers. At the other extreme, the implementation of a comprehensive cost accounting system that directly captures the cost elements related to activities and the cost of each activity that comprise each service will be very expensive. An interim approach may use allocation rules and algorithms to assign costs to activities and services at modest expense. The most economic approach to ABC may combine all three methods in proportion to the perceived value of cost information provided.

The cost to implement SSC falls within the low to modest category. The cost data necessary to implement SSC already resides in existing accounting reports. The required quantity and quality data coincide with ISR (Services) reporting requirements and standards. The cost to implement SSC is no greater than the cost to comply with external reporting requirements.

6.4.2. Cost To Maintain:

An ABC system can be expensive to maintain. There are recurring expenses related to computing the multitude of assignment algorithms each year using fresh cost data and the actual experience of the previous year. The alternative is to apply old assignment algorithms to new data. The annual cost of additional technical staff to sustain a direct cost accounting system will also be expensive. The time expended by functional leaders to refresh expert judgments on cost assignments can be a burden that diverts the attention of management from daily operations. SSC is relatively inexpensive to maintain. Once data sources for cost, quantity and quality are identified in the implementation phase, the annual

effort consists of downloading data and then computing and analyzing the predictive model.

6.4.3. ABC Comparison With Traditional Costing

The hierarchial classification of activities allows us to illustrate the fundamental differences between activity-based and traditional cost systems. In a traditional system, the consumption of overhead by products is assumed to be explained only by unit-based activity drivers. In a sophisticated traditional system, overhead costs are classified as fixed and variable with respect to unit-based drivers.

Unit-based cost systems allocate fixed overhead to individual products, using fixed overhead rates, and assign variable overhead using variable overhead rates. From the perspective of activity-based costing, the variable overhead is appropriately traced to individual products (for this category, overhead consumption increases as units produced increases). However, assigning fixed overhead costs using unit-based activity drivers can be arbitrary and may not reflect the activities actually being consumed by the products. Many of the costs assigned in the traditional fixed overhead category are, in reality, batch level, product-level, and facility-level costs that vary with drivers other than unit-level drivers.

Activity-based cost systems improve product-costing accuracy, by recognizing that many of the so-called fixed overhead costs vary in proportion to changes other than production volume. By understanding what causes these costs to increase or decrease, they can be traced to individual products. This cause-and-effect relationship allows managers to improve decision making. Additionally, this large pool of fixed overhead costs is no longer mysterious. Knowing the underlying behavior of many of these costs allows managers to exert more control over the activities that cause the costs. It also allows managers to identify which of the activities add value and which do not. Value analysis is the heart of activity-based management and is the basis for continuous improvement.[48]

6.5. Accuracy Of Each Approach:

The accuracy of an ABC cost estimate is a function of the procedure used to assign costs. If a direct cost accounting system is employed to record each cost element to an activity and each activity to a specific customer service, the resulting cost estimate should be sufficiently accurate. If such a system does not exist, then an estimate must be made to

[48] Don Hansen and Maryanne Mowen, **Cost Management**, Cincinnati, Ohio, U.S.A., South-Western College Publishing, 1997. p.320

assign cost elements to activities and activities to services. This estimate is made by expert judgment or analysis that formulates an assumption based assignment algorithm. Thus the accuracy of the final cost estimate of the service depends on the correctness of the expert judgment and the validity of assumptions. Moreover, assuming the error of each assignment estimate is small, the final error of the service cost estimate may be substantial given that when an estimate is added to an estimate the errors are added and when the estimate is multiplied to an estimate the errors are multiplied. Independent of the margin of error of the cost estimate, the ABC process lacks an internal feedback mechanism to detect the existence of estimating errors. The primary check on cost validity is the external customer's challenge of the service price.

The accuracy of the SSC cost estimate is statistically determined by the regression coefficient of determination. This measure states the percent of service cost variation explained by changes in service quantity and quality. The higher the explained variation the more reliable the cost estimates. In addition, the regression technique allows the cost estimate to be expressed in degrees of accuracy. For example the cost estimate can be expressed as 95% statistically accurate with a possible error of + or - 5%.

6.6. Value To Installation Management:

The ABC approach provides installation management positive externalities. ABC generates very precise cost information about operating an organization that allows functional managers to see deeply into resource consumption processes that deliver a service. The assignment of cost to activities allows managers to evaluate the relative value of the activity with respect to cost in order to work smarter. The identification of the causal relationship between activity cost drivers and service cost provides management a tool to control resource consumption in delivering a service. The evaluation of activity cost and cost drivers by senior installation leadership creates a new economic environment of cost accountability.

SSC provides installation managers a practical tool to readily price a service based on average customer usage. SSC however can not provide insights to management on the process used to deliver the service. The results of SSC can be benchmarked to the costs of other installations providing the same service to provide management a relative reference of efficiency.

6.7. Summary Of Approaches To Determine Price:

When feasible, customers of installations services should be charged a price for the quantity and quality of service consumed. When a service is no longer free, the consumer adjusts demand for the service inline with the perceived worth of the service and obtainable budget. The adjusted demand communicates to providers what and how much service is needed given available budgets.

Table 6.1. Comparison of ABC and SSC

	Price Assumption	Precision	Accuracy	Cost to Implement	Cost to Maintain	Value to Installation Management
ABC	Marginal cost	High	High to low	High to moderate	High to moderate	Very useful
SSC	Average cost	Average	High to average	moderate to low	low	Limited use

The table above summarizes the relative attributes of using ABC and SSC to determine a service price. When all is considered, the precise Marginal Cost generated by ABC may not be superior to the SSC generated Average Cost in establishing a price for an installation service. The ABC concept of pure marginal cost, while intuitively appealing,

lacks practical economic advantage over average cost generated by SSC. In fact, existing literature only vaguely explains the theory of ABC in a logical context of mathematical principles, economic design variables and operating parameters. In contrast, the SSC methodology is based on practical economic principles and basic econometric techniques. There are other practical limitations on using the detail intensive ABC process to determine price. The amount of resources expended on collecting and manipulating the immense amount of ABC data may outweigh the benefits in precision. ABC is more expensive to implement and maintain than SSC. The level of precision in identifying customer cost to set a price may be beneficial in maximizing profits in the private sector, however this exactness is not essential to meet the public sector objective of recovering costs. Unless ABC incorporates a direct cost accounting system, the accuracy of the precise cost estimate may also be suspect. Judgements and assumptions about cost assignments may contain errors. Statistically these errors are compounded when estimates are added and multiplied in the multistep approach to derive the cost estimate. Unless the cost estimate is questioned by an external source, there is no internal feedback mechanism to evaluate the accuracy of the ABC estimate. While the average SSC cost estimate is not as precise as ABC, the accuracy of the estimate can be immeditially determined by statistical methods. The unrivaled strength of ABC is its capacity to show why resources are consumed in providing a service. This penetrating insight empowers functional managers to decrease existing marginal costs which will also decrease the average costs mirrored in SSC.

ABC seeks to understand true economic cost;

- Based on cause-effect relationships
- Reflecting drivers of resource consumption
- With reasonable, but not precise, accuracy

ABC promotes better resource management;

- Eliminates free goods
- Stimulates behavioral change
- Enables accountability for cost management.

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APPENDIX A

SUPPORT SERVICES BY INSTALLATION STATUS REPORT (ISR) FUNCTIONAL CATEGORY

Service Number

Command Staff

3 Pastoral Care
4 Religious Services
107 Installation Operation Management
108 Command Inspections
109 Command Investigations
110 Complaint/Assistance Services
112 Command Information
113 Community Relations
114 Media Relations
115 Correctional Custody Services
116 Law Enforcement Services
117 Physical Security
118 Protocol Services
119 Installation Safety Office
120 Administrative Law Services
121 Criminal Law Services
122 Legal Assistance Services

Engineering

58 Bldg. Maintenance - Admin. & Trng.
59 Bldg. Maintenance - Command
60 Bldg. Maintenance - Family Housing
61 Bldg. Maintenance - Hosp./Medical
62 Bldg. Maintenance - Industrial/Shop
63 Bldg. /Facility Maintenance - Other
64 Bldg. Maintenance - RDT&E
65 Bldg. Maintenance - Storage/Whse.
66 Bldg. Maintenance - UPH
67 Custodial Services
68 District Cooling
69 District Heating
70 Electricity

Engineering (Continued)

71 Environment - Recycling
72 Environmental Compliance
73 Environmental Conservation
74 Environmental Pollution Prevention
75 Environmental Restoration
76 Environmental Services Mgmt.
77 Equipment in Place Services
78 Facilities Engineering Services Mgmt.
79 Family Housing Management
80 Fire & Emergency Response Svcs.
81 Fuel Heating
82 Improved Grounds Maintenance
83 Indoor Pest Control
84 Master Planning
85 Minor Construction
86 Miscellaneous Engineer Services
87 Natural Gas
88 Other Utility Services
89 Outdoor Pest Control
90 Railroad Maintenance
91 Real Estate & Construction Admin.
92 Real Property Demolition
93 Refuse Removal
94 Sewage
95 Snow and Sand Removal
96 Space Management
97 Surfaced Area Maintenance
98 Transient Housing Management
99 Unimproved Ground Maintenance
100 UPH Management
101 Water

Information Management

35 Audio/Visual Media Services
36 C-E Equipment Support Services
37 Communications Support
38 Data Processing Services
40 Records Management

Logistics

41 Ammunition Supply
42 Asset Management
43 Food Services
44 Laundry and Dry-cleaning Services
45 Material Support Maintenance
46 Retail Supply
47 Retail Supply - CIF
48 Transportation Services

Operations

49 Airfield Operations
50 Flight Simulator
51 Operations Planning Support
52 RC Training Support
53 Reserve Component Support
54 Security Program Support
55 TASC
56 Training Operations Support
57 Training Support

Personnel and Community

1 Career Transition Service
2 MILPO Services
5 Civilian Training
6 Management/Employee Relations
7 NAF Personnel Support
8 Other Civilian Personnel Service
9 Position Management
10 Recruitment/Placement
12 Army Emergency Relief
13 Center-Based Child Care Services
14 Child Development Svcs. Mgmt.
15 Community Outreach
16 Continuing Educ. Svc.
17 Educ. Pgm. For Child Care Providers
18 Exceptional Family Member Program
19 Family Advocacy
20 Family Member Employment
21 Financial Planning
22 Home-Based Child Care

Personnel and Community (Continued)

23 Information, Referral, & Follow-up
24 MWR Program Services
25 Relocation Services
26 School-Age/Latch Key Programs
27 Substance Abuse Program
28 Youth Development Programs
29 Youth Development Svcs. Mgmt.
30 Youth Leisure & Social Recreation
31 Youth Sports and Physical Fitness
105 Equal Employment Opportunity
106 Equal Opportunity Office Services

Resource Management

32 Contract Administration
33 Contracting
34 Purchasing
102 Budgeting/Programming
103 Management Accounting
104 Management Analysis
111 Internal Review
103a Reimb. Order/MOA/MOU/ISSA Mgmt.

APPENDIX B

PARTICIPATING SBC MACOMS AND INSTALLATIONS

EUSA

- 20th ASG/Area IV (Camp Henry)
- 23rd ASG/Area III (Camp Humphreys)
- 34th ASG/Area II (Yongsan)
- 50th CSG/Area I (Camp Red Cloud)

USARPAC

- Alaska
- 25th ID (L) and USARHAW
- 10th ASG (Torii Station)
- 17th ASG (Camp Zama)

USAREUR

- 6th ASG (Moehringen)
- 22nd ASG (Vicenza)
- 26th ASG (Heidelburg)
- 53rd ASG (Bad Kreuznach)
- 80th ASG (Chievres)
- 98th ASG (Wuerzburg)
- 100th ASG (Grafenwoehr)
- 104th ASG (Hanau)

USARSO

- Fort Clayton, Panama

MDW

- Fort A.P. Hill, VA
- Fort Belvoir, VA
- Fort Meade, MD
- Fort Myer, VA

PARTICIPATION SBC MACOMS AND INSTALLATIONS

USMA

U.S. Army Garrison, West Point, NY

FORSCOM

Fort Carson, CO
Fort Hood, TX
Fort Irwin, CA
Fort Lewis, WA
Fort McPherson, GA
Fort Riley, KS

USARC

Camp Parks Reserve Forces Training Area, CA
Fort Dix, NJ
Fort Hamilton, NY
Fort Hunter Liggett, CA
Fort McCoy, WI

MEDCOM

Fort Detrick, MD
Fort Sam Houston, TX
Walter Reed Army Medical Center, MD

TRADOC

Fort Benning, GA
Fort Bliss, TX
Carlisle Barracks, PA
Fort Eustis, VA
Fort Gordon, GA
Fort Huachuca, AZ
Fort Jackson, SC
Fort Knox, KY
Fort Leavenworth, KS
Fort Lee, VA

Fort Leonard Wood, MO
Fort Monroe, VA
Presidio of Monterey/Defense Language Institute, CA
Fort Rucker, AL
Fort Sill, OK

ARNG

ARNG Minnesota
ARNG California

AMC

Aberdeen Proving Ground, MD
Adelphi Research Lab, MD
Anniston Army Depot, AL
Bluegrass Army Depot, KY
Detroit Arsenal, MI
Dugway Proving Ground, UT
Fort Monmouth, NJ
Letterkenny Army Depot, PA
McAlester Army Ammunition Plant, OK
Natick Lab, MA (SSCOM)
Picatinny Arsenal, NJ
Pine Bluff Arsenal, AR
Pueblo Army Depot, CO
Red River Army Depot, TX
Redstone Arsenal, AL
Rock Island Arsenal, IL
Selfridge Support Activity, MI
Sierra Army Depot, CA
Tobyhanna Army Depot, PA
Tooele Army Depot, UT
Umatilla Army Depot, OR
Watervliet Arsenal, NY
White Sands Missile Range, NM
Yuma Proving Ground, AZ

ACRONYMS

ABC	Activity Based Costing
ACSIM	Assistant Chief of Staff (Installation Management)
ACOE	Army Communities of Excellence
AAFES	Army Air Force Exchange Service
AMC	Army Materiel Command
AMSCO	Army Management Structure Code
APIC	Army Performance Improvement Criteria
APC	Accounting Processing Code
APF	Appropriated Funds
ASG	Area Support Group
BASOPS	Base Operations
BCE	Base Commercial Equipment
BLS	Baseline of Services
C-E	Communication – Electronics
CIF	Central Issue Facility
CEAC	Cost and Economic Analysis Center
CER	Cost Estimating Relationship
CSA	Chief of Staff, Army
CONUS	Continental United States
DA	Department of the Army
DBOF	Defense Business Operating Fund
DERA	Defense Environmental Restoration Account
DFAS	Defense Finance and Accounting Service

DS/GS	Direct Support / General Support
DoD	Department of Defense
EFMP	Exceptional Family Member Program
EOR	Element of Resource
EOY	End of Year
ES	End Strength
FC	Fiscal Code
FCC	Family Child Care
FTE	Full – Time Equivalent
FASAB	Federal Accounting Advisory Board
FORSCOM	Forces Command
FY	Fiscal Year
GSA	General Service Administration
GO	General Officer
GPRA	Government Performance and Result Act
HHG	Household Goods
HQDA	Headquarters, Department of the Army
ICMO	Installation Contract Management Office
ISSA	Inter service Support Agreement
ISR	Installation Status Report
MACOM	Major Command
MILPO	Military Personnel Office
MIPR	Military interdepartmental Purchase Request
MOA	Memorandum of Agreement

MOU	Memorandum of Understanding
MTOE	Modified Table of Organization and Equipment
MWR	Morale, Welfare and Recreation
MSC	Major Subordinate Commands
NCO	Non – commissioned Officer
NG	National Guard
NAF	Non-appropriated Fund(s)
O&M	Operations & Maintenance
OCIE	Organizational Clothing and Individual Equipment
OPA	Other Procurement, Army
OSA	Office of the Secretary of the Army
OASA (F&MC)	Office of the Assistant Secretary of the Army for the Financial Management and Comptroller
OCONUS	Outside Continental United States
PCS	Permanent change of Station
POC	Point of Contact
PRON	Procurement Request Order Number
RC	Reserve Component
RDT & E	Research, Development, Test and Evaluation
RIF	Reduction – In- Force
SAR	Selected Acquisition Report
SJA	Staff Judge Advocate
SBC	Service Based Costing
SES	Senior Executive Service
SSC	Standard Service Costing

TASC	Training Aids Support Center
TDA	Table of Distribution and Allowances
TDY	Temporary Duty
TISA	Troop Issue Subsistence Activity
USACEAC	US Army Cost and Economic Analysis Center
UCMJ	Uniform Code of Military Justice
UPH	Unaccompanied Personnel Housing
VERA	Voluntary Early Retirement
VSIP	Voluntary Separation Incentive Pay

GLOSSARY

ACTIVITY - A named process, function, or task that occurs over time and has recognizable results.

ACTIVITY BASED COSTING – A set of managerial accounting methods used to identify and measure the consumption of resources by activities.

BAYES – A statistical method that uses deductive logic to derive the probability of an event.

COST – Resources consumed in the performing activities to produce a service.

COST ESTIMATING RELATIONSHIP – A mathematical expression relating cost as the dependent variable to one or more independent cost-driving variables. The expression may be represented by several functions, such as linear, power, exponential and hyperbolic.

CUSTOMER – External and internal recipients of a product or service.

EFFECTIVENESS MEASURES – A measure of how well a process outcome meets customers' expectation.

EFFICIENCY MEASURE –A measure of the resources put into a process (cost) to achieve a given level of output.

INSTALLATION – An installation may consist of one or more pieces of real estate. For the purposes of SSC, a distinction is made that the installation
Level is the level at which policy and resourcing decisions are made (i.e., Fort, Depot, ASG).

INSTALLATION STATUS REPORT (ISR) – A decision support system that evaluates Army-wide performance against established standards for installation support services performed at Army installations.

NORMALIZE – to adjust data (normally cost data) for effects such as: inflation, anomalies, seasonal patterns, technology changes, accounting system changes, reorganizations, etc.

OUTCOME MEASURE – An assessment of the results of program activity compared to its intended purpose.

OUTPUT MEASURE – The tabulation, calculation, or recording of activity or effort which can be expressed in a quantitative or qualitative manner.

PACING MEASURE – A single output measure used as an indicator for the total level of effort of all activities included in performing a service.

PERFORMANCE MEASURE – An objective indicator of service effectiveness and efficiency that is directly related to the service mission.

PERFORMANCE STANDARS – A set indicators that define the quantity, quality and cost related to providing a service.

PROCESS – A specific ordering of work activities across time and place, with a beginning and end, and a clearly identified inputs and outputs. As structure for action with the intent of satisfying a mission objective, processes are performed and are facilitated by the use mechanisms to effect the conversion of inputs to outputs.

SERVİCE –Aggregation of one or more activities that come together to create a product(s) or save a customer.

SERVİCE BASED COSTING – A method that measures the costs incurred to provide a service and the outputs of providers.

STANDARD SERVİCE COSTING – A method that measures a standard cost for an expected level of performance.