AN IMPLEMENTATION OF ACTIVITY BASED COSTING METHOD IN THE SERVICE SECTOR

by

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B.S. Management Engineering, Istanbul Technical University, 1994

Submitted to the Institute for Graduate Studies in
Science and Engineering in partial fulfillment of
the requirements for the degree of
Master of Science
in
Industrial Engineering

Boğaziçi University
1998

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ACKNOWLEDGMENTS

I would like to express my gratitude to my thesis supervisor, Doç. Dr. David Pinhas, for his valuable guidance and continuos support. He has also provided me valuable assistance in developing my cost accounting scope.

I would also like to thank Doç. Dr. Gülay Barbarasoğlu and Prof. Nuri Uman for their comments and serving on my thesis committee.

I would also wish to thank to finance manager and employees of the X company for their valuable assistance for data maintenance and comments.

ABSTRACT

AN IMPLEMENTATION OF ACTIVITY BASED COSTING METHOD TO THE SERVICE SECTOR

This thesis consists of an implementation of activity based costing which is the new method for cost accounting, to the service sector. Firstly, the organizational structure of the software company was analyzed and its products and resources of the products were defined. At the second step, the cost drivers which explain the relations between the resource-activity and activity-product were determined. Then the products costs were calculated by using two different ABC methods. These methods differ in cost allocation step. The first method, firstly distributes the costs to the activities, and then distributes the activities costs to the products. However, the second ABC method uses cost accumulation model which regards the relations of the activities to distribute the costs to the activities and the products.

As a result of the survey which used 1996 and 1997 fiscal data, the results which help the company to know its organization more and to work more efficiently and effectively were obtained.

ÖZET

AKTİVİTE AĞIRLIKLI MALİYETLENDİRME YÖNTEMİNİN HİZMET SEKTÖRÜNDE UYGULANMASI

Bu çalışma maliyet muhasebesinde yeni bir yöntem olan "aktivite ağırlıklı maliyetlendirme" yönteminin hizmet sektöründe uygulanmasını içermektedir. İlk aşamada, uygulamanın yapıldığı yazılım şirketinin organizasyon yapısı incelenerek, kullanılan kaynaklar ile ürün grupları belirlenmiş ve aktiviteler tanımlanmıştır. İkinci aşamada kaynak-aktivite ve aktivite-ürün arasındaki maliyet ilişkisini ortaya koyan dağıtım anahtarlarına karar verilmiş ve bu bilgiler ışığında iki farklı "aktivite ağırlıklı maliyetlendirme" yöntemi kllanılarak ürün maliyetleri hesaplanmıştır. Kullanılan iki yöntemin farklılaştığı nokta şirket maliyetinin aktivitelere ve ürünlere dağıtıldığı aşamadır. Birinci yöntem iki aşamada maliyetleri ürünlere dağıtırken, ikinci yöntem maliyetleri önceki aşamalarda planlanan modele göre ürünlere dağıtmaktadır. Ayrıca ikinci yöntem, birinci yöntemin aksine, üretimi destekleyici aktivitelerin de birbirleri arasındaki ilişkiyi dikkate almaktadır.

1996 ve 1997 yılları maliyet verilerinin kullanıldığı bu çalışma sonucunda firmanın kendini daha iyi tanıması ve daha verimli çalışmasını destekleyici bulgular elde edilmiştir.

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1. INTRODUCTION

Cost accounting is interested in finding the accurate product cost to help companies to control product profitability. One of the main problems in finding accurate product cost is the distribution of the overhead to the product cost. Therefore new cost allocation methods are added to the cost accounting. One of them is "activity based costing". Like total quality management, and engineering approaches, the activity based costing method is a supported system approach. Therefore analyzing the whole organization before determination of the products cost has an essential role in the ABC method. As the system approach is interested in cause and effects of the system dynamics, ABC sees the organization as a total of the activities and its focus is the activities which cause the cost of the product to reduce costs.

The purpose of this study is to implement the ABC method in the service sector, to determine accurate product costs and to enable the service company to correctly develop its strategies when making an unprofitable product profitable.

In Chapter 2, some general cost accounting concepts are given. This chapter is the review of the literature especially about cost allocation methods and ABC as a new cost allocation method. The need for ABC instead of the traditional cost accounting methods is also discussed.

The concepts of ABC and the methodology of the two different ABC methods are discussed in Chapter 3. The objective in this chapter is to explain the methodologies of the two ABC methods. Although these two methods are based on the analysis of the activities which form the production of the products, they differ in their cost allocation steps. Unlike the second ABC method, the first method disregards the relation between administrative and operation support activities when the costs are accumulated.

Chapter 4 exists from the implementation of the two ABC methods mentioned in chapter 3. The main purpose of this chapter is to understand the similarities and differences of the two ABC cost systems and the company's cost system. The implementation was carried out in a software company by using its 1996 and 1997 fiscal years data. Firstly, activities of the company were determined by interviews with the personnel and the manager of the general accounting department. After selection of the cost drivers which explain the relations of the resource-activity and activity- product, costs of the company were distributed to the activities and then activities costs were distributed to the products according to the two ABC methods.

Chapter 5 presents cost and profitability analysis of the products. The two ABC methods' results are compared with each other and the company's costs. Since to know accurate costs is essential in making strategic decisions, this chapter aims to help the company to produce profitable products in an effective and efficient way.

The last section concludes the thesis with an evaluation of the two ABC methods and discusses their results.

2. LITERATURE SURVEY

2.1. Cost Accounting

During the last decade, new concepts such as "global competition", "continuous improvement", and "customer oriented production" have forced organizations to make changes in their methods and technological structure to survive in a competitive environment.

The following changes have lead companies to use all the techniques and require more information to take the relevant decisions to go further.

(1) changes in customer's expectations;
(2) increases in the number of companies;
(3) competitive environment in which companies produce similar products;
(4) high quality products;
(5) price sensitivity of customers.

Moreover they started to take strategic decisions about how to price products low, to add new resources, to drop product from the product mix of the company, make-or-buy decisions and so forth. Generally, the major information source of the company is cost accounting systems particularly about pricing products and profitability of products. Originally cost accounting, dealt with ways of accumulating historical costs and of charging these costs to the units of output, or to departments in order to establish stock valuations, profits and balance sheet items [1]. However, after changes in the market, the management now regards cost accounting as a key element of the organization to reach cost information and understand the causes of costs in order to perform the following functions, because managers and workers need an array of timely and relevant information to be supplied by management accountants. [2]:

(1) to evaluate how well the organization is doing relative to its budget;

(2) to facilitate continuous improvement;

(3) to derive the value of inventory and cost of goods manufactured and sold for financial reporting;

(4) to value the inventory for taxation;

(5) to price products or bid on contracts for various jobs;

(6) to determine product or job profitability;

(7) to decide whether to make or buy certain components.

Another definition of cost accounting is that it is primarily concerned with accumulating, summarizing, and reporting cost data for the preparation of financial reports for those who need cost data [3]. The historical cost data is used to determine:

1. The cost for inventories reported on the balance sheet
2. The cost of goods sold, selling costs, administrative cost for the computation of net income.

Venerated surveys of accounting history, now nearly a century old, date the advent of meaningful cost accounting to the mid 1880s [4]. The practical applications of costing for decision making are said to have been developed in the United States as an innovation of Frederick Taylor's scientific management movement. Before the 1880s, cost accounting methods had some shortcomings such as the failure to understand the effect of volume on prices, the non-utilization of costs for product line decisions, a concern only with past rather than future costs and a general lack of sense about best practices [5]. Pollard [6]concedes that after the British Industrial Revolution accounting was capable of solving certain problems (such as stock control, prevention of embezzlement, or departmental comparisons), but he concludes that ultimately accounting did not come to guide management decisions. However, companies knew that to maintain accurate cost and time information on each process they need accounting information. Moreover accounting innovations were not the product of professionals, managerial or financial, but of perceptive businessmen who did costing intuitively and frequently got it right. Wells grants the existence of certain more advanced accounting usage, such as departmental accounts and transfer pricing, but generally denigrates the application of cost accounting procedures until the increase in fixed assets, after the industrial revolution necessitated a more careful allocation of common costs. However it is stated by Edwards [7] that when costing practices were developed, overheads were not a significant element of total cost in certain industries and so it was not important when making decisions. In the nineteenth-century some fruitful results emerged. Stone [8] uncovered cost accounting methods at the Charlton Mills in 1810 that were "not believed to have been in use until the twentieth century". These included the allocation of overheads to cost centers on the basis of predetermined rates and rudimentary examples of transfer pricing. Cost accounting started to be used in such areas as product line decisions, overhead allocation and inventory control so as to make the appropriate decisions.

Although cost accounting methods helped companies to plan and control activities there were inadequate areas of traditional accounting such as its inability to determine which product lines were profitable [9]. However, after the innovation of computer technology, accounting started to improve considerably because the computer enables companies to collect accurate data easily in the manufacturing companies. Parallel to changes in markets, technology and customer expectations, there is today more need for accounting than during the industrial revolution. Furthermore, entrepreneurs need to develop cost accounting methods with increases in diversity and complexity of products to obtain more profits.

According to ABC guide of the Department of Defense [10] the most current established accounting systems normally capture and distribute resource costs by one of the following methods:

(1) organizational element;
(2) budgetary account;
(3) traditional cost accounting with direct and indirect cost allocation.

Organizational element: Though overhead costs are sometimes applied, it is more common to find that these costs are ignored at the unit level. The indirect costs are usually captured and paid into a central repository with no attempt to subdivide further. In many traditional organizations, the only costs that are identified to the organizational elements are the direct salary costs. This system was created to provide management with information on the costs of organizational elements, but was never intended to define the output costs either at the element or organizational level.

Budgetary account: Accounting systems became a safeguard mechanism to capture commitments, undelivered orders, and expenditures, normally divided by the organizational element to enable tracking of budget execution. The major objective was to fully use the resources assigned rather than enhance productivity or to reduce expenses, because any attempt to conserve resources led to a reduction in the future budget resource level. Like organizational accounting systems, there was no attempt to cost output or in most cases to even define output.

Traditional cost accounting systems include two types cost system in terms of manufacturing systems which are the job order accounting system (JOCAS) and the process cost accounting system (PCAS). JOCAS is used in organizations whose products or services are readily identified by individual jobs, units or projects. Commonly, the firm provides a special product or service that is tailored to customer specifications. No two orders are necessarily alike, nor do all orders always pass through the same departments or workcenters. PCAS is used by organizations whose products or service are mass-produced in a continuous flow of production, such as in a cement plant or petroleum refinery. Costs are accumulated by departments instead of by jobs, with an average cost per unit calculated by dividing the total costs by the number of products made. When manufacturing processes are a combination of job order and process systems, *a hybrid cost accounting system* can be used. For example, a company that makes suits may have a basic design, but each batch of suits will vary. One batch uses wool, while another batch uses a mixed fabric. Such a process needs, a hybrid cost accounting system [2].

As cost allocation methods have been used widespread in cost accounting and it is also interested in output, cost allocation methods will be discussed in detail.

2.2. Cost Allocation Methods

There are different classifications of costs. Period costs and product costs are one of them. Period costs are those costs that can be associated with a particular accounting period rather than with the products delivered to the customers. It includes administrative and selling costs needed to keep the business operating. Product costs are the cost of inventory purchased for resale or produced for sale. From another point product cost includes all costs that are needed for the production of the product [3].

Product cost is classified as follows:

(1) direct materials;
(2) direct labor;
(3) variable overheads and fixed overheads.

Direct materials costs refer to the material costs used in the production of the product directly. For example as plastic is a direct material in the production of television, its cost belongs to the direct material costs of the television. *Direct labor costs* refer to costs of the labor who works in the production of the product. For example, labor who works in the production line of the television is considered to be direct labor and its cost belongs to the direct labor cost. On the other hand, the costs of the material and labor for the office cleaning in the television company refer to the indirect costs. The common characteristic of direct costs is that they are traceable and so they join the product cost directly.

The following guidelines may help to distinguish between direct and indirect costs [2].

(1) If a cost can be easily traced to a product or service by using source documents such as material requisitions and time tickets, then it is a direct cost.
(2) If a cost must be allocated in order to be assigned to a product, then it is an indirect cost with respect to that cost object.

Overheads include indirect materials cost and indirect labor cost. Unlike direct costs the primary characteristic of overheads are that they are not physically traceable to the product cost. If any overhead cost is changed according to production volume it is called variable overhead cost, otherwise it is called fixed overhead cost. Overhead costs include resources which are not used in the production process, they are usually split into production overheads, administration overheads and selling and distribution overheads. For example as marketing department does not work for production of products its costs are evaluated as an overhead cost. Labor costs of marketing department are variable overhead cost, but their PC's depreciation is regarded as a fixed overhead cost.

Overhead costs include the following [2]:

(1) indirect materials such as supplies that are not identified with specific products or services;
(2) indirect labor such as supervision, expediting, materials handling, inspection, maintenance and clerical work within the plant;
(3) other overhead items including depreciation, rent, insurance, taxes, utilities, small tools and repairs.

As adding overheads into product cost directly is not possible, the accuracy of the product cost directly depends on the distribution method of the overhead. In allocation of overheads, overhead rates are used. Overhead rate can be calculated using actual data or predetermined data. While a predetermined overhead rate demands future estimated overhead cost from accountants, actual overhead rate requires the past year's data. Of course when computing the predetermined overhead rate, the analyzer needs the past data, again to make reliable estimations. For example the predetermined overhead rate is calculated by dividing *estimated annual overhead* to *the estimated annual production volume.*

Computation of the overhead rate is done every year, not every month because there is the seasonal overhead cost concept. Examples for seasonal overhead costs are heating, vacation pay, some taxes and so on. Since overhead elements except for the fixed overheads can differ over time, usage of an average annual overhead cost per unit is better.

As most companies produce more than one product, many overhead costs cover the production of more than one of the products. Such overhead costs are called **joint costs.** The problem joint costs create is that the denominator of the predetermined overhead rate computation in units of production of different products. To solve this problem, a common denominators such as labor hour, machine hour are used. The measure of production activity for the computation of a denominator for the rate refers to the activity base. An activity base should be directly measurable for each product and should have, at least indirectly a cause-and-effect relation to the overhead cost.

Overhead cost allocation methods in general consist of two steps. At the first step overhead costs are grouped together, they can be applied to the product's cost according to a formula usually involving an overhead rate. Direct labor costs, direct labor hours, and machine hours are examples frequently used as the basis for applying overheads. Applying overhead costs to products or services is the second step in the two-step approach. This cost allocation method creates two problems. First, cost accounting systems need the most accurate overhead rate possible. Second, it needs an overhead allocation basis that is accurate enough for management cost control needs. This second issue attributes that no longer can modern manufacturers, professional service organizations and governmental organizations continue to record all overheads into a single account and just one overhead rate based on direct labor hours.

The more costs that can be directly traced to a product, and the less overheads allocated to it, the more accurate the product's cost will become. If all cost elements can be directly traced, the result will be an objectively accurate product cost everyone can accept. However overhead allocations are subjective, and depend on the methods chosen by the management accountant [2].

Up until recently the cost elements which are direct labor, material, variable overheads and fixed overheads, the direct labor cost and direct material cost had high percentages in the companies' total cost. In traditional accounting the departments are evaluated as cost centers and each department's overhead costs as well as the department's share of the service departments' costs are allocated to each job by using direct labor hours as the allocation base [11]. However, especially after automation cut out a lot of direct labor, the composition of total cost started to change. New expensive activities that are hard to assign to products exist: long distance calls, electronic mail systems, antidiscrimination law suits, wheelchair ramps, trade association memberships, management consulting, cafeterias and so on [12].

In the past as the overhead percentage was not high relative to direct costs, managers did not take it into consideration in making decisions related to products' costs and profitability, because errors made in adding overheads to products were not too significant [1]. Depending on whether companies' costs are labor intensive or material intensive, the allocation basis of overhead costs changes in traditional cost accounting.

After the 1970s, the cost structure started to change as a result of technological innovations in the manufacturing and computer area. Unlike the past, the overhead cost percentage started to increase in the total cost of the company, because by adding new concepts in management science such as reengineering, and total quality management the labor in the companies not only work on producing activities, but support the production process, to provide motivated organizational structure in order to develop companies through their products. As a result of the change of cost composition of the companies they started to suspect their cost accuracy and developed new alternative methods to eliminate obstacles in the traditional cost allocation method, because if managers do not know the correct product costs they could support an unprofitable product but eliminate a profitable product from the product line.

Moreover after increases in customer demands for variety, companies started to produce many kinds of products and increased production process flexibility. However, traditional cost accounting is based on the mass production of a mature product with known characteristics and stable technology. As a result of product variety and complexity, the number of activities in the organizations increased. This situation made the calculation of each product cost difficult and unreliable. Therefore, many companies now recognize that their cost systems are inadequate for today's powerful competition. Systems designed mainly to value inventory for financial and tax statements are not giving managers the accurate and timely information they need to promote operating efficiencies and measure product costs [13]. According to Kaplan the reason so many companies have such difficulties is that cost system designers have failed to recognize that their systems need to address three different functions:

(1) inventory valuation for financial and tax statements, allocating periodic production costs between goods sold and goods in stock;
(2) operational control, providing feedback to production and department managers on the resources consumed (labor, materials, energy overhead) during an operating period;
(3) individual product cost measurement.

In traditional cost accounting as managers do not have adequate product cost information, they continue to produce unprofitable products and many years later a reduced total profit will show them their wrong product strategy, because; the main premise behind these traditional cost systems is that products cause costs. Moreover, the traditional approach focuses on what was achieved, not how it was achieved. However managers must understand how effectively and efficiently resources are used in achieving outcomes. So, cost management systems must be developed to enable managers and workers to evaluate activities, eliminate waste, improve quality, satisfy internal and external customers, and control costs throughout the company's value chain.

In traditional accounting another obstacle is an assumption which says that overhead costs are fixed so they do not change in a short time. However Kaplan [13] claims that many costs traditionally thought of as a fixed cost actually vary according to diversity and complexity of products. Much manufacturing overheads, for example, come from transactions associated with the start or finish of production, such as placing orders, receiving and inspecting purchased materials, setting up machines, moving inventory and shipping finished goods. To reflect these costs, the system must include not only traditional volume- related measures for tracing costs to products such as labor, machine hours, and materials quantities, but also measure count setups, inspections, receipts, parts, vendors, and engineering change orders. The scheme must determine the indirect production volume and the activities necessary to produce multiple items in the same facility.

Kaplan in explaining his opinion to establish an alternative accounting system emphasizes that the new system must take into account companies' total cost in terms of system perspective, because a product's cost includes not only the cost of factory resources to convert raw materials and purchased components to a finished item, but also the cost of resources to establish the distribution channel, make the sale, service the product and supply support services such as engineering design, process improvement, purchasing, information systems, financial and cost analysis and general administration. He also claims that an alternative cost accounting system must enable managers to update the current system, because to introduce new products quickly and cope with short delivery cycles the new accounting system must be a dynamic system to catch current data and to give managers accurate information on time. The traditional cost accounting bases of cost allocation (usually direct labor) do not necessarily follow causal relationships, consequently costs assigned to a product are not necessarily those that will change if the product is added, dropped or changed. Therefore the new cost allocation method must analyze all the organization's jobs, departments and activities in relationship with each other.

Fisher [14] also supports the need for changes in the traditional cost accounting system, he argues that accounting and management reporting traditionally have focused almost entirely on information about an organization's past events, even though such information often is so old it no longer has meaning. But of course the 21st century managers will expect and demand real time knowledge of what is rather than what was. As computer technology enables companies to collect data easily about what, when and how much was produced, cost control systems now have ability to record this data for calculation of accurate product costs. Besides cost accounting must use new methods to convert accurate and current raw data to accurate and useful cost information to benefit from them when making decisions.

More over traditional management approaches encourage managers to focus on symptoms of problems rather than on causes. Cost cutting measures are often used to increase profits and meet targets. However, such measures are often counter productive as they reduce the available resources without reducing workload or changing the factors causing resource consumption.

For allocation of indirect costs the two-stage activity-based allocation method was advocated in the late 1980's by Harvard Professors Robin Cooper and Robert Kaplan for activity-based costing systems [15]. A stage one allocation is an assignment of costs or expenses to a cost objective that will be reallocated to a product line or another secondary cost objective. Stage two allocation is one that assigns production costs or expenses to revenue producing divisions, or to product lines.

According to allocation rate some classifications are made [15]. Actual rates are subject to fluctuations and variations that may distort the overall cost of the final product. Budgeted rates are averages that smooth out the unpredictable variations in the charges to the cost objectives and eventually to the final product.

A single allocation rate may be used to allocate the indirect costs of a cost center to the cost objectives on the basis of one cost driver. The dual rate method recognizes that there are two separate cost drivers based on the variability of the costs incurred by the provider department. For variable and fixed cost distribution different cost drivers are used.

There are three popular cost allocation methods for service departments which are [3]:

(1) direct allocation;
(2) step allocation;
(3) reciprocal allocation.

Direct allocation: In this method, the service department's costs are allocated to the producing departments directly. Therefore this method does not recognize any services provided by one service department to another service department.

Step allocation: The step method of allocating service department costs recognizes that some service departments provide services to other service departments, as well as to production departments, and some service departments' costs can be allocated to other service departments [3]. Therefore, the step allocation method recognizes the relationship between service departments. Unlike the direct allocation, deciding which service department's cost will be allocating the first and which one will be the second is important before starting allocation, because after the cost of a service department is allocated, no further costs are allocated back to that department. In the step allocation method, if any change occurs in the order of service departments, the amounts allocated change. Generally, service departments are arranged in order of the largest dollar amount of directly incurred costs or the highest percentage of service given to other service departments.

Reciprocal Allocation: Like step allocation, this method also recognizes relationship among the service departments. Moreover, unlike the step allocation, in reciprocal allocation, after the cost of a service department is allocated, costs are allocated back to that department. So this method includes more causal relationship in the calculation of the overhead rate than the step method. The reciprocal method is a mathematical application using simultaneous equations. As there is no need to establish a ranking order of allocation, it eliminates one element of potential misallocation [15]. In spite of advantages of this method, usage of a lot of mathematical equations makes the method difficult to implement.

Another allocation problem is allocation of joint costs. Because joint costs are not traceable to a single cost objective. There are three methods for allocating the joint costs to products.

The first one is *physical units method* which bases the allocation of joint costs on the barrels of each product line. *Sales value at split-off method* emphasizes the market value of the products in allocating the joint costs. The third one the *net realizable value method* uses the market value after further processing less the incremental processing costs.

There are many debates about cost allocations because choosing the appropriate cost allocation method for a specific company is not easy and there is no general rule. Furthermore Kaplan [16] claimed that "many accountants and almost all economists argue that any allocation of joint costs (including overhead and depreciation over time) is arbitrary and serves no useful purpose. According to Horngren [17] because of this kind of situation as to whether to include uncontrollable or indirect costs is a difficult question, which must ultimately be resolved in terms of how the given alternatives influence management behaviour in a particular organization. In one organization, allocation may be desirable because it induces the desired behavior. In another organization, the same allocation procedure may cause the opposite behavioral effect.

It is argued that the major benefit of cost allocation is solving organizational control problems, i.e. controlling a manager's discretionary spending on perquisites. Since cost allocations mean distributing common costs to related departments and also distributing department's costs to other departments, it leads department managers to become aware of each other and track each others' expenditures to see whether there is any overconsumption in any cost element, because when a lot of resources are shared by several managers, to control and plan activities and quantity of products becomes more difficult.

After the before mentioned developments and increased awareness of obstacles of traditional cost allocation methods, companies started to seek new methods which would be eliminate these obstacles. This alternative approach is Activity- Based Costing (ABC) which is presented by Cooper and Kaplan [18].

2.3. Activity Based Costing

The first published use of terminology linking activity and cost is normally attributed to Staubus although earlier attributions of this approach have been made by Horngren who refers to the work of Longman & Schiff on distribution cost in the 1950s [11]. Solomons also outlines similar ideas within the context of standard costing, where the use of activities rather than simply labor hours in developing overhead rates, is shown to improve variable overhead variance analysis [19].

Cooper [20] outlined the stimuli for new methods -and ABC in particular- as being because of inaccuracies in traditional product costing techniques resulting from:

(1) a large fixed-cost base;
(2) a relatively small direct labor force;
(3) high incidence of technological change;
(4) growth in product diversity and;
(5) growth in competition.

Current interest in activity management and activity costing reflects the convergence around 1980 of two forces: a long-undetected set of problems in management accounting that seems to have originated in the 1950s and the growth of new competitive pressures in the 1970s that made companies acutely aware of these problems [21]. He argues that basically, activity- based management asserts that the causes of profitability and cost in most businesses are too complex to know or control by referring to financial information recorded in accounting records or reports. Instead companies must manage financial results and track costs with information about activities (or work); in particular with information on how activities that consume resources and satisfy customer wants promote competitiveness and profitability. Besides, after production of complex products and flexible production process, tracking of individual product costs has started to be difficult.

The survey which was carried out in Sweden, 76.8 per cent of companies stated that they needed improvement in their cost accounting systems. They also emphasized that there are four areas for the greatest improvement [22]:

(1) development of an alternative overhead allocation base (70.3 per cent);
(2) increasing direct traceability of costs (61.3 per cent);
(3) cost collection (60.4 per cent);
(4) introducing life-cycle costing (35.1 per cent).

Even though the basic ideas of ABC were developed early, and have been available in the literature for decades, it is the Cooper and Kaplan version which has received attention from a wider audience. Earlier references to activity, activity accounting and activity costing can be found in Kohler 1952, Staubus 1971; and Shilinlaw 1977. Ideas close to ABC can be found in Scandinavia, e.g. variability (Madsen 1959, Madsen and Polsie 1981), objective (Polisie 1976), and the step-by-step costing method (Frenckner and Samuelson 1984) [22].

The recent roots of Activity-based management can be traced to Texas-based CAM-I through its cost management system (CMS) project task force [23]. Founded in 1972, CAM-I is a nonprofit consortium of advanced manufacturers. The original purpose of CAM-I was to study and establish systems, methods, equipment standards, and computer platforms so that manufacturing machines, and equipment could communicate with each other in the factory of the future, the so-called "lights-out" factory where no direct labor was performed by humans. In this project the main question was "How can product cost be calculated when there is no direct labor on which to allocate overheads". Hence, the CMS task force was established in 1986, led by financial people working for the advanced manufacturers of the consortium. The initial result of CMS task force work was published in a book titled "Cost Management for Today's Advanced Manufacturers" by Berliner and Brimson in 1988.

One of the main conclusion of the CMS task force was that *products do not consume cost directly*. This new costing methodology and two-stage allocation method (now known as ABC), made its first public appearance in the two articles which are "One cost system is not enough" (4), and "Measure costs right: Make the right decisions" [18] published in the Harvard Business Review.

According to Kaplan [23], "reporting cost and performance of activities" are not new concepts, only rediscovered. As far back as the 1850s, organizations were accounting and recording the cost of activities and the related activity outputs. Until the 1920s, managers invariably relied on information about the underlying processes, activities, transactions, and events that produced the financial numbers. By the 1960s and 1970s, managers commonly relied on the financial numbers alone, often ignoring the activities, transactions, and events that give rise to the financial numbers. Like their nineteenth century counterparts, managers again understood the importance of managing the underlying processes, activities and so on Because financial numbers are the results and can not be managed directly.

For elimination of obstacles of traditional cost accounting, ABC focuses on:

(1) expensive resources;
(2) analysis of all activities, of the organization in terms of system perspective;
(3) determination of valuable and nonvaluable activities;
(4) collection of current cost data;
(5) choosing different appropriate drivers for every cost element distribution;
(6) establishment of a cost accounting system easy to understand;
(7) obtaining reliable cost information;
(8) tracing costs both volume- sensitive and nonvolume- sensitive drivers;

(9) resources whose consumption varies significantly by product and product type;

(10) resources whose demand patterns are uncorrelated with traditional allocation measures like direct labor, processing time, and materials.

According to Kaplan & Cooper [18], the first element leads the analyzer to resource categories where the new costing process has the potential to make big differences in product cost. The ninth and tenth elements identify resources with the greatest potential for distortion under traditional systems, because traditional systems take into account only volume-sensitive drivers. If relevant drivers are chosen, product costs represent accurate costs. By taking these objects into consideration, ABC leads managers to analyze problems in detail, not on the surface.

According to Brimson [24], the central concept behind ABC is tracking the costs of manufacture at an activity (process) level rather than a departmental level, which is the common practice of traditional cost accounting. Additional to obtaining accurate cost information it provides an opportunity to identify areas which could be performed more efficiently.

ABC is an essential part of the functional process improvement and reengineering effort. It captures quantified cost and time data and translates this into decision information. ABC measures process and activity performance, determines the cost of business process outputs, and identifies opportunities to improve process efficiency and effectiveness.

For the question of when a company should start to implement Activity- Based Costing, Cooper [20] suggests its time for this new cost system when functional managers want to drop seemingly profitable lines, profit margins are hard to explain, hard to make products show big profits, departments have their own cost systems, you have a high margin niche all to yourself, competitors' price are unrealistically low, customers do not mind price increases and results of bids are hard to explain. In addition, before carrying out ABC, managerial expectations must be clear.

Kaplan and Cooper [25] claim that what emerges is a much more accurate picture of which activities generate which costs and in what quantities. Obviously, this yields a better picture of the actual profitability of the product. Once management has a clear understanding of the true (or relatively true) cost of product manufacture and its profitability, it is in a much stronger position to make informed business decisions. Because in traditional cost allocation product is generally overpriced or underpriced managers can develop wrong strategies related to the present and future [18].

However, ABC was a practically impossible until the advent of low-cost microchip technologies in the 1970s made it economic to collect and compile large amounts of nonvolume-sensitive cost driver information. The availability of cheap, powerful personnel computers, spread sheets, and data-base languages allows businesses to develop new cost systems for strategic purposes off-line from official accounting systems [18]. In principle, a two stage approach is used to conduct an ABC analysis. The thrust of the design, which was codified originally by Robin Cooper, is to identify a relatively small set of both volume-sensitive and nonvolume sensitive overhead cost drivers in stage one to trace indirect costs to each driver. In stage two the company determines the percentage of the drivers consumed by each product or service. The result is an estimate of the indirect costs of each product based on nonvolume-sensitive drivers such as engineering change notices (ECN), setups, and inspections, as well as the traditional volume-sensitive drivers such as direct labor hours and material dollars [21]. Activities refer to actions to carry out something so they are expressed with verbs or phrases such as purchasing, and developing quality of products. Drivers refer to nouns to distribute cost elements to activities and products. Drivers must be accountable or measurable such as purchase orders, electricity consumption per a day, and product parts. They help managers to clarify relationship between product and resources.

Johnson [21] argues that one popular mode of activity analysis begins by building an extensive dictionary of key activities under each of an organization's functions. The supervisor of each departments' tables yields a composite cross-functional matrix that portrays what people do in a company far better than any traditional management accounting information. Some examples of cross-functional matrix's results in some companies are:

(1) Cost accounting information often confounds efforts to manage costs simply because it shows only where money was spent, and how much, not why it was spent.

(2) Activity analysis in a pilot shop revealed that people spent almost 30 percent of their time in various types of rework activity.

By understanding what and how activities are carried out in the organization, determination of cost targets help managers to control workers who do specific activities, because, unlike ABC, traditional distribution does not align the amount of activity that is consumed individually by each output directly to the appropriate output [10]. Managers also can track time information related production process easily and make relevant comments on workers' performance. Besides, since engineers know activity costs and activities' cost elements, they can utilize from this information in new product designs, because while they are trying to find the best product design, they can calculate product cost to find the optimum product design. Moreover it can be said that analysis of activities gives a view which explains the whole structure of the organization with their relations like MRP (Material Requirements Plan). Therefore if a designer knows what kind of activities the new product requires, they can easily calculate the new product's cost. Moreover companies can easily update their cost system if a new product is added to a product line or subtracted from a product line. So identifying and costing activities provide potentially powerful information such as the following for design engineers, production managers, or marketing strategies [26]:

(1) knowing the high cost of parts handling (a defined activity) can encourage design engineers to simplify production design;
(2) recognizing that volume-based overhead allocations can give false signals (e.g. knowing that automation-related support costs will not go down by reducing direct labor) helps managers determine the optimum level of production technology;

(3) knowing even the approximate costs of various customer services can guide marketing strategists toward a profitable mix of service and volume.

Activity based costing approach leads a company not only to be interested in costs, products, also to focus on their elements such as overhead costs, material costs, and activity costs. The cost of direct labor and materials, the most important production factors, could be traced easily to individual products [18]. ABC is an essential part of the functional process improvement and reengineering effort. It captures quantified cost and time data and translates this into decision information. ABC measures process and activity performance, determines the cost of business process outputs, and identifies opportunities to improve process efficiency and effectiveness. The Department of Defense argues that ABC emphasizes process improvement which are:

(1) reconfigure the current organization into an activity structure;
(2) select an "as-is" process flow for review and improvement;
(3) make radical changes to develop a "to-be" process flow for dramatic improvements in performance.

ABC is an excellent source of information for various improvement techniques. People understand activities and people understand costs based on activities. ABC reorganizes traditional financial information into a form that makes sense to the casual functional user; in addition to the usual information that tells them how they spend money, it gives them information on what they do with the money [27].

According to Kaplan & Cooper [18] two types of cost should be excluded from a system of activity-based costing. The first one the costs of excess capacity should not be charged to individual products. The other exclusion is research and development for entirely new product and lines.

Activity-based costing method give more reliable cost information to companies in developing strategies such as [18]:

(1) dropping unprofitable products;

(2) increasing or decreasing of product prices according to price sensitivity of products;

(3) redesign products to use more common parts;

(4) using computer-integrated manufacturing look more attractive.

3. THE METHODOLOGY OF THE ACTIVITY BASED COSTING

3.1. The Concepts of the Activity Based Costing

As mentioned before, activity based costing has been developed to solve problems of traditional cost accounting methods. Traditional accounting methods concentrates more on external performance of the company than internal performance of the company. Because traditional accounting practices do not focus on activities of the company, accountants fail to identify cost problems of the company accurately. As ABC is a new concept there are a lot of definitions, but they emphasize similar basic propositions.

Activity based costing emphasizes the two following propositions [19]:

(1) activities consume resources (and so cause cost);
(2) product consumes activities.

There is a definition which explains clearly these two propositions [28]:

Activity-based costing is a cost accounting concept based on the premise that products require an organization to perform activities and that those activities require an organization to incur costs. In activity based costing, systems are designed so that any costs that cannot be attributed directly to a product flow into the activity then flows to the product(s) that make the activity necessary based on their respective consumption of that activity.

Implementation of activity based costing (ABC) is not difficult. It enables the company to collect information about its organization such as cost structure and what is done in the departments. It can also determines its improvement priorities.

This method can be implemented by both service and manufacturing companies. However, there are more implementations in manufacturing than service companies because determination of activities is clearer in manufacturing.

ABC is especially appropriate in the manufacturing and service companies where the following are true [2]:

(1) competition is high;
(2) product mix is diverse in batch sizes, physical sizes, degree of complexity and raw material characteristics;
(3) product life cycles are short, such as three years or less;
(4) collection and manipulation of data are performed by an integrated computer-based information system;
(5) source of their cost shifts from direct to indirect categories.

To understand the activity-based costing method, its concepts must be explained. The activity-based costing system includes six components [2]:

(1) resource categories;
(2) activities;
(3) cost objects;
(4) first stage resource drivers and second stage activity drivers;
(5) cost centers;
(6) direct cost inputs;

Resource categories represent the sources of costs that support activities. For example, "preparation of a project's plan" is an activity for the project manager. A PC, a Microsoft Project utility, a table and, a chair are resources for the manager to carry out this activity.

Activities, are defined as processes or procedures that cause work (24). This concept is different from the department's work in an organization. The department which carries out a lot of activities, can be called the activity center. For example the purchasing department carries out a majority of the purchasing activity, but it also makes a lot of activities to make its major activity. For example determination of necessary goods, researching venders and their prices, arranging proposals to venders .

Every activity can be divided into sub-activities, but in defining activities the organization analyzer should not forget that the key is to divide the organization's operations into its relevant activities. Analyzer should utilize some diagrams or models to find out the activities and their subactivities. Activity flow diagram, IDEF activity model, and fishbone diagram will be explained in this survey with figures.

To understand the organization's current structure easily, an "Activity Flow Diagram" can be used to show all the activities. It describes the activities that are performed in an organization and shows their interdependencies [2]. Some symbols are used to prepare the activity flow diagram. A square refers to source or destination description. A circle refers to an activity description. An arrow shows the input or output flow. Figure 3.3.1 is an example for activity flow diagram which shows interrelations of two activities, support for software and help desk, in a software company. Help desk registers the problem and the demand coming from customers and if it is a problem related to software Help Desk dispatches it to support for software team. After Support team solves the problem, it gives information to Help desk to send this information to the customer.

An activity model is also shown as a node tree to describe the organization's activities and their relationship. The IDEF activity model is hierarchical, consisting of multiple layers of increasing detail. At each node or layer of the model, a total of three to five activities are defined which encompass all of the functions at that node. In the IDEF0 model, the first node is known as the "A0" (pronounced A-zero) level [27]. Figure 3.1.2 and figure 3.1.3 shows a typical A0 and A1 levels. In the A0 level main activity is developing software programs and there are four subactivities. If dividing "making analysis" activity into subactivities is necessary, A1 level is used. As it can be seen from figure 3.1.3, "making analysis" activity consists of three subactivities.

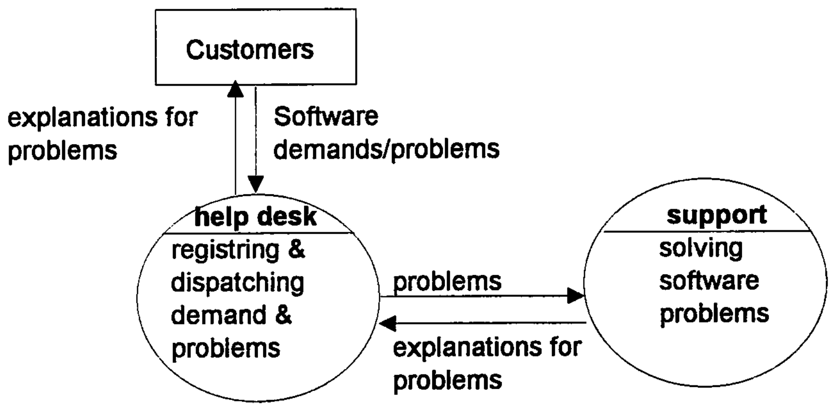

FIGURE 3.1.1. An example for activity flow diagram

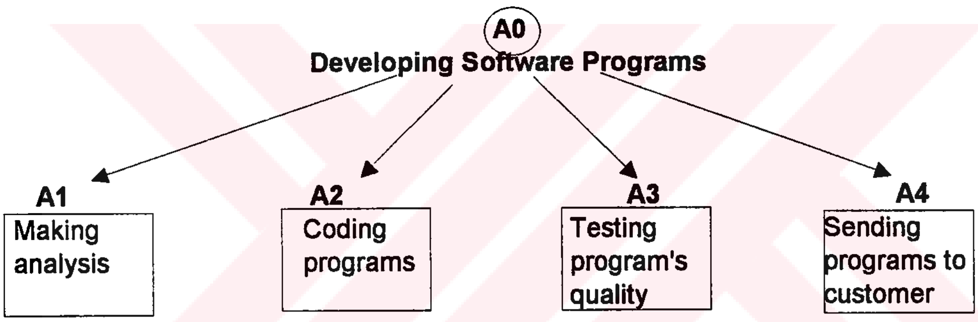

FIGURE 3.1.2. An example for IDEF activity model

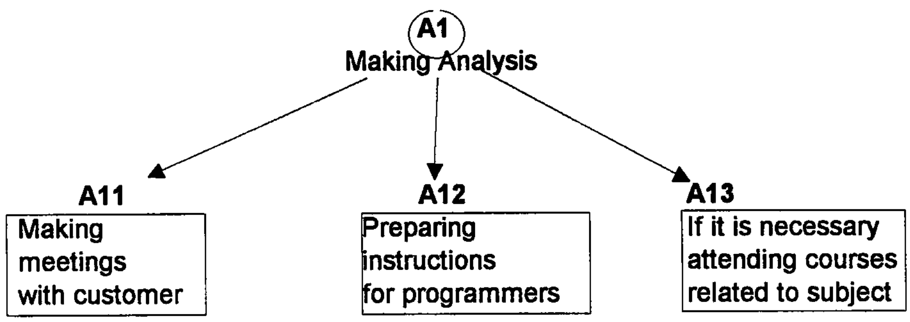

FIGURE 3.1.3. An example for IDEF activity model

A fishbone diagram (also called a cause-and-effect diagram) also can be used as a tool for defining activities and their subactivities. It is appropriate for aggregating and decomposing activities to find the optimum activity number. The process of combining tasks into a homogeneous group to form a function-specific activity is referred to as an aggregation. The process of breaking down groups of dissimilar tasks into several function-specific activities is called decomposition.

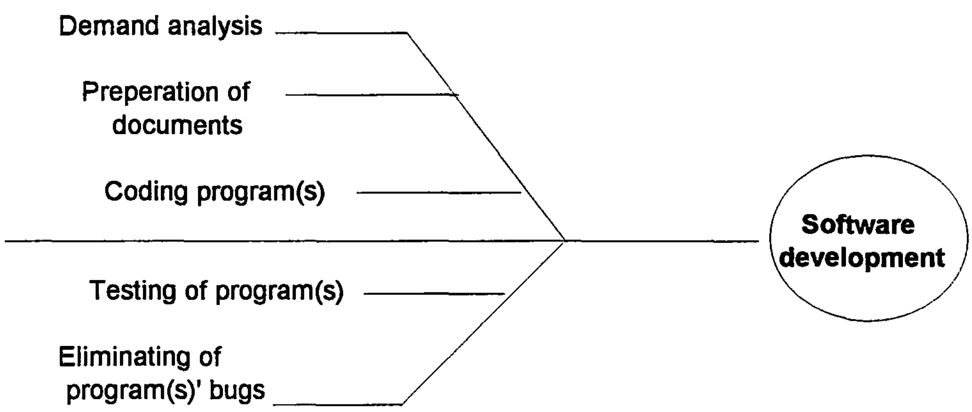

FIGURE 3.1.4. An example for fishbone diagram

There are some rules of thumb that help in performing aggregation and decomposition [2]:

(1) If more than ten activities are defined for a typical department, then the activities should be reviewed for aggregation. On the other hand, if one activity is defined for one medium- or large-size department, the activity should be reviewed for decomposition.

(2) Activities that are the responsibilities of different people should not be aggregated.

(3) Generally, an activity should contain no more than five to fifteen well-defined highly-related tasks.

(4) If an activity contains only one task, it has probably been subjected to excessive decomposition.

(5) If an activity contains unrelated tasks it needs to be decomposed.

(6) If there is only one input and one output, the activity has been decomposed enough.

(7) If there are multiple inputs and outputs, the activity may be a candidate for decomposition. However, a well defined, function-specific activity may contain two or three inputs and two or three outputs and may not require decomposition.

Cost objects are end items for which the accumulation of costs is desired. The following are typical cost objects [2]:

(1) products;
(2) services;
(3) units;
(4) batches;
(5) contracts;
(6) cases;
(7) jobs;
(8) projects;
(9) customers.

First stage resource drivers and second stage resource drivers, are factors used to measure how a cost is incurred and / or how best to charge the cost to activities or products. As different activities consume the same cost, the best appropriate resource drivers are chosen to distribute the cost through the activities.

Cost centers, are the lowest level of detail for which costs are accumulated and distributed. Cost centers come from one activity or a group of activities. Direct cost inputs are cost elements that are easily traced to cost objects.

Activity based costing gives importance to the followings:

(1) associates the cost of resources with activities in a way which reflects how those activities consume the resources;
(2) provides information improvement action;
(3) focuses on activities associated with the major costs of doing business;
(4) promotes value analysis;
(5) develops metrics-performance, quality, and costs;
(6) determines activity and unit cost allowing "best practice" comparison and "to -be" development.

To understand differentiation of traditional accounting and ABC in terms of overhead allocation, the following example is useful:

The company's overhead cost is $500 and Table 3.1.1 illustrates information about two products A and B.

To calculate the overhead costs of products the overhead rate must be find. Overhead rate for labor based allocation is:

$$\frac{\text{Overhead}}{\text{Total direct labor cost}} = \frac{500}{350} = 1.43 \tag{3.1}$$

So, the overhead share of A: 1.43*200 = 286
the overhead share of B: 1.43*150 = 214

The overhead rate for material based allocation is:

$$\frac{\text{Overhead}}{\text{Total direct material cost}} = \frac{500}{280} = 1.79 \qquad (3.2)$$

So, the overhead share of A: 1.79*100 = 179

the overhead share of B: 1.79*180 = 321

Table 3.1.1. A product cost data

Cost Elements	**Product A**	**Product B**	**Total ($)**
Direct Labor	200	150	350
Direct Material	180	100	280
Overhead			500
Total			1130

Table 3.1.2. Labor based cost allocation

Cost Elements	**Product A**	**Product B**	**Total ($)**
Direct Labor	200	150	350
Direct Material	100	180	280
Overhead	286	214	500
Total	586	544	1130

Table 3.1.3. Material based cost allocation

Cost Elements	**Product A**	**Product B**	**Total ($)**
Direct Labor	200	150	350
Direct Material	100	180	280
Overhead	179	321	500
Total	479	651	1130

As it can be seen from the table 3.1.2 and table 3.1.3, according to the allocation basis, the product cost can be changed. Of course, wrong product cost information causes the wrong price policies and afterwards lack of competitive power in the market.

Activity-based costing is used for different purposes [29]. The first one is Strategic Cost Management. ABC provides a tool for measuring the cost benefit associated with investment in new products, markets and technology, and prioritizing alternative investments in terms of value for money and impact on corporate performance. It also enables management to highlight areas within the institution that use an excessive amount of resource. Product costing is the most common use of activity-based costing and often forms the basis for product pricing and product profitability. Analyzing all the activities of the organization gives an opportunity to improve efficiency and effectiveness of the organization. The Customer Profitability concept is related to determination of accurate costs for each product and then measurement of the income per customer based on each product or each activity level. Activity based costing is used also for Operational Cost Management. Activity based management analyzes activities within a value chain, and gives managers an opportunity to focus on resources on adding value. Activity based budgeting assumes that as activities are related to the underlying cost drivers, if the cost driver can be eliminated the cost of the activity falls to zero. Activity based costing makes it possible to understand activities and causal relationship between activity and business activity in terms of performance management. It also helps managers to make clear duplicate or extraneous activities to reduce the product cost.

3.2. Traditional Cost Allocation Versus Activity Based Costing

Focus points and assumptions of activity based costing differ from traditional cost allocation methods. Although their differences have been discussed in the literature survey chapter, two methods will be compared again to emphasize necessity of activity based costing.

In traditional accounting, accountants use the numbers only when they interpret company's costs. As a result, if the company needs to cut the cost, they reduce each departments' budget. However, managing the numbers is not an effective way to cut the costs because it does not include the reasons for costs in an organization [29]. On the other hand accountants who use activity-based costing method, does not tend to treat the numbers as given, they try to analyze them utilizing from their relations each other.

The traditional cost allocation methods distort product costs, because it has not kept up with changes in the organizations [22], but activity based costing covers changes in the organization by adding the new activity-cost relations to the costing system.

Process costing and job costing methods are also based on activities, but they do not relate the costs to the factors which inspire the initial expenditure decision (cost drivers) [29].

Traditional product costing systems either completely exclude selling and distribution and other nonmanufacturing costs or assigned them to products on a rather arbitrary basis, such as relative sales value, manufacturing cost, conversion cost or gross margin. Neither of these methods reflected the demand for the selling and distribution activities placed by different products sold to different types of customers through different distribution channels.

Although obstacles of traditional allocations are mentioned, implementation of ABC may not be needed. Activity based costing method is the necessary for the company instead of using traditional approaches at the overhead distribution when the following ten characteristics occurred at the company [28]:

(1) direct labor operations have been replaced with automated, tape, or computer controlled equipment since the system was last revised;
(2) indirect costs are becoming a much larger percentage of total costs, or overhead rates have been increasing during recent years;
(3) all overhead is applied to cost objectives on the basis of direct labor dollars or hours;
(4) the organization appears to be competitive on one end of its product line, but not on the other end;
(5) operations exist that do not always require the same number of operators;
(6) many operations are set up, started, and can then run with little or no human intervention;
(7) there are both "men using machines" and "machines using men" within the facility;
(8) a disproportionate amount of cost is charged to "other" categories or general categories such as "other direct costs" or "supplies";
(9) accounting personnel spend a great deal of time doing special studies to develop answers to fundamental questions such as determination of product/ product line profitability, departmental operating costs.

Table 3.2.1 will explain two costing systems in terms of their methodology approaches.

Table 3.2.1. Traditional allocation versus activity-based costing

Traditional Two-stage Allocation System	**Activity-Based Costing System**
Stage 1	**Stage 1**
Step1: Trace all support costs to production and service departments cost pools	Trace all support costs to activity cost pools associated with distinct activity cost drivers
Step 2: Allocate service departments costs to production departments	
Stage 2	**Stage 2**
Assign costs to jobs or products based on production departments' cost driver rates (computed as ratios of support costs accumulated in each production department to the corresponding level of a unit-related measure of production volume in the department)	Assign costs to jobs/products based on activity cost driver rates (computed as ratios of support costs accumulated in each activity cost pool to the corresponding level of the activity cost driver)

3.3. The Methodology of the Activity Based Costing

After a company determines to implement the activity based costing instead of its current cost system, one activity based costing approach should be selected. In this survey two approaches will be explained and in the implementation section examples will be used to make them clear.

Firstly, one of the two methods will be explained and then the other. As some steps are similar if there is no difference in their any step the step will be discussed in detail at the only one method explanation.

The steps of the first ABC method are as follows [19]:

(1) activity identification;
(2) activity costing;
(3) cost driver selection;
(4) cost driver rate application to products.

On the other hand the steps of the second ABC method are as follows [28]:

(1) identify and define relevant activities;
(2) organize activities by cost center;
(3) identify major elements of costs;
(4) determine relationships between activities and costs;
(5) identify cost drivers to distribute costs to activities and then activities to products;
(6) establish the cost flow pattern;
(7) select the appropriate tools for effecting the cost flow pattern;
(8) plan the cost accumulation model;
(9) gather the necessary data to drive the cost accumulation model;

(10) establish the cost accumulation model to simulate the organization's cost structure and flow and to develop costing rates.

Firstly, the first ABC method will be explained. Throughout the ABC methodology, the aim will be to catch accurate cost data and cost information in order to evaluate the individual product's profitability.

3.3.1. Steps of the First Activity-Based Costing Method

The first ABC method is explained in this survey utilizing from the book "Activity Costing for Engineers" [19]. However, some other books or articles are also used for developing the ABC concepts.

3.3.1.1. Activity Identification. Managers need to fully understand the cost, time, and quality of activities performed by people or machines throughout an entire organization if they are to achieve the major goals of business process improvement, process simplification and organizational improvement .

Activity analysis task includes four major steps [30]:

(1) identify the process objectives defined by what the customer wants or expects from the process;
(2) chart by recording from start to finish the activities used to complete the product or service;
(3) classify all activities as value-added or nonvalue-added;
(4) continuously improve efficiency of all activities and plan to eliminate nonvalue-added activities.

The name, "Activity-Based Accounting" implies that the managerial cost data cannot be applied until the activities are defined for the organization model or the selected portion of the organization under review by the project team [10]. As this step has a major role to implement activity based costing system to organization, understanding of the whole organization work flow is important, because, after activity identification, organization can decide to drop non-value activities or to improve the performance of value-added activities. Moreover, if some activities require unnecessary effort while producing production, they can be eliminated by simplifying the production process or rearranging factory design.

Activity identification includes finding out what is done in the organization and in its departments. By its very creation, analyzer and management are forced to reevaluate traditional views, paradigms and thought patterns that have hindered realistic improvement programs. It realigns the resources and managerial effort along the real functions of the organization rather than the structure of the organization elements. This is a major departure from the historical view of the organization. To gather data from the organization, the analyzer should interview the people who work in the specific department [10].

Analyzer can utilize different diagrams or models such as fish-bone diagram mentioned section 3.1 when determination of the activities. “Activity mapping framework” is another diagram to use in finding out activities in each department. This is similar to a systems flowchart and records the workflows being undertaken in the dimensions of departmental location and time sequence [19]. An example for the framework is as shown in table 3.3.1.

TABLE 3.3.1. Activity Mapping Framework

Department A	Activity A1		Activity A2
Department B		Activity A2B1	
Department C	Activity B1		

In this step, the analyzer(s) interviews managers and personnel. If an accountant participates in the activity identification step, it will be useful in determination of relevant cost drivers for distribution of costs to activities.

3.3.1.2. Activity Costing. After activity identification, the costs of the company are assigned to the activities. Firstly, required data is gathered. Specific monitoring is preferable as a means of obtaining this information, but where this is not possible "best estimates" by knowledgeable employees may have to be relied upon. At this step, of course determination of the relation between activities and resources makes easy to distribute the costs to the activities. After choosing appropriate cost drivers for each resource, resources' costs are distributed directly into related activities by using them.

Firstly for preparation of the activity-cost table, activities are established to rows and resources (or are called cost) are established to columns. Each cost of resource is distributed to each activity which uses this resource by using the cost drivers. At the end of the distribution of costs to activities, totals at the end of rows refer to the activities' total cost. In other words if the numbers in the cells are used to explain, **1** refers to how much salary cost the marketing activity demands, **2** (in general totals at the end of rows) explains how much money the marketing activity demands to carry it out. **3** refers total cost of the salaries at the company. **4** shows total costs of the company.

Table 3.3.2. The table for distribution of costs to the activities

	COST ELEMENTS			
ACTIVITIES	Salary	Depreciation	Building rent	Total activity cost
Marketing	1			2
Accounting				
Quality development				
Purchasing				
Total Costs	3			4

3.3.1.3. Cost Driver Selection. A cost driver is the variable used as denominator in the rates used to apply activity costs to products:

$$\frac{\text{Activity cost for period}}{\text{Cost driver volume for period}} = \text{Cost driver rate} \qquad (3.3)$$

It is a quantitative measure indicative of the work throughput of the activity. In choosing the cost driver the following criteria should be considered [19]:

(1) The variable should be quantifiable and homogeneous. For example if work complexity is chosen as a cost driver then one common attribute of the work complexity is required to provide a quantitative measure of this characteristic.

(2) Data on the selected variable should be capable of capture in a cost effective way and of being linked to individual product lines

(3) The cost driver selected should have a strong correlation with cost levels in the resource or activity. In other words for resource distribution to activity, the cost driver should explain the activity cost relation.

Examples for such cost drivers are as follows:

Table 3.3.3. Cost driver examples for activity cost distributions

Activities	**Cost drivers**
Marketing	Number of orders
Purchasing	Number of parts
Quality control	Inspection time
Human resource	Number of personnel
Maintenance	Number of problem, or solution time
Account payable management	Number of invoices
Audit reporting	Number of contractor audits

In practice three different types of cost driver are commonly found [19]:

(1) Pure volume: The selected driver is considered a homogeneous measure of activity output, e.g., if all purchase orders or set-ups are either identical or similar then simply the volume of this variable can be used as a cost driver.

(2) Weighted volume: The selected driver does not prove to be a homogeneous measure of activity output, e.g., purchase orders may require differing amounts of resource input depending on whether they are made to UK, USA or Japanese suppliers. One solution to this type of situation is to identify the relative resource consumption by each type of order and use this to generate a weighted total of purchase orders which can be then used in costing.

(3) Situational: A circumstantial factor can be identified as having the major influence on the activity cost. For example, for purchasing, the number of suppliers could be used as the cost driver, particularly where supplier vetting and liaison are the main elements of cost. This type of driver may be of particular use where it is hoped that the selected cost driver rates will help focus management's attention on ways of reducing cost proliferation, e.g. by containing the number of suppliers.

3.3.1.4. Cost Driver Rate Application to Products. After obtaining activities' costs (totals at the end of rows at the table 3.3.1.2.1), these costs are assigned to products by using appropriate cost drivers.

Again, to find products costs, a table is prepared similar to the previous table 3.3.1.2.1. At the table for the distribution of the activities' costs to the products, activities' costs are in the columns and products are in the rows. After each activity cost is distributed to products, at the end each product cost is obtained. Again the numbers in the cells can be used to explain meaning of the each cell. **1** refers to how much marketing activity cost the product A demands, **2** shows the product A's total cost. **3** is the same with **2** in the previous so both of them shows total marketing activity cost. **4** is same with **4** in the previous table, both of them shows total costs of the company.

Table 3.3.4. The table for the distribution of the activities' costs to the products

	ACTIVITIES' COSTS				
	Marketing	Accounting	Quality development	Purchasing	**Total products' costs**
Product A	1				2
Product B					
Product C					
Total Costs	3				4

3.3.2. Steps of the Second Activity Based Costing Method

The steps of the second ABC method will be explained by utilizing from the book of Douglas T. Hicks which is "Activity-Based Costing for the Small and Mid-Sized Organization. Like the other method's explanation, another books or articles were used to criticize this method in detail.

<u>3.3.2.1 Identify and Define Relevant Activities.</u> As this step is same with the first ABC method, only some adding will be explained because determination of the activities is the most important step of the ABC method.

"An activity is the transformation of inputs into outputs performed by mechanisms under the constraints set by controls." To make a clear explanation of the activity, some activity examples can be given: purchasing, finance, marketing, quality control, maintenance, human resource, training, security are called activities. However if the analyzer wants to make a detailed analysis, all these activities can be divided into their sub activities and then they are used in activity costing.

To find relevant activities for the explaining organization's work or process flow all possible activities should be identified at the beginning of the analysis. When beginning to develop a list of activities, it is better to identify too many than too few [28]. However, the activity can be regarded as a set of works. Determination of "activities" requires to take into consideration this key "any work is called an *activity* if determination of which resources are consumed by this activity is possible and practical". At the activity determination stage, the revealing of all activities done in the organization is useful for identification of value added and nonvalue added activities especially from the customer's perspective. Because value added activities increase the "value" of product, if they are eliminated the product's service to the customer would be reduced in the long run. Therefore, these activities must be carried out, but non-value added activities which add no value to the product, can be eliminated from the organization's activity set. A company can use determination of non-value added activities in its "process improvement", "reengineering" and "quality improvement" activities. Besides this step helps the company to find recurring activities and to eliminate them. Furthermore by identifying activities that the customer did not value, and determining the cost of that non-value-added effort, reengineering efforts are better able to focus on those areas with the greatest opportunity for cost reduction and increased efficiency without affecting the value the customer assigns to the product.

Like eliminating or improving nonvalue-added activities, improving inefficient activities is a good result of activity analysis because inefficient activities consumes excess resources. However in the short run it may be impossible to change the process or product design that creates the need for nonvalue-added activities. Therefore, it may be beneficial to improve the efficiency of the nonvalue-added activity [30].

After identification of all activities, the activity level of ABC implementation must be determined in terms of necessity, because if there are a lot of activities, implementation of the method will be difficult and expensive. So a decision of the volume of activities is essential for performance of activity based costing. Besides relevant or optimum volume of activities changes from company to another company or from analyzer to another analyzer.

3.3.2.2. Organize Activities by Cost Center. After determination of activities, they should be grouped into cost centers, as the combining of them will help the analyzer in other steps to understand the activity structure more easily.

To organize the activities to cost centers, some factors should be taken into consideration such as the cost profile, and operating relationship.

The first factor is that if there is operating relationship between activities they are combined into one cost center. However if activities consume same resources and their cost drivers seem the same they can be combined into one cost center.

Although some activities have no operating relationship they can be combined into one cost center if they work for the same process. Besides, there is no rule that all activities must be in a cost center. In some cases a cost center consists of one activity.

According to the approaches, the categories of the cost centers can be changed. Two similar categorizations for cost centers will be explained. The first explanation belongs to the Department of Defense [10] other one belongs to Hicks [28]. It argues that each organizational element serves one of three functions: managerial, support, or operational. Descriptions of each of these functions are as follows:

(1) Managerial: Managerial elements serve as the leadership and coordination of the organization. Management personnel along with their small support staff do not contribute directly to the organization's output and must be distributed to the operational elements that do. The elements identified as managerial typically will have more than one element under their control for oversight and direction and be shown separately in organization charts and listings. Operational and support elements also have managerial personnel within their elements. However, it is not necessary to define these costs separately since they are already included with the most appropriate organizational element.

(2) Support centers: Support elements perform important services that benefit the entire operation but do not contribute directly to the output. The larger the organization, the more likely these elements will be large and diverse to support internal requirements. These functions are important to the smooth internal operation and consist of elements such as: payroll, accounting, automatic data processing, and maintenance. Costs for these internal requirements must be redistributed to the operational elements that they support. If an element is both support and operational, then it will be necessary to separate the service portion for distribution to the operational elements.

(3) Operational: The operational elements are those which do the work of the organization and contribute directly to the output. These elements are usually referred to as the first-line or production units. Normally, these will be the lowest level of division on the organization chart. If lower organizational elements are combined because of the similar nature or by the preference of the project team, then it would be considered a single operational element, provided the mission it performs is relatively the same. However, in the service companies operational elements are generally not the lowest level of division on the organization chart.

According to Hicks, cost centers can be considered in four categories:

(1) service centers;
(2) operation support activities;
(3) administrative activities;
(4) operating activities;

Service centers serve other cost centers. Generally these cost centers' activities are not related directly with companies' main work, but they are needed to carry out this main work. In other words, they cannot be charged to customers directly. For example maintenance, quality improvement, and internal education. However, these examples can be changed according to the company's circumstances. If the quality improvement activity work for making quality improvement on products directly, it is considered to be an operating support or operating activity. However, if it is carried out for enabling operating activities to be made in quality standards and improves them, it is considered to be service center.

Operation support activities help operating activities directly such as purchasing, making transporting of products, customer consultancy i.e. in banking.

Separation of operating activities and support operating activities are generally difficult. The key is that operating activities are core activities to produce the product(s) (services of goods). In the other words, if these activities are not used in the production process, product(s) can not be generated. For example, the transporting products to customers is not an operating activity if this activity is not the main work of company. However, in the production sector, as it is not the main work it is a helping activity.

Administrative support activities include managerial activities which are interested in the whole company. For example, accounting, human resource, general management, marketing.

However, under different circumstances, examples can be changed . If the marketing activity works for only one product selling, it can be regarded as an operating support activity.

Operating activities are carried out to produce product(s). If they are not carried out the production process breaks down and so products are not produced. In production companies, examples for operating activities are assembly, cleaning, machining, welding. In service companies examples are opening a bank account, giving credit to a customer's import transaction, developing a program in the computer sector. As it is seen the scope of this kind of activities is wider in the service sector than the production sector.

3.3.2.3. Identify Major Elements of Cost. In Activity Based Costing (ABC) costs refer to indirect costs. Because direct costs can be assigned to products easily, there is need to use indirect costs to find accurate cost information of products.

Like identification of activities, all elements of costs should be identified to choose the relevant cost driver to distribute costs to activities. According to Department of Defense [10] the costs should be gathered and allocated within the organization at the lowest possible structural layer. This normally will be the smallest element that has an assigned manager, whether it is a team, unit, or branch. Where there are multiple teams or units with similar missions within a single branch or element, it is not necessary to differentiate, since the functions performed are more important than the organizational components.

Having all of the costs as the lowest level greatly facilitates translation from the organization to the activity model. If costs are at too high a level, it will be harder to subdivide costs by functions. Costs are usually allocated based on interviews with managers on the functions. Estimates become more reliable when managers are closer to the actual work [10].

Besides, some elements of costs are consumed by different activities although these costs seem similar. If they are considered together and they are distributed activities together with one cost driver, obtaining accuracy of activity cost becomes impossible. For example as saving cuts and meal costs are fringe benefits, they are thought of together and their total is distributed with one cost driver which is appropriate for only one cost element, therefore the cost of activities will not be accurate. Although the number of personnel is an appropriate driver for meal costs, labor dollar is more appropriate for saving cuts costs. So the level of cost elements is important to do an appropriate cost flow analysis.

The Defense Department argues that it is important to remember that throughout the activity accounting process the resultant cost of the activity model is not a "true" cost, rather it is a "representative" cost drawn from existing information. The translation process from the traditional accounting system into the activity allocation process tends to be less than a perfect system, and the transformed costs lose some of their form and content. ABC costs serve as a basis for comparison and fairly represent the best approximate cost that can be determined. The data is credible for comparative analysis though not totally suitable for absolute measurement.

There are two basic questions relating to timing of the data collection process that are constantly asked [10]:

(1) When can data collection begin?
(2) What length of time will be appropriate and sufficient for data collection?

First, the gathering of the actual organization costs can begin as soon as the scope of the activity model is determined. It is not required that the entire activity model be finished. Second, the time period is a little too complex for a simple answer. The best time-frame to look for an appropriate and sufficient amount of data is the first previous full fiscal year and, when possible, the two previous full fiscal years. The greater length of pertinent information enhances reliability and credibility.

Of course, because the accounting records are the major source of cost data, meaningful information is available throughout the organization.

The following is a list of possible cost elements of a company:

Salary and wage cost elements:

Salaries
Hourly wages
Overtime premium
Shift premium
Vacation pay
Holiday pay
Paid breaks

Fringe benefit cost elements:

Group health insurance
Retirement
Meal
Transportation of personnel

Specific Assignment costs:

Depreciation
Rental costs
Property taxes
Office supplies
Education
Travel

Salary and wage cost elements are the most significant variable expenses of the organization and also they can be easily traced. Besides after salaries and wages are determined, fringe benefits are calculated as a percentage of them. Since managers have to keep under control specific assignment costs like supplies or rental costs, these costs are traced but to separate them into sub elements is more difficult than the other cost groups.

3.3.2.4. Determine Relationships between Activities and Costs. When the analyzer does an interview, s/he must gather data for this step otherwise more time is required. S/he must ask people some questions when asking other steps' questions:

(1) What do you do in this department? (For the first and the second step of ABC)
(2) Which resources do you use when you do these activities? (For the third step)
(3) Do you utilize any other departments or activities directly? (For the fourth step)

Some resources are used by only one activity but some are used by a lot of activities. Therefore some measure of apportionment will be necessary. After determination of resource-activity relation, cost drivers should be selected according to their relation. In other words correlation between activity and resource should be found in this step.

The fundamental assumption of the two-stage allocation method is the absence of a strong direct link between the support activities and the products. ABC develops the idea of cost drivers that directly link the activities performed to the products manufactured. These cost drivers measure the average demand placed on each activity by the various products. Then activity costs are assigned to products in proportion to the demand that the products place on average on the activities.

3.3.2.5. Identify Cost Drivers to Assign Costs to Activities and Activities to Products.
Before identification of cost drivers (resource and activity drivers) for both cost distribution and activity distribution, the analyzer has information about which factors affects this cost's (resource) consumption or activity usage.

At step 2 cost centers are obtained to use the same driver for similar activities. So in choosing drivers cost centers can be taken into account for accuracy.

The most important concept in selection of drivers that the analyzer should pay attention to the distribution of the costs which have a high proportion in the total cost than the others.

In ABC systems, most common cost drivers are [28]:

(1) the labor group: labor dollars, labor hours, direct labor dollars, direct labor hours, headcount;
(2) the operating time group: cell time, line time, machine time, cycle time;
(3) the throughput group: pieces, gallons, tankerloads, truck-loads, tons;
(4) the occupancy group: square footage, equipment location, equipment valuation;

(5) demand;
(6) surrogate cost drivers.

Some of them may seem not relevant for service companies such as cell time, line time, but instead of them cycle time, and project time can be used. Generally the labor group is preferred by both service companies and manufacturers especially in distribution of fringe benefits. Labor dollars and labor hours often drive the personnel salary and worker's compensation insurance. Headcount drives health insurance, meal, transportation. In service organizations cost drivers generally relate to volume, value, quality, time and level of service [29].

The operating time group is the most appropriate cost driver for distribution of machine costs, material costs and operating supplies costs to related activities. For example, if there is a one to one relation between material usage and line time or cell time, they are relevant drivers for distribution of material usage.

The throughput group is the most appropriate cost driver when units of throughput are determined to be the primary cause of an activity's costs. For example if a cost difference occurs from packaging types the throughput group is the relevant driver.

The occupancy group is the most appropriate cost driver if fixed costs are based on physical location of activities or assets. For example square footage is used for distribution of building rent, building depreciation, and real property taxes.

Demand is the most appropriate cost driver when an activity's services are used by other activities or cost objectives. For example the quality control activity is used for the developing of production quality. However, in quality philosophy all activities must be carried out based on quality standards, so these activities demand a quality control activity for their work. According to their demand, the quality control activity cost is distributed to these activities.

Surrogate cost drivers are the most appropriate driver when the either cost driver is not very easy to measure or the activity is not material enough to warrant a unique cost (24). For example for distribution of material handling, general management, marketing, accounting, and human resource; this group is used as a driver.

Sometimes only one cost driver is enough for the distribution of resource cost, but sometimes more than one cost driver is needed to make the accurate distribution of resource cost into an activity. For example for distribution of personnel salary, the headcount is selected as a driver but if personnel salary varies from one activity to another more driver is needed to obtain an accurate result. The second driver can become the salary category which will be given weight. After multiplication of these two cost driver, the result is used as a cost driver which is called "multiple cost driver".

Cost driver examples to understand the choosing of an appropriate cost driver are as follows:

Table 3.3.5. Cost driver examples for cost distribution

Cost Elements	Cost Drivers
Transportation	Number of transportation usage of the activity
Salary, fringe benefits	Number of personnel, labor dollar
Electricity	kW/h
Building rent	Square footage

As a rule of thumb, the appropriate cost driver is the one that represents the primary output of the activity. In other words, a direct cause-and-effect relationship exists between changes in the cost driver and costs of the activity.

<u>3.3.2.6. Establish the Cost Flow Pattern.</u> A cost flow down diagram is used in establishing the cost flow pattern. For a cost flow diagram, the three cost categories and four cost center categories are set out as seven distinct levels [28]. Besides cost objectives, direct material, direct outside processing and customer may be included in this diagram.

This diagram provides the analyzer with a visual understanding of the cost-activity, activity-product relationships.

Under this method, there is a difficulty in deciding distribution priorities of cost centers. Because activities interact with each other, distribution simultaneously is difficult. Therefore, some priority must be decided otherwise circular calculations would go on forever (10).

The following hierarchical rules were decided upon and will be applied to this distribution:

(1) The support functions which only support other support functions will be divided first, using rules 2 and 3.

(2) Use the function first that interfaces the greatest number of elements. Those support elements which have impact on the largest number of elements need to be divided first or some portion of the distribution might be lost.

(3) If the number of interfaces is the same, use the highest dollar value. Using the highest dollar amounts reduces the possible deviation that could occur by using a different order.

After the drawing cost flow diagram the flow down of indirect costs can begin. Figure 3.3.2.6.1 shows the flow down of the costs.

Level I Salaries and Wages: Firstly salaries and wages relations with another levels are determined. When an employee is paid for not working such things as holidays, illnesses, his or her gross pay becomes a fringe benefit. As a result, this level flows down to level II.

As there is no relation between level I and level III, level I costs do not flow down to level III. Because there are employees in the cost centers which are level IV through VII, salaries and wages flow down to them. If an employee is paid for cost objective activities, as these salaries and wages are considered to be direct cost, they flow down to cost objectives directly.

Level II Fringe Benefits: Like salaries and wages this cost is related to employees. Therefore level II's flow down to other levels is the same with level I.

Level III Specific Assignment Costs: They are flow down directly to level IV through VII. As these costs are not direct cost they are not charged to cost objectives directly.

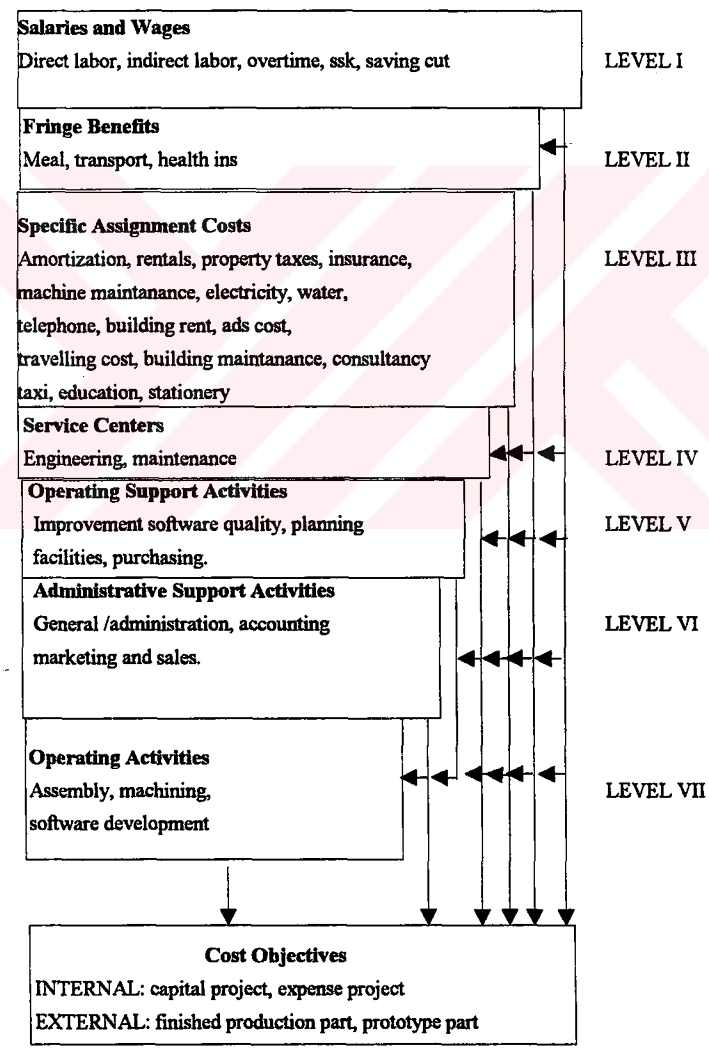

FIGURE 3.3.1. Cost flow diagram

Level IV Service Centers: Service center's costs are charged to cost centers which demand their services. By the definition of service centers they can be demanded by another service center. This situation can cause a problem, because to be able to calculate costs service centers must be ordered (categorized). Therefore different combinations are made in obtaining hierarchy between them to distribute one service cost to another. Of course some methods can be used to find a more optimum hierarchy between them.

Level V Operation Support Activities: The nature of the cost centers at level V are such that its costs can flow to only one level, the level VII operating activities. Level V cost centers support Level VII activities, so the costs should flow down to those activities.

Level VI Administrative Support Activities: In some instances, it may be preferable to flow down administrative support activities to the Level VII operating activities where they can flow down to the cost objective in the operating activity's indirect costing rates. In some instances, the decision is made to treat this level of costs as a traditional General/Administration charge made directly to the cost objective.

Level VII Operating Activities: Operating activity costs have only one place to go. By definition, operating activities work for producing the products. Therefore their costs flow down to the cost objective.

3.3.2.7. Select the Appropriate Tools/Plan the Cost Accumulation Model/Gather the Necessary Data. After developing a cost flow pattern, the system designer must reach into a "bag of tools" to select and assemble the suitable mechanics for implementing that pattern in an activity based system. This selection process represents the seventh step in establishing an ABC system [28].

Analyzer can use different cost drivers in distribution of the costs to activities or products, but the company's cost system can limit analyzer to choose driver s/he wants to use. For example analyzer thinks that the number of proposals given to customers is the relevant cost driver for distributing the marketing activity to the products, but if the company does not save or record the proposals to its database, this cost driver can not be used. Analyzer can use surrogate cost drivers which are practical and readily available measures that are used to distribute costs to cost centers or cost objectives when it is impractical to collect and maintain data relative to the most theoretically correct cost driver. There are a lot of surrogate drivers such as conversion costs, consumption units, labor-based cost distribution, demand-based cost distribution. For example consumption units cost driver is used when one cost driver can not be enough in carrying out accurate cost distribution. Although headcount is an appropriate cost driver for distributing office supplies, it does not explain the question "How much more consumption". Consumption units cost driver is calculated by multiplying headcount with a driver multiplier which explain the previous question.

After analyzer selects the tools for implementing ABC, s/he can start to plan the cost accumulation model. At this point, determining the order of operating support activities costs distribution to other activities has essential role to obtain accurate cost information.

In gathering the information necessary to drive the cost accumulation model, the system designer must continue to keep in mind that goal is accuracy, not precision. To this point, the process has involved concepts, not statistical data. On the other hand, advantage should be taken of any good historical data that are available. Where none are available, however, interviews and estimates by appropriate and knowledgeable employees are effective substitutes for levels I, II, III, IV, V, VI, VII, and VIII which need data for establish the ABC.

3.3.2.8. Establish the Cost Accumulation Model. After necessary data collected, analyzer is able to establish cost accumulation model. At this step, all major costs are distributed to activities and then accumulated activities' costs are distributed to the products by utilizing from other steps mentioned in previous pages. To obtain accurate cost, analyzer must be carefully in implementation of which service department's cost will be allocating the first and which one will be the second. Because changes in order determined at the sixth step change the products costs.

3.4. Its Applicability to Service Organizations

Although, examples of ABC in articles generally are related to manufacturing, ABC can use in service sectors, because, all improvements mentioned above also have impact on service companies. Like manufacturing companies they also need accurate cost information to survive in a savage competitive environment. Moreover, service companies have not only direct labors, but also technological investments and supportive departments whose costs are regarded as overheads. Therefore, the need of activity based costing implementations in service companies are the same as the need of manufacturing companies.

In implementation of ABC, some characteristics of service organizations makes costing more difficult [26]:

(1) output is often hard to define;
(2) activity in response to service requests may be less predictable;
(3) joint capacity cost represents a high proportion of total cost and is difficult to link to output-related activities.

However, product and services are created through the complex range of activities of staff within the service organizations. Moreover, departments rarely support only one product or service, and conventional costing finds it difficult to analyze the activities within a department and consider the factors that drive the costs [29]. Also, as there are more competition than manufacturing markets, prices of its products generally are determined by the competition. Therefore determination of accurate costs, and profitable products, reducing high costs are essential.

The same principles of the ABC can be used to develop relevant cost systems for insurance companies, banks, sports teams, restaurants, car dealerships, consulting firms, leasing companies, public utilities, medical clinics, software companies [28]. However, activity-based costing has been applied to the service sectors only since the early 1980s [29].

The ABC process has a disciplined approach which is applied as rigorously as the situation allows, but still has flexibility for a certain amount of creativity in the final use and evaluation [10].

4. AN IMPLEMENTATION OF ACTIVITY BASED COSTING METHOD IN THE SERVICE COMPANY

An implementation was carried out in a service sector to see whether ABC methodology can be implemented to service products such as manufacturing products. In this survey products are services in the software area.

Before implementation of the activity based costing method, the current costing system must be analyzed to understand what is being done in the organization and in its departments. Then, after making every element of cost structure clear, reengineering works can be carried out using data obtained by ABC implementation. Therefore all activities and the departments in the organization which enable the services to be produced should be analyzed in order to implement ABC to the organization.

Two methods which were mentioned in the methodology part will be explain by their practices in the "X" organization. In the survey, data belonging to the 1996 and 1997 fiscal years were used from "X" company whose main subject is software programming. As there was no database at the beginning of the analysis showing the current cost structure of the company all data were collected through interviews with personnel and the finance manager. Of course, accountants of X company knew total costs, but knew neither the departments' resource consumption nor activities' resource consumption when the activity analysis was started.

X organization has five kinds of services. They are:

(1) software development for banks;
(2) giving system support to the specific bank (which will be called Y bank);
(3) giving industrial consultancy to the specific industrial company (which will be called Z company);
(4) giving support and maintenance to the banks and

(5) giving education to the banks' users.

Its main product is developing software programs for six banks which are its permanent customers. Except for the industrial consultancy service, the company earned income from the four services mentioned above in the 1996 fiscal year. The company started to obtain income from its industrial consultancy product in 1997. It also has a "banking software package" which was developed by the company's personnel seven years ago. This package which will be called Q software package, includes nearly all banking works such as treasury, share, credit and debit transactions, so if the company sells usage right of the whole package to a new customer it earns income. After the sale, the company gives support and maintenance service for conversion of the bank's data from the old structure to the new structure. If it is necessary, the conversion team makes some developments on the Q package to adapt the new bank to the Q software package environment. Therefore the Q software package is the main product of the company. This service cost is not charged to the new bank, because this cost is met by the Q software package income.

If users of the Q package, banks, want to add new facilities to the software, the company demands fee according to the facilities' costs which are calculated by using "human days" needed to develop the software program. There are project teams in the organization which develop software programs demanded by customers. As the Q software package was developed on the mainframe, new demands are generally related to the mainframe software. Some software are developed on PC with PC software such as Visual Basic which is supported with Windows software programs.

Although the one aim in developing software programs is to prevent the production of poor quality products, programs may include "bugs" which refer to the problems in usage of the programs. To prevent the time loss of the project teams by giving maintenance to a poor quality product, there is another team which is called "support and maintenance". This team solves the problem as soon as possible after its occurrence. For the support and maintenance service, banks pay fee to the company every year.

Only Y bank pays fee every month to the company for its system support service. The system support service includes mainly installation of PCs in opening branches of the bank and arranging the Y bank's operational works at night.

There is no strong competition for the X company, but to be able to work with the customers as their software department, the company must determine product costs accurately, otherwise, its customers can establish their own software departments and develop their demands with their own personnel.

To explain how the software package "Q" is used, and the relations between modules, there is a team to give education to the banks' users. Because banking works are complex and very important, users must know what he/she will do under certain circumstances. There is also education related to usage of Microsoft utilities efficiently. The banks pay according to the course duration. The education department manager must calculate one day education cost by considering education resources and price it according to the market position.

The industrial consultancy group serves the specific company (Z company) about installation of a new package program to its company. As the package is bought from a foreign software company, learning the structure of programs needs time. Since searching and learning was not completed in the 1996 fiscal year, no fee was charged to the Z company. So there was no income from this service in 1996, but there was in 1997.

Y bank is the basic bank customer of the company. This bank pays fee to the company every month. The total fee is paid for receiving system support, software programs and support and maintenance services in 1996. However, X company started to sign proposals with Y bank for each of the software development project in 1997.

The following table will make clear that mentioned above:

Table 4.1. Income Resources of the Company

Products of the company	**Income resources of the products**
Giving system support to the Y bank	The Y bank pays fee every month
Developing software programs	The Y bank pays fee every month + other banks pay fee for the projects
Giving support and maintenance to the banks	The Y bank and other banks pay fee every year
Giving education to users	All the banks pay fee after taking courses
Giving industrial support to the Z company	The Z company has started to pay fee since 1997
Giving conversion support to the banks	New banks pay fee at each sale.

There were 105 people in 1996, and 106 people in 1997 in the organization. X company has different project teams to meet different bank's software development demands. There are two through eight people in the project teams. They are grouped according to the bank's demand. For example, one project team is interested in banking credits, another one is interested in export transactions. These teams are financial works, financial control, institutional banking, cash management, individual banking, ATM which is interested in withdrawing fee from fee machines, ATM operation, Internet, two conversion teams, investment banking, share, and centrops which are under the project development assistant general manager in 1996. In 1997 these teams are current works, financial control, institutional banking, cash management, individual banking, ATM, ATM operation, Internet, one conversion team, investment banking, and centrops. Each team consist of business analysts and software engineers (or programmers). A quarter of a project team consists of business analysts, the others are software programmers or engineers. The project teams use a discipline which is called "Solution Development Discipline (SDD)" when developing a software program. According to SDD after approval of the demand of the customer, business analysts make an analysis to learn the customer's demand and prepare some documents which explain the new software program or modifications in the current software program and which give the software engineer a direction when developing the software demand of the customer. Engineers use the same development environment, but if the project requires extra fields and/or files, engineers take help from PDA. After the software programmers complete the coding and testing of programs the business analysts make tests to establish whether the program matches the customers demand or not and to prevent any problem which might occur in the production environment. The project teams are also responsible to prepare SDD documents especially for the "Support and Maintenance" team. Whenever a problem (bug) occurs in the program after it has started to run in the production environment, the Help Desk team registers it to database and sends it to the Support and Maintenance team to solve it. All problems coming from banks' users are dispatched to the related groups by Help Desk. Some people in Support and Maintenance carry out small demands which do not require more than ten human days. This group is called the "Joker team". It can be said that one quarter of the "Support and Maintenance" team's time is spent as the "Joker team". However there was no Joker team in 1997.

There are also some departments for survival of the company. The accounting department and finance manager carry out classic accounting work. The customer relationship manager tries to establish good relations with the customers and to sell new projects to banks. The human resource departments also carries similar work with other companies' human resource department such as preparation of salary sheets, and arranging meetings with new candidates for the company's work . As can be seen from the organization chart, these are under the general manager.

There is a system department which includes PDA, DBA (big systems), PC and Network team, and an operators team for Y bank and for the company. One assistant general manager manages only this system group. PDA helps project teams about defining fields and transferring programs to the necessary environment. DBA which can be seen at the big systems department on the organization chart, helps project teams on where they will store data in the file and in creating new database if necessary. So PDA and DBA serve for only the project teams. The network and PC team is interested in solving PC and network problems, loading NT and software packages to PCs, and installation of new devices in the Y bank. Operators for the company carry out taking back up of files and programs, back up and restore demands of software engineers, controlling of the relationship between the host and users, sending of programs to other banks, and printing of reports according to demands of the project teams. Operators for Y bank work at night for the end of day work of Y bank. When batch programs are running they track the work to see they are running correctly. Moreover they arrange printed reports to send them to "Y" banks' branches.

The industry team works for one specific company (Z). They give it consultancy advice to implement a new package program to its finance department. They try to determine if the program's specifications match the minimum required list aspects which are determined by the Z company.

The education team gives education to the bank's users about the company's programs for use in banking transactions and also Microsoft utilities.

The business Innovation team does such work as:

(1) creating and improving of project process standards;
(2) improving of education questionnaire;
(3) forming of bonus systems;
(4) creating of basic standard documents for project teams according to SDD.

The documentation team consists of one person who writes the user handbook for the Q software package and checks the new user handbooks written by project teams. Business Innovation and documentation groups are under an assistant general manager who manages only these groups.

80 of the people in 1996 and 81 of the people in 1997 at the company worked in the operation departments. The remainder worked in the managerial or supportive departments.

Table 4.2. Personnel usage for each product's production

	Number of Personnel	
Products of The Company	**1996**	**1997**
System support for Y bank	20	37
Software development	42	27.5
Giving education to users	2	2
Software support for industrial companies	3	4
Support & maintenance	6	7
Conversion of "Q software package"	7	3.5

4.1. Steps of the First Activity Based Costing Method

4.1.1. Activity Identification

Since the first aim before implementation of ABC is to understand the organization, all kinds of activities (important or not) were in focus. Firstly activities of a large quantity were determined. However, as activity based costing approach is interested in activities which were tracked easily in terms of consuming resources, after identification of all activities, some of them were eliminated or grouped.

Activities were in the following form after interviews with personnel. A more detailed understanding of activities there is also their definitions at the table 4.1.1

Table 4.1.1. Activities of the departments and their definitions

ACTIVITIES	Departments	ACTIVITY DEFINITIONS
General accounting/Finance	Finance	Registration of costs to database, arranging fiscal policies of the company
General management	General Management	Managing the company, determination of the company's strategies, leading personnel
Selecting best appropriate personnel	Human resource	Human/resource department selects personnel who can work in the company environment in harmony.
Marketing & sales	Customer relationship	Creating good relations with customers, preparation of proposals to customers for new products
Controlling office works	Office management	Giving purchasing orders for paper, tea , sugar, toilet paper, controlling office cleaning.
Improvement software quality	Business Innovation group	Determination of quality standards for products and providing of their implementation by project teams
Loading of programs into cassette	Operation group for the company	PDA loads programs from one database to another database when it is necessary, also loads programs into the cassette when programs are sent to customer's production/test environment.
Defining of fields	PDA	When programmers need a new field in the file for software development, PDA defines it.
Solving system problems	PC and Network	PC & Network group solves problems especially related to the mainframe
Establishment of PCs	PC and Network	PC & Network group
Back up- recovery works	Operation group for company	Operation groups at the company and at the Y bank take back-

		up of the files and refresh files when it is necessary
Printing reports	Operation for Y bank	Batch programs run every night to update Y bank's customers data and some programs generate reports. Operators print them
Creating database	DBA/big systems	DBA creates new database when it is necessary
Support for UNIX & Adabas problems in conversion	DBA/big systems	DBA gives help to conversion groups when any problem occurs
Solving software bugs	Support and Maintenance	Support & Maintenance group solves software bugs and improves programs
Solving & registering user problems	Help Desk	Help Desk solves banks' user problems and if it cannot solve them it dispatches the problems to appropriate team.
Preparing statistical reports	Help Desk	Help Desk prepares statistical reports for management about user problems situation.
Preparation of user documents	Documentation	After teams develop programs, business analysts prepare documents for banks' users to explain to them what they do with these programs.
Meeting little soft. demand	Joker	Support & Maintenance team also develops software programs which do not require more than ten human days
Making analysis	Project teams/Business analyst	Business analysts have interviews with customers to determine customer demands from new software programs and then prepare documents to make clear program specifications.
Coding software programs	Project teams/Computer Eng.	Programmers determine adding new fields to any file in order to develop software
Testing	Project teams/Business analyst	Programmers develop software programs according to business analysts' documents.
Establishing database	Project teams	After finishing the development of programs, business analysts and programmers do tests to determine appropriateness of programs in terms of customer expectations.
Research	Project teams	Some projects require research from books, magazines if it makes high technical knowledge necessary
Making hardware & software analysis	Project teams	Again some projects need hardware and software analysis of the customer
Making upload & download works	Operators for the company	If a project needs data from a different database environment, project teams upload or download data to company's database environment
Establishing of hardware	PC and Network	If a new project for Y bank requires new hardware, project teams help establishment of hardware
Writing conversion programs	Conversion teams	Conversion teams develop new programs to transport the bank's data to "Q" package environment.
Making modification in "Q" package program	Conversion teams	According to customer needs, conversion teams make modifications in "Q" package program
Giving education to banks' users	Education group	Education team gives education about "Q" package program and Microsoft (MS) utilities
Reviewing software for the industrial company	Industry group	Industry team reviews a package program which is bought from a software company to adapt it to "Z" Company

Unlike the second ABC method, this method does not mention about organizing activities by cost center. However, after activity identification, as organizing the activities by cost center makes easy the implementation of the distribution steps, they were organized as the second step of the second method.

4.1.2. Activity Costing

After identification of the activities by interviewing with personnel, Table 4.1.2 was found to show which activity creates which costs:

Table 4.1.2. Cost distribution of the activities

Cost	Activities
Personnel salary, meal, SSK, saving cuts, health insurance, telephone	All the activities
Depreciation	30 per cent of it used by all cost centers, other part distributions will be explained.
Overtime	All the activities except for office management, and general management
IBM rent	All the activities
Building rent, building maintenance	All the activities except for system activities
Others	All the activities
Education	BIG, creating database, support & maintenance, financial control, financial works, institutional bank, individual b. (1), Internet, centrops, cash management.
Traveling cost, guest cost, and management committee honorarium	General management
IBM maintenance, machine rent	Operating support activities except improvement software quality, problem identification and PC support activities, all software development activities on mainframe, system activities and education
Taxi	All the activities except for improvement software quality, general management, individual banking (1 and 2) and Investment banking
Transport	All the activities except for general management, marketing & sales, defining fields.
Cleaning & security	All the activities except for system activities for Y company
Stationery	General accounting, training and project teams
Electricity/water/heating	All the activities except for system activities for Y company
Consultancy cost	General accounting and improvement software quality
Ads cost	Marketing & sales

According to the types of the activities cost drivers were chosen to distribute costs into activities. Table 4.1.3 shows the cost driver of the activities.

Personnel salary, overtime, SSK, saving cuts, meals, transport, health insurance and telephone distribution to activities were carried out using the number of personnel used in the related activity. The salaries of personnel were grouped in four categories:

(1) inexperienced person in the first category;
(2) experienced person in the second category;
(3) managers in the third category;
(4) general manager and his assistants in the fourth category.

These salary categories were used for distribution of personnel salary, overtime, and saving cuts because these costs change according to the salary level of each personnel. In the calculation of the salary multiplier, firstly the number of personnel in each salary category and salary category weight were multiplied and then these were added for each activity. For example: there are four people in the improvement software quality activity. As one of them is assistant general manager, he belongs to the fourth category. As other three personnel are experienced people, they are in the second category. So, the salary multiplier is 10.

Table 4.1.3. Costs drivers for the activities

COST ELEMENTS	DRIVERS
Personnel salary, saving cuts	Number of personnel weighted with salary category
Overtime	Overtime hour per person weighted with salary category
Meal, transport, health insurance, SSK	Number of personnel
Taxi	Taxi payment per personnel
Cleaning & security	Square footage
IBM maintenance	Number of personnel
IBM rent	Number of personnel
Machine maintenance	Number of personnel
Electricity	kW/h per person
Water/heating	Number of personnel
Stationery, telephone	Number of personnel
Training	Training day per person
Building rent, building maintenance	Square footage
Management committee honorarium	No driver (assigned to general management)
Depreciation	Number of personnel
Ads cost	No driver (assigned to marketing & sales)
Traveling & guest cost	No driver (assigned to general management)
Consultancy cost	No driver (assigned to improvement of software quality and general accounting)
Others	Number of activities

The salary multiplier, the number of personnel, overtime and weighted overtime hours, average taxi costs per month have the following values for each activity:

Table 4.1.4. Number of personnel and salary multiplier distribution to the activities, overtime and weighted overtime hours, and taxi costs per month of the activities in 1996

Activities	Number of Personnel	Salary Multiplier	Average overtime hour in a month	Overtime hour weighted with salary multiplier	Average taxi cost per month
General Administration					
General accounting/Finance	3	3	30	30	35
General management	4	16	0	0	50
Human Resource	1	1	18	18	3
Marketing & sales	1	3	37.5	112.5	12
Facilities					
Office management	1	1	0	0	2
Operating Support Activities					
Improvement software quality	4	1	80	200	0
Defining fields, DDMs	1	2	60	60	3.6
Creating database	3	3	90	90	17
PC support	1	1	45	45	3
Performing operation works	2	2	168	168	25
Support for software	8	13	210	341.25	2
Problem identification	2	2	60	60	20
System Groups					
PC and Network support	13	15	420	484.6	60
Performing operation works	7	8	588	588	80
Project groups					
Financial control	4	5	20	25	0
Financial works	3	3	60	60	2
Institutional banking	4	6	65	85	1
Cash management	5	5	70	70	6
Individual banking (1)	1	1	18	18	0
Individual banking (2)	3	4	25	25	0
ATM	3	3	45	45	6
ATM operation	2	4	20	20	3
Internet	2	2	23	23	6
Conversion team (1)	3	5	212.5	425	20
Investment banking	4	4	150	150	0
Share	3	3	60	60	2.5
Centrops	8	11	30	41.3	3
Conversion team (2)	3,5	6	297.5	510	20
Education	2	4	45	90	12
Industry	3	5	126	210	2
TOTAL	105	151	2232	4074.65	396.1

Table 4.1.5. Number of personnel and salary multiplier distribution to the activities, overtime and taxi cost distribution of the activities in 1997

Activities	Number of Personnel	Salary Multiplier	Overtime Costs	Taxi Cost
General Administration				
General accounting/Finance	3	3	671.8	644.6
General management	4	16	0.0	629.3
Human Resource	2	2	22.4	81.4
Marketing & sales	3	3	940.5	241.7
Facilities				
Office management	1	1	268.7	0
Operating Support Activities				
Improvement software quality	2	3	845.1	99.1
Defining fields, DDMs	1	2	1267.7	93.2
Creating database	3	3	633.8	44.,0
PC support	1	1	2366.3	77.7
Performing operation works	2	2	2687.1	647.1
Support for software	7	12	470.2	127,3
Problem identification	3	3	6825.6	63.7
System Groups				
PC and Network support	28	38	8282.0	1570.1
Performing operation works	9	12	8282	2070.7
Project groups				
Financial control	2	3	108.5	17.7
Current works	2	5	108.5	31.3
Institutional banking	2,5	5,5	369.0	112.8
Cash management	4	4	303.9	94.0
Individual banking	2	2	108.5	0.0
ATM	3	3	195.4	94.0
ATM operation	4	5	3537.9	50.0
Internet	2	2	99.9	94.0
Conversion team	3.5	4.5	1845.1	541.8
Investment banking	4	4	1592.0	0.0
Centrops	2	3	106.1	35.0
Education	2	4	179.1	103.9
Industry	4	6	671.8	96.7
TOTAL	**105**	**154**	**34507**	**8057**

Overtime costs change from one activity to another according to the emergency level of carrying out activities. Cost driver for overtime cost was weighted overtime hours in 1996. As the general accounting department tracked the overtime consumption of each group in 1997, finding the cost driver for overtime cost was not necessary in 1997.

As gross salaries of all personnel are higher than the SSK limit and the SSK cost is a fixed cost, it was distributed across the activities according to the number of personnel.

Taxi costs were distributed across activities according to the taxi payment per person as seen in table 4.1.4.System group activities have a higher taxi consumption (35.3 per cent of total taxi cost) than the others. Because the system group activities require to go to the branches of banks and their working hours are different from standard working hours, their taxi usage is higher.

Like overtime costs distribution, taxi costs distribution which is seen from the table 4.1.5 was given from the general accounting department in 1997.

Cleaning & security, building rent and building maintenance were distributed according to the square footage cost driver.

Square footage distribution is in table 4.1.6 As it can be seen from this, general management uses the major part of building, because general management rooms are very large. Additionally the education activity utilizes the education room more frequently than the other groups.

In 1996, training was distributed to the activities according to how many days the team attended to the training course in 1996, because training costs of the activities were not known. Each course duration was weighted with the course's cost, as there is no information about training distribution to the activities in the organization. As seen from table 4.1.6, BIG's training cost is higher than the others, because they attended many training sessions to learn the SDD methodology mentioned before. Afterwards, this group gave lectures to other groups about SDD. However, in 1997 as accounting and finance department tracked the training costs of the activities, the training cost was given by this department.

Table 4.1.6. Building square distribution of activities, annual training day in 1996 and annual training costs in 1997 of the activities

Activities	Building square (unit) in 1996	Building square (unit) in 1997	Annual training day in 1996	Annual training cost in 1997
General Administration				
General accounting/Finance	7.65	7.65	0	121.3
General management	23	23	0	219.7
Human Resource	4	4	0	629.8
Marketing & sales	1	3	0	677.4
Facilities				
Office management	1	1	0	0
Operating Support Activities				
Improvement software quality	6.85	4.85	31	378.2
Defining fields, DDMs	1.33	1.33	0	0
Creating database	3	3	16	1173.6
PC support	1	1	0	0
Performing operation works	2.66	2.66	0	0
Support for software	9	9	5.5	226.9
Problem identification	2.4	3.6	0	0
System Groups				
PC and Network support	0	0	0	1316.4
Performing operation works	0	0		0
Project groups			0	0
Financial control	4	2	0	0
Financial works (its name was Current works in 1997)	3	3	2.5	0
Institutional banking	4	4	2.5	0
Cash management	7	5	3	130.4
Individual banking (1)	1.3	-	5.5	-
Individual banking (2)	2.6	2.6	3	122.6
ATM	3	3	0	130.4
ATM operation	2	4	0	652.0
Internet	2	2	30	0
Conversion team (1)	3.5	3.5	0	0
Investment banking	4	4	0	195.6
Share	3	-	0	-
Centrops	9	9	2.5	2.5
Conversion team (2)	3	-	0	-
Education	10.4	19	0	287.5
Industry	4	4	0	258.2
			100	6519.8

Water/heating cost was distributed according to the number of personnel. Electricity was consumed for four aims: lighting, running PCs, running mainframe and cleaning. Their electricity consumption differs in terms of kW/h. Since system groups' activities which are PC & network support and arranging the operations carried out at the Y bank's building, these activities do not consume electricity for cleaning, running PC and lighting. However mainframe electricity cost was assigned to them. Except for the system groups, the number of personnel is 85. Generally personnel work eight hours per day. Mainframe runs eighteen hours per day. The cleaning activity is carried out using a vacuum cleaner one hour per a day. As it is seen from table 4.1.7, electricity consumption for cleaning is negligible. All personnel use electricity for lighting and running PC except for the system group which works at Y bank. Therefore these electricity costs were assigned to activities using the number of personnel cost driver. However, since all activities do not use the mainframe, this electricity cost was assigned to the project groups, the system groups and the education team. As the education team uses the mainframe 50 per cent of its working time, the mainframe electricity cost was assigned by using this percentage.

Except for the system activities for Y bank in 1996, other activities' average overtime hours per day (in total) was 61.2 hours and the number of personnel was 85. Table 4.1.7 shows that the mainframe electricity consumption equals total PC and light electricity consumption. Therefore 50 per cent of the electricity cost was distributed to activities by using their working time including their overtime consumption, 50 per cent of the electricity cost was distributed to activities which utilize the mainframe by using the number of personnel.

Table 4.1.7. Electricity consumption of the machines in 1996 and in 1997

Electricity objects	kW/h (1)	Working hour per day (2)	kW per a day in 1996 1*2	Working hour per day (3)	kW per a day in 1997 1*3
PC	0.07	8*85+61.2	51.88	8*69+34	41.02
Mainframe	6.60	16.00	105.6	16.00	105.6
Cleaning	1.40	1	1.4	1	1.4
Light	0.07	8*85+61.2	51.88	8*69+34	41.02

Table 4.1.7 shows electricity consumption of the machines in 1997. Except for the system activities for Y bank in 1997, activities' average overtime hours per day (in total) was 34 hours and the number of personnel was 69. As it can be seen from table 4.1.7, the mainframe electricity consumption was more than the total PC and light electricity consumption in 1997. The mainframe electricity consumption was 56 percent of the total electricity cost. Therefore 44 per cent of electricity cost was distributed to activities by using their working time including their overtime consumption, 56 per cent of the electricity cost was distributed to the activities which utilize the mainframe by using the number of personnel.

Because there is a standard procedure which the project teams must carry out while software is being developed, they write their projects using a lot of paper and other stationery. The accounting activity and the education activity also need a lot of writing material. Since the majority of the stationery cost is consumed by software development activities, education activity and general accounting and finance activity, this cost was distributed according to the number of personnel in these activities.

As management committee honorarium costs and ads costs are independent costs, they are not affected by any variable. No activity uses these costs directly. Therefore they were not distributed to all activities. Management committee honorarium costs were charged to the management activity and ads costs were charged to the marketing and sales activity. Since traveling and guest costs belong to the management activity, they are charged to it.

In 1996, 20 per cent of consultancy cost belonged to the improvement software quality activity, the remaining part belongs to general accounting and finance activity. In 1997 percentages were vice versa.

Machine rent and IBM Maintenance costs were distributed to activities according to the number of personnel in each activity which used the mainframe. The education group used the mainframe only half much as the project groups. Although there are four personnel in the institutional banking activity, one of them is related to PC software development and another one is the manager who does not use the mainframe. Therefore two personnel were used in the distribution. Like institutional banking activity although there are three personnel in the DBA activity one of them is assigned to PC software groups only. Therefore two personnel were used in the distribution of machine rent and IBM maintenance.

Since IBM rent includes MS utilities such as Microsoft project, Microsoft Word and generally each activity uses them equally, the driver for this cost is the number of personnel

Depreciation costs includes a very different element. In 1996, 30 per cent of depreciation includes office furniture, the remaining part includes especially software copyright, mainframe, ATM, As 400, alpha server which have high costs. As 400 machine's cost was not included in depreciation in 1997 and cost percentage for office furniture in depreciation was 18.

Table 4.1.8. Depreciation distribution in 1996 and in 1997

Depreciation elements	Cost (%) in 1996	Cost (%) in 1997
Mainframe	57	78
Software copyright	31	13
Alfa server	7	7
ATM	2	1
As 400	2	-

Office furniture costs were distributed to the activities by their number of personnel. As software copyright means payment to use software language while developing software programs, it was distributed to the software development activities by using the number of personnel. Since the mainframe usage is similar to software copyright, it was distributed in the same way. The ATM cost was charged to the ATM operation and the ATM group. Because Alfa server was used by only three people, it was charged to their activities equally: Institutional banking; Cash Management and Individual Banking (1). Since As 400 is used by the Cash Management group, this amount was charged to this group.

Appendix A (for 1996) and appendix C (for 1997) shows each activity cost after distribution of resources using cost drivers. Resource costs were distributed according to the first methodology previously mentioned. So all resource costs were distributed to the related activity by using their cost drivers without being categorized.

4.1.3. Cost Driver Selection

After cost driver selection for the distribution the costs to the activities, the cost drivers were selected to distribute the activities' costs to the products. The value of the cost drivers will be shown at the following step when explaining the distribution of the activity costs. Table 4.1.9 shows the cost drivers. As the projects groups and system groups work for only the specific products, there is no need to use any cost driver in their costs distribution to the products.

Table 4.1.9. The cost drivers for the activity's cost distribution to the products

Activities	**Drivers**
General Administration	
General accounting/Finance	Total taxi payment per product
General management	Number of personnel
Human Resource	Number of personnel
Marketing & sales	Number of proposals
Facilities	
Office management	Number of personnel
Operating Support Activities	
Improvement software quality	Demand of products for this activity
Defining fields, DDMs	Demand of products for this activity
Creating database	Demand of products for this activity
PC support	Number of personnel
Performing operation works	Demand of products for this activity
Support for software	Demand of products for this activity
Problem identification	Number of problems
System Groups' activities	No driver
Project groups' activities	No driver
Education	No driver
Industry	No driver

4.1.4. Cost Driver Rate Application to Products

In this step products costs will be found by distributing the activity costs to the products utilizing from the cost drivers which were selected in the previous step. Firstly the products of the company were determined. These are as the following:

1. System support for Y bank
2. Developing software programs
a. Software programs on PC
b. Software programs on the mainframe
c. Conversion of "Q" package program package program
3. Giving education
a. Education for MS utilities
b. Education for "Q" package program
4. Software support for industrial company
5. Software support for "Q" package program

The personnel distribution of the cost centers which will use as a cost driver is as follows:

Table 4.1.10. Personnel distribution of the cost centers

Cost centers	Number of personnel in 1996	Number of personnel in 1997
System support for Y	20	37
Software development on PC	3	4.25
Software development on the mainframe	39	23.25
Giving education	2	2
Software support for industrial companies	3	4
Software support for "Q"	6	7
Conversion of "Q" package program	7	3.5
TOTAL	80	81

Table 4.1.11. Taxi payment per product

Products	Taxi payment per product in a month in 1996	Taxi cost per product in 1997
1. System support for Y bank	140	3241.80
2. Software development		
a. Software development on PC	0	399.88
b. Software development on the mainframe	29.50	71.15
c. Conversion of Q package program	40.00	482.39
3. Giving education	0	0
a. Education for MS utilities	6	46.27
b. Education for Q package	6	46.27
4. Software support for industrial companies	2	86.09
5. Software support for Q package	2	113.35
TOTAL	225.50	4487.20

The general accounting activity was carried out to register groups' taxi payment, machines purchased for the company and to give general manager information about total company costs. 60 per cent of the general accounting activity is related to the general manager. The remaining part of the activity which is related to the personnel was distributed to the products according to taxi payment per product as per table 4.1.11.

General management includes the General Manager and three Assistant General Managers. The General Manager is related to the all cost centers, one of the Assistant GM is related to only the project groups, one is related only to the system group, and the third is related to the software quality development department. So the total cost of the general management was divided by four. The first part was distributed to the software development product, the second part was distributed to the system support product, and the third part was added to the software quality development activity. The general manager costs were assigned to all products by using the number of the personnel cost driver.

Human resource and office management costs were distributed to all products by using the number of personnel.

Marketing and sales activity is carried out for the selling of the software programs only. This activity is related to only project teams' products. Demand percentages of project teams for the marketing activity which was formed from the number of proposals arranged for each product is like that:

Table 4.1.12 The demand percentages of the products for marketing activity

Products	% (in 1996)	% (in 1997)
Software programs on the mainframe	62	67
Conversion of "Q" package program	20	20
Software programs on PC	18	13

Distribution of improvement software quality (BIG) was carried out by using demand of products. Demand percentages of the products for software quality development activity is as follows:

Table 4.1.13. The demand percentages of the products for software quality activity

Products	% (in 1996)	% (in 1997)
Software programs on mainframe	55	40
System support for Y bank	25	35
Education for Q package	10	5
Software programs on PC	0	10
Software support for industrial companies	5	5
Software support for "Q" package program	5	5

Operation activity for the company is used from the three products. Unlike operation activity for Y bank, this activity is carried out for supporting company's activities. PDA activity and DBA (creating database) activity are also consumed by the three products with the following percentages:

Five per cent of "support for the "Q" package program" activity is carried out for "software programs on the PC" product. The remaining part belongs to the "software programs on the mainframe" product.

Table 4.1.14. The demand percentages of the products for the PDA, DBA and operation for the company activities

Products	Demand percentages of the products for the PDA activity (%)	Demand percentages of the products for the DBA activity (%)	Demand percentages of the products for the operation for the company activity (%)
Software programs on mainframe	63	65	70
Software programs on PC	0	30	18
Conversion of "Q" package program	17	0	0
Software support for "Q" package program	10	5	12

PC support activity is not consumed by the "system support for Y product" only, because if a problem occurs in any PC, the person gets help from PC support in which its place is at the company . This activity cost was distributed to other products according to the number of personnel.

Problem definition activity was distributed to the products according to the number of problems registered for each product in a month.

Table 4.1.15. The number of problems per products in a month

Products	Number of Problems in 1996	Number of Problems in 1997
System support for Y bank	327	272
Software support for "Q" package program	85	92
Conversion of "Q" package program	13	20
Software programs on mainframe	11	12
Software programs on PC	0	4

In 1996, 20 per cent of PC & network activity belonged to "software programs on the mainframe", the remainder belongs to the "system support for Y bank" product. This percentage was 15 in 1997.

The cost of arranging the operation for Y bank activity was distributed to "system support for Y bank" product.

The cost of arranging the operation for Y bank activity was distributed to "system support for Y bank" product.

One person from institutional banking, one person from cash management, Internet and individual banking (1) teams belonged to the "software program on PC" product in 1996. One person worked for both institutional banking and conversion works and people in Institutional banking spent half of their time for PC software development, one person from cash management team, and Internet belonged to the "software program on PC" product in 1997.

ATM, Internet, investment, share, joker, finance control, financial works, three people from institutional banking, four people from cash management, Individual banking (2) team belonged to the "software program on mainframe" in 1996.

Conversion works (1) and conversion works (2) activities carried out for the conversion of the "Q" package program product.

The education team consists of two people who give instructions about the Q package program and Microsoft utilities, and Internet . Therefore it can be said that there are two types of services of the education team. They are known as "giving Q software package education to banks' users (the first service)" and "giving Microsoft (MS) utilities education to banks' users (the second service). Two people who work in the education team spent 56 per cent of their time for preparing the Q software package instructions to the banks' users in 1996. This percentage was 75 in 1997. Other part of their time belonged to the "education for ms utilities". These percentages were obtained from the human day for each product in each year (in appendix A).

Appendix B and appendix D "distribution of the activity costs to the products in 1996/1997" show the results according to the first ABC method.

4.2. The Steps of the Second Activity-Based Costing Method

4.2.1. Identify and Define Relevant Activities

As mentioned in the methodology section, the second method differs from the first one in terms of the distribution of the resource costs to the activity and the activity costs to the products. So it can be said that except for distribution of costs, other steps of this method are the same as the first one. (determination of activities, activity cost relations and so on)

4.2.2. Organization Of The Activities By Cost Center

Although the 32 activities listed at the first step of the first ABC method differ from each other, they have been grouped and eliminated because of difficulty in determination of resource consumption at this level.

Administrative support activities:

(1) general management;
(2) general accounting/finance;
(3) human resources;
(4) office management (facilities);
(5) marketing and sales.

Operation support activities:

(1) defining fields;
(2) creating database;
(3) PC support;

(4) performing operation works;

(5) improvement software quality;

(6) problem identification;

Operating activities in 1996:

(1) support for software;

(2) joker;

(3) PC & network support;

(4) performing operation works;

(5) financial control;

(6) financial works;

(7) institutional banking;

(8) cash management;

(9) individual banking (1);

(10) individual banking (2);

(11) ATM;

(12) ATM operation;

(12) Internet;

(13) investment banking;

(14) share;

(15) centrops;

(16) conversion works (1);

(17) conversion works (2);

(18) education;

(19) industry.

Operating activities in 1997:

(1) support for software;

(1) PC & network support;

(3) performing operation works;

(4) financial control;

(5) current works;

(6) institutional banking;

(7) cash management;

(8) individual banking;

(9) ATM;

(10) ATM operation;

(11) Internet;

(12) investment banking;

(13) centrops;

(14) conversion works;

(15) education;

(16) industry.

There are 30 activities for 1996, 26 activities for 1997 and their names are different from the table 4.1.1.1. Because some kind of activities were in detail and some of them were considered to be similar in terms of their resource usage they were eliminated. For example test and software development activities consume the same resources. Besides, as in the organization there are software development teams and there is no relation between them, every team is regarded as one activity. However, there are some relations between some departments. The degree of relation will be determined at step five.

In the table in operating activities 5 through 15 for 1996 and 4 through 14 for 1997 represent the project teams. Project teams generally use the same resources, but they differ in environment usage when developing software programs. Generally they develop them on a mainframe, but some teams use PCs when developing codes. Individual banking (1), one person in Cash Management team, one person in Institutional Banking team, and Internet team develop software programs at PC environment using Visual Basic, they do not use a mainframe environment and Natural program, nor do they utilize PDA in 1996. One person in the Cash Management team, Internet team, and half of the Institutional Banking team work for the development software programs in PC environment in 1997.

4.2.3. Identification Of Major Elements Of Cost.

Costs are regarded as cause for resource consumption of activities. As seen from the cost table there were four major costs in 1996 which are personnel salaries (48.5 per cent), overtime (11.9 per cent), depreciation (8.9 per cent), and IBM rent (6.4 per cent). Their total is 75.7 per cent of total costs. In 1997 major cost elements were personnel salaries (47.5 per cent), depreciation (13.1 per cent), overtime (6.5 per cent), and IBM rent (5.4 per cent). As it can be seen, overtime cost decreased in 1997. As these costs are not consumed similarly by each activity, the ABC methodology will help to find out the resource consumption level of the activities and then the products.

After interviewing with finance manager, all costs of the company were determined:

Table 4.2.1. Costs of the resources in 1996

Cost Elements	Cost (million)	%
Personnel salary	123168	48.5
Overtime	30215	11.9
Depreciation	22651	8.9
IBM rent	16170	6.4
Building rent	10405	4.1
Others	6542	2.6
Training	6288	2.5
Meal	5899	2.3
Traveling cost	4530	1.8
SSK	4089	1.6
Saving cuts	3889	1.5
IBM maintenance	3772	1.5
Taxi	3149	1.2
Transport	3132	1.2
Health insurance	2186	0.9
Cleaning & security	1868	0.7
Stationery	1672	0.7
Machine rent	1446	0.6
Electricity/water/heating	1277	0.5
Telephone	846	0,3
Management committee honorarium	167	0.1
Consultancy cost	167	0.1
Guest cost	166	0.1
Ads cost	143	0.1
TOTAL	253885	100

Machine rent means "mainframe rent". IBM rent means operating system rent which includes MS utilities, Windows NT. IBM maintenance refers to maintenance of the mainframe.

Table 4.2.2. Costs of resources in 1997

Cost Elements	Cost (million)	%
Personnel salary	251782	47.5
Depreciation	69492	13.1
Overtime	34507	6.5
IBM rent	28624	5.4
Others	25867	4.9
Building rent	22581	4.3
IBM maintenance	9382	1.8
Telephone	9223	1.7
Meal	9117	1.7
SSK	9064	1.7
Taxi	8057	1.5
Saving cuts	7898	1.5
Transport	7156	1.4
Training	6520	1.2
Management committee honorarium	5672	1.1
Electricity/water/heating	5566	1.1
Health insurance	4241	0.8
Traveling & guest cost	4135	0.8
Stationery	3392	0.6
Cleaning & security	3286	0.6
Ads cost	3180	0.6
Consultancy cost	1325	0.3
TOTAL	530068	100

4.2.4. Determination of Relationships Between Activities And Costs

After interviews with personnel, the activity-cost relationship was concealed. Salaries, overtime payment, SSK, saving cuts and meals, health insurance, cleaning & security costs are consumed by each activity. Some activities consume taxis, others consume transport costs, it changes according to the necessity for a taxi to carry out the activity. Taxi costs can be used for two reasons which are to go to meetings with the customer and to go to the company in your own car. So if a member of the staff whose work needs a taxi frequently takes money from the company for fuel oil for his car, he does not consume transport costs. IBM rent is the operating system rent which includes MS utilities. IBM maintenance is maintenance of the mainframe which is essentially used by the software development teams. The machine rent cost is similar to IBM maintenance cost related to the mainframe.

Electricity/ water/heating is consumed by each activity except for the system group for Y bank. 45 per cent of this cost belonged to electricity, 20 per cent of it belonged to the water and the remaining part belonged to heating. Stationery is consumed essentially by the software development teams. The telephone is used by each activity. Education cost is consumed by the software development activities and system activities. Only system activities do not consume building rent, because system activities give support to Y bank and these activities are carried out at the bank. As management committee honorarium is a general cost, it was distributed to all activities. Depreciation comes in two parts, 30 percentage of it in 1996 and 18 percentage of it in 1997 were related to furniture, the remaining part was related to the mainframe, and software packages . The first part was charged to all the activities, but the second one charged to the software development teams and system group. Ads cost is related to all activities, but it is charged to marketing and sales activity. Travel costs and guest costs are consumed essentially by the management activity. The building maintenance cost is similar to the building rent which is not consumed by the system activities. Consultancy cost is in two categories which are financial consultancy and quality consultancy. In 1996, 20 per cent of the consultancy cost was charged to the quality development department (BIG) and other part belonged to the general accounting. Unlike 1996, 20 per cent of the consultancy cost was charged to general accounting and the remainder was charged to the quality development group in 1997. Because the company gave importance to quality in order to get the ISO 9000 document, it took help from a private consultancy company. Finally, there are many cost elements in others category. As they have different aspects from each other, they were assumed as homogeneous in the "others" category and they were charged to all the activities by using the number of personnel as a cost driver.

4.2.5. Identification Of Cost Drivers To Assign Costs To Activities

As the selection of the cost drivers for the distribution of the costs to the activities are the same with the first ABC method, all the explanation related to cost driver selection was written at the “activity costing” step of the first ABC method.

4.2.6. Establish the Cost Flow Pattern

As seen in figure 4.2.3, all resources and activities were grouped to implement the cost flow- down method.

By using this shape, appendix E and appendix F were formed. In the rows there are cost elements: Labor costs, specific assignment costs, administrating support activities, operating support activities. In the columns there are activities and cost centers. Activities seem different from the first method because they are grouped according to their similarity. System works include defining fields, creating database, PC support and performing operation works. As their distribution rates to the products are different, their rates are weighted with their activity costs. The rates are in the following form:

Table 4.2.3. “System works” activity costs rates which were used in distribution of them to the products

Products	Rates (%)
Software development on the mainframe	65
Software development on PC	19.4
Software support for Q software	8.5
Conversion of Q software	7.1

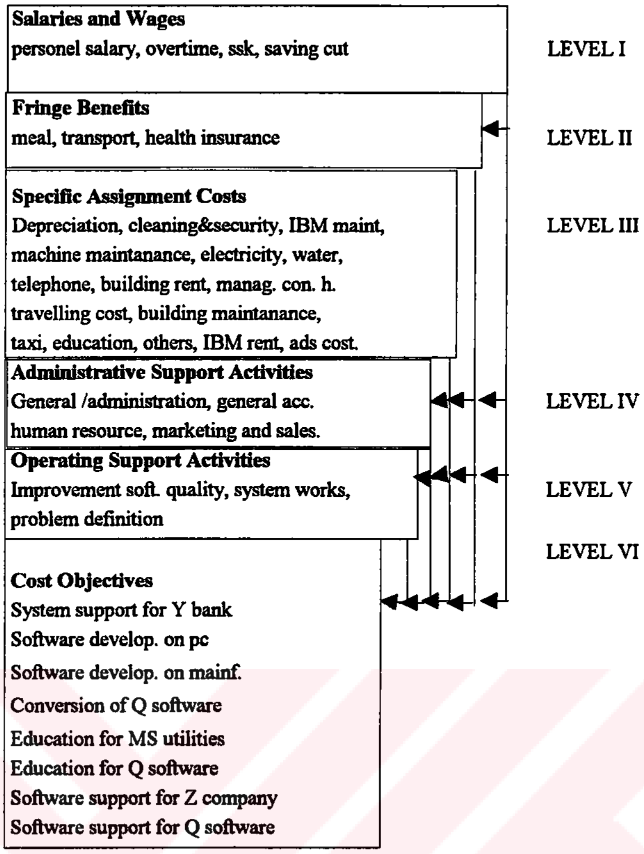

Figure 4.2.1 Cost flow down diagram for the X company

Another group with a different name is the system group. It consists of operation works for Y bank and PC and network groups. Although they are brought together, their differences in resource consumption were taken into consideration in their cost calculation. Labor and specific assignment costs were calculated by utilizing from the first ABC method's activity-resource table.

Education activity used in the first method was divided into two products and they were tracked individually in terms of cost distribution . As given in the first method, time consumption percentages were used in distribution. They were used in the distribution of the electricity, stationary, building rent, IBM rent, and taxi costs, because these costs are affected by the time consumption needed for each product. Depreciation cost consists of the mainframe depreciation and the furniture depreciation for the education activity. As the "education for ms utilities" products are not related to the mainframe, only furniture depreciation was distributed to it. 25.8 per cent belonged to the furniture depreciation in 1996, and this percentage was 41.8 in 1997. Other costs were distributed between them equally, because, other costs are not related directly to the education team's services.

4.2.7. Select the Appropriate Tools/Plan the Cost Accumulation Model/Gather the Necessary Data.

Firstly labor costs were distributed by using the "number of personnel" for each activity. After labor costs distribution, specific assignment costs were distributed. For specific assignment costs distribution the same drivers were used with the first method. At the end of the distribution of them, cost through specific assignment costs were calculated: total labor/fringes and all specific assignment costs were added.

In the book of Douglas T. Hicks [28], after specific assignment costs distribution operation support activities are distributed and then general administration costs are distributed. However, in the company X operation support activities consume administration activities but generally administration activities do not consume operation support activities. Therefore, after administration support activities distribution, operation support activities were distributed. Administration support activities values in the "costs through specific assignment costs" cells were used for distribution. At the end of the distribution, administration support costs are zero, because their costs were added into other costs by using the same drivers with the first method.

The last cost element operating support costs were distributed using the same drivers with the first method.

Personnel time consumption for "education for ms utilities" and "education for Q software" products is considered in the distribution of IBM rent, building rent, and electricity to these products.

4.2.8. Establish the Cost Accumulation Model.

After implementation of all the steps of the ABC method, appendix E (for 1996) and appendix F (for 1997) were built as a cost accumulation model.

5. THE RESULTS OF THE IMPLEMENTATION ACCORDING TO THE TWO ABC METHODS

As system group gives a service to Y bank, only this bank pays a fee every month. For software developments on the mainframe and PC, a “human day “ is basic to calculate their product costs. In 1996 one human day cost was determined not by using cost information, however, in 1997, it was determined by utilizing the activity based costing method. After one human day cost is multiplied by the number of days in which the product will be developed, total product cost was obtained. Total product cost was multiplied by the profit margin to determine the product price for the customer. However, this calculation is valid to sell software programs to banks except for Y bank, because Y bank pays the company fee which covers all services bought from the company.

The company demands a fixed price for conversion of the Q package from the banks. There was no analysis for calculation of this price, it determined it according to its expectations and market position.

Support for the industrial company earned no income in 1996, but the company earned a little income in 1997.

Every year, the company makes an arrangement with their customers to give support for its software programs. There is a fixed cost for giving support to the banks every year. There is no method for calculation of support for the software’s price like the conversion of the Q package product price .

For the education product’s price, human day cost is basic and this value is multiplied by education time. However, prices in the market have an important effect on determination of the price especially for “education for MS utilities”.

The company has an advantage in selling the products, because there are seven more banks to sell the products. If it cannot diminish the product cost, it can reduce the price and try to sell the same product to another bank. However this situation demands a powerful marketing department. There was only one person in the marketing department in 1996, the number of personnel was increased to three in 1997.

The total costs for professional services which are products of the company was used by finding the unit costs of each product. Appendix G shows total products costs and income for each year according to the two ABC methods and estimated products costs by the company. Appendix H shows human days necessary to produce the service demanded by customers, unit product costs and unit price according to the two ABC methods and estimated products costs by the company.

As the company does not know the total cost of the products in 1996, budgeted costs for 1997 was used for comparison as seen in appendix G. For 1996 both ABC methods have similar results. On the other hand for 1997 ABC methods showed little difference. "System support for Y bank" product's cost according to the second ABC method is 7.7 per cent higher than the cost which was found according to the first ABC method. On the other hand "software development on the mainframe" product cost in the first ABC method is 9.4 per cent higher than the cost which was found in the second ABC method. Unlike "software development on the mainframe" product, "software development on PC" product was higher in the second ABC method in 1997, but it was higher in the first ABC method in 1996.

"Conversion of the Q software" product cost was similar in both ABC methods in each year. While "education for ms utilities" product cost was higher in the second ABC method, "education for Q software" product cost is higher in the first ABC method. The reason for different results of the two ABC methods is that in the first method all costs were accumulated in the "education" activity and then this activity cost was distributed two education products using the time consumption percentages. However in the second method these two education products were tracked individually. On the other hand, in 1996 the costs of the products obtained from the two ABC methods are similar, because the time consumption percentages were close to each other in this year. In the second method either 44 per cent was used in distribution of the costs to the "education for ms utilities", and 56 per cent was used in distribution of the costs to the "education for Q software" product or the costs were distributed to them equally (in other words 50 per cent was used). On the other hand, the first method used only 44 and 56 percentages respectively. As these are close to each other, similar results were obtained in 1996. However, in 1997 as these percentages 25 and 75 respectively, the results are different.

"Software support for the Z company" product costs in both ABC methods was similar, because there was little support from other departments in the production of this product. In 1997 "software support for Q software" product is 4.1 percent higher according to the second ABC method.

As it can be seen from appendix G there are little differences in the product costs according to the two ABC methods. The one reason for this similarity is that although the first ABC method disregards the relation between activities, before the distribution of the general management cost and general accounting cost, they were distributed to the activities which have a relationship with them as it can be seen from Appendix B and 4.

The other reason for the similarity is that the major part of the product cost is the total of labor/fringes cost and specific assignment costs, and the amount obtained from support activities' cost is low although the percentage is high according to the product total cost. For example, the highest difference for the two methods is obtained in "software development on mainframe", because its total of labor/fringes cost and specific assignment costs is 62.6 per cent. So the remaining part for other activities cost distribution is 37.4.

Utilizing appendix F, the ratio of administrative support activities to the total cost is found as 18, and the ratio of operating support activities to the total cost is found as 14. Since the ratio of the administrative support activities and operating support activities costs to the total cost is 32, having different results according to the two ABC methods would be possible if the operating activities in the X company had any relation between each other.

However usage of the second ABC gives more accurate product costs because it includes not only relations between operating activities, but also includes support activities of the operating activities. Moreover this is approved when the general accounting and general management activities costs were distributed to other related activities before the distribution to the products in the first method.

However in 1996 the company's budgeted products costs are different from the costs found according to the two ABC methods. The company did not use the ABC method in calculation of budgeted costs in 1996 and the budgeted costs for the products include some expectations from 1997. For example in 1997, the company decided to increase the number of personnel for the system department and decrease the number of personnel for the software development department. As it can be seen from tables for 1997, these decisions were implemented. Therefore, the second ABC method's costs and company's costs for the "system support for Y bank" and "software development" products are very similar to each other in 1997. The reason for the similarity is that the company started to track the activities' costs such as overtime, taxis and to use the activity-based costing method to calculate product costs. Unlike distribution of the costs related to the mainframe according to the two ABC methods, in 1996 the company mostly charged them to the system department. The company used the ABC method in 1997, but it generally used the number of personnel as a driver, because electricity, building depreciation which need to use different cost drivers from the number of personnel had little proportion in the total costs. Therefore "education for Q software package" product costs in ABC methods are different from the company's product costs. The cause of this difference is that as building rent cost is distributed to this product by using a "square footage" cost driver in the ABC methods, the education activity gets a higher proportion from the building rent cost. Furthermore, the company did not distribute the mainframe cost to the "education for Q software package" product. Like the education product, the " software support for Q software" product cost according to the ABC methods and the company are different, because the company charged the "help desk" activity mainly to this product and usage of the number of personnel as a cost driver changed this product cost. So there are differences with the company's product costs in 1997 especially for "education for Q software" and "support for Q software" products.

Both methods say the same for profitable and nonprofitable products. Table 5.1 and table 5.2 shows the profitable and nonprofitable products according to the two ABC methods and the company. (+) refers to profitable product, (-) refers to nonprofitable product.

According to the two methods "software development on the mainframe" product cost has the highest proportion in the 1996 total cost, and the second highest cost belongs to the "system support for Y bank" product. As it can be seen from appendix H, while the most profitable product according to ABC methods is the "system support for Y bank", it is the "conversion of Q software" product according to the company in 1996. Moreover, the company thinks that the "system support for Y bank" product is a nonprofitable product. Other products in 1996 are nonprofitable products. While the "education for Q software" product is the most nonprofitable product in 1996 according to the ABC methods, it is profitable according to the company. Therefore determination of the accurate cost is very essential to convert nonprofitable products to profitable products especially when the company has no profit in the total.

Table 5.1. Products' ranks according to their profitability in 1996

Rank	ABC (1)	ABC (2)	COMPANY
1	System support for Y bank (+)	System support for Y bank (+)	Conversion of Q software (+)
2	Conversion of Q software (+)	Conversion of Q software (+)	Education for Q software (+)
3	Education for MS utilities (-)	Education for Q software (-) & software development on the mainframe (-)	System support for Y bank (-)
4	Software support for Q software (-)	Software support for Q software (-)	Software development on PC (-)
5	Software development on the mainframe (-)	Education for MS utilities (-)	Software development on the mainframe (-)
6	Software development on the mainframe (-)	Software development on PC (-)	Software development on the mainframe (-)
7	Education for Q software (-)		Software support for Q software (-)

Table 5.2 Products' ranks according to their profitability in 1997

Rank	ABC (1)	ABC (2)	COMPANY
1	Conversion of Q software (+)	Conversion of Q software (+)	Conversion of Q software (+)
2	Software support for Q software (+)	Software support for Q software (+)	Software support for Q software (+)
3	Software development on PC (+)	Software development on PC (+)	Software development on PC (-)
4	System support for Y bank (+)	System support for Y bank (+)	Education for Q software (+)
5	Software development on the mainframe (-)	Software development on the mainframe (-)	System support for Y bank (+)
6	Education for Q software (-)	Education for Q software (-)	Software development on the mainframe (-)
7	Education for MS utilities (-)	Software support for the Z company (-)	Software support for the Z company (-)
8	Software support for the Z company (-)	Education for MS utilities (-)	Education for MS utilities (-)

If the three products which are "software development on the mainframe and PC", and conversion of Q software" can be considered together, software development products have the highest costs and it was a profitable product in 1997 according to the ABC methods and the company. However, if they are regarded individually, "software development on the mainframe" is not a profitable product. The most profitable product is "conversion of Q software" and the second one is the "software support for Q software" product according to both ABC methods and the company. While the "system support for Y bank" is more profitable than the total of the three software development products according to the first ABC method, the total of the three software development products are more profitable according to the second ABC method and the company. Like the 1996 results, "education for Q software" is a nonprofitable product for the two ABC methods, but it is a profitable product for the company. The reason for the different result is that the company charged less cost to this product than the two ABC method by using only the number of personnel as a cost driver. The other reason is that the company charged all costs to these products equally. The most nonprofitable products in 1997 are "education for ms utilities" and "software support for the Z company", because income earned from these two products is very low.

In 1996, the unit cost of the "system support for Y company" is more than its price according to the company, but its price is more than its unit cost according to the two ABC methods. As the company did not know the costs of the products at the beginning of the 1996 fiscal year, determination of accurate prices for products was not possible. However its price was more than its cost in 1997 according to the three approaches. "Software development on PC" was a nonprofitable product in 1996. Although its cost is higher than "software development on the mainframe" product cost according to ABC methods, it was priced the same with "software development on the mainframe" by the company. Besides its sales in 1996 were very low, because the customer for this product was only Y bank. Therefore, the company expanded the customer portfolio for this product in 1997 and it increased the price more than its cost. Like PC software developments, "software developments on mainframe" price was determined less than its cost in 1996 and also in 1997. The company wanted to price the product high, but customers rejected the high price in 1997, because they paid a high price for the "support and maintenance" product. Moreover they preferred to pay nothing for their many demands. However if these two products, "software development on the mainframe" and "software support for Q software" are regarded as being together it will be a very profitable product in 1997, because although customers rejected the charge for "support and maintenance" in 1996, they were persuaded in 1997. As "conversion of Q software" refers to the sale of the Q software package to a new customer, its income is high in each year. However, its income was higher in 1997 than in 1996. Because the company decided to increase its income from the sales of Q package and "support and maintenance" product at the beginning of the 1997 fiscal year, because customers demands additions to Q software was not same as the company's expectations. The company also increased the number of personnel in the marketing and sales department to create more sales and to introduce new software developments on mainframe and PC products to customers. According to the company, giving education to the bank users is regarded as part of the software development's sales, so this product must be carried out to provide customer satisfaction. As the education room is generally free throughout the year, the company earns extra fees from giving education about MS utilities. According to the company as there is a very competitive market for this product, determining its price higher than its cost is not possible. Therefore its price was less than its cost in both years. However if the company gives more education it can earn more fees. Since the company determined "education for Q software" product costs lower than ABC methods, its price seems higher than its cost which is also determined by the company. However this product price is less than its price according to the two ABC methods. Therefore the company should either increase the price or increase the sales of this product. Of course if it is possible the company should decrease its activities costs. As “software support for Z company” product earned no income in 1996 and very little income in 1997, the company must earn a high income from this product to eliminate its loss. The company regarded its costs in two years as investment costs and the company will now start to find new customers and determine its price.

6. CONCLUSION

Although the two ABC methods have generally similar results in each year, as the second ABC method includes relations of the activities, it will be used for making comments on the product costs.

After analysis of the two years, it can be said that there are three nonprofitable products in particular to make profitable:

(1) software development on the mainframe;
(2) education for Q software;
(3) software support for Z company.

While one approach to earn more fees from the products is to increase the price, if this is not possible, the other approach is to decrease the products costs. The most appropriate strategy to increase "software development on the mainframe" product income is to sell the same product to another customer at an agreed price. The second strategy is to decrease the cost if it is possible. The company tried the second strategy in 1997. As the highest cost of this product consists of labor related costs, the company decreased the number of personnel working for this product. Although losses from it decreased in 1997, it is still a nonprofitable product. As it can be seen from table 6.1, the highest cost proportion of the product belongs to the labor/fringe benefits (34 per cent). As it is high percentage, the product is labor intensive. Therefore only if the company thinks that the sales of the product will be less, decreasing the number of personnel is meaningful. The other important cost element of the product is the system works activity cost at 14.4 per cent. So if this activity's cost decreases, the product's cost decreases. As in this activity overtime cost is the second highest cost after labor/fringe benefits costs, decreasing the overtime costs of the system works will reduce "software development on the mainframe" product cost. The third important cost element is depreciation cost at 11.8 per cent. Especially the mainframe depreciation cost commands a high proportion of this cost.

Table 6.1 "Software development on the mainframe" product's important cost elements in 1997

Cost elements	Percentage (%)
Labor/fringe costs	34
System works activity cost	14.4
Depreciation cost	11.8
Marketing and sales activity cost	8.6
General management activity cost	7.6
Improvement software quality activity cost	5.4

As it can be seen appendix K, 85.8 per cent of the "education for Q software" product cost consists of total of labor/fringes costs and specific assignment costs. As 36.7 per cent of the product cost is labor/fringe costs, it would be necessary to decrease the number of personnel at the education department from two to one. Additionally the number of training days throughout the year is inadequate to make the product profitable. If only one person produces this product, the cost of the product will decrease. The company started to implement this idea at the beginning of 1998. In 1997, other important cost element was building rent at 24.6. This cost element is fixed in the total "education for Q software" product cost, because there is an education room in the company which is reserved especially for the education activity. Therefore to use this room efficiently, more education should be given. Another important cost element is the improvement software activity cost. As the most important cost element is general management activity cost with 58.3 per cent, to reduce its cost this activities cost should be diminished. As one assistant general manager is only related to this activity, its cost has become high.

Table 6.2 "Education for Q software" product's important cost elements in 1997

Cost elements	Percentage (%)
Labor/fringe costs	36.7
Building rent	24.6
Improvement software quality activity cost	11.7

For "software support for Z company" the company must determine the accurate price and find new customers which should be separate from the holding in order to increase the product price.

ABC is not a cure-all. It does not provide automatic answers to what a manager should do in any given situation. However, it does provide cost information that gives insight into the cost consequences of making a particular decision, and does this far better than traditional costing. As mentioned, before the X company priced the products not utilizing the cost allocation methods, it did not know the accurate product costs and its profitable and unprofitable products. After making cost analysis by utilizing ABC's results, the accurate costs give help to the company about which product should be in focus to make the company profitable.

Implementation of ABC refers not only to understand the product costs, but also to understand the organization and the activities. Generally organizations use ABC to reach accurate product costs, however some organizations use it as part of an overall quality productivity improvement initiative. Business process reengineering has become popular because of its ability to improve the cost effectiveness of organizations. By driving out waste and inefficiency, redesigned processes can simultaneously improve quality, cost, and timeliness. Because understanding the cost of performing various activities (both current and proposed) is essential if business process engineers are to design process changes that lead to improved cost, ABC helps managers and engineers. However, as the X company had finished its reengineering work before the activity-based costing implementation was started, a little recurring activities which will be explained were found to eliminate from the production process.

ABC will provide cost information helpful in pricing those services in which the support organizations are competitive with alternative sources. Particularly when integrated with benchmarking and other process management techniques, ABC can support reengineering efforts in a variety of ways:

(1) provide more accurate costs of products and services

(2) provide the cost of servicing different customers

(3) provide activity and process costs

(4) support value-added analyses

(5) provide the costs associated with poor quality

(6) help identify areas of potential improvement

(7) help prioritize and focus process reengineering efforts

(8) support investment justification of process improvement initiatives

As the X company has a lot of customers, it can make differentiation on the product prices for each customer by utilizing the accurate cost. Therefore it can sell the products to more customers and obtain more income.

The X company can find the new products costs easily by utilizing the cost accumulation model created in the ABC method.

Activity analysis of the X company's organization not only revealed the value-added and non-value added activities, but also led the company to carry out the activities in more efficient ways. For example, as the number of personnel at the marketing activity increased from one to three in 1997, this number was not enough to introduce the new products to the other customers. They still only write proposals to customers, because the number of the customers also increased in 1997.

As the improvement software activity wrote all procedures related to the product quality standards and also gave training courses to the personnel in 1996, only one personnel was enough to lead personnel to implementing the product quality standards.

As there were personnel for PC support in PC and network support for the Y company, a person for PC support at the company was not necessary. If a person needs the PC support at the X company s/he tells the Help Desk team the problem, and then one person from the PC and network team can come to the X company on the specific days and s/he solves her PC problem. Therefore costs of the products decrease.

There are two personnel to carry out “making operation works for the X company” activity, now. As this activity’s overtime cost is high, hiring one more person and working in relays can decrease this activity’s cost.

Making operation works for the Y company is carried out for arranging end of day works of the Y bank. If the X company develops end of day’s software programs and decreases the time needed to carry out end of day works, X company can decrease the overtime cost.

Software development activities such as financial control, cash management, also represent the teams at the company. As they are strictly separate from each other, if any group has no project to do, it can wait a few days and it does not help another team. As this situation increases this activities’ costs, teams should work together when needed. Thus, as software development teams prepare a lot of documents which need more time, product costs increases. Therefore, the quality department should find optimum in the number of documents which are prepared by the software development teams.

Although software development teams prepare documents for the customers, the education team also prepares documents for the customer to explain the Q package programs. As there is no enough contact between these teams, the recurring activity exists and it causes time loss and more cost.

Overall, implementation of the two ABC methods not only gave the X company accurate product costs, but also gave a direct to focus on its activities which produce its products.

THE COST DISTRIBUTION TO THE ACTIVITIES ACCORDING TO THE FIRST ABC METHOD IN [illegible]

	Salary	Overtim	SSK	Saving	Meal	Transp	Health i	Taxi	Clean	IBM m	IBM re	Mach.	Electri	Water	Station	Teleph	Traini	Building	Manag	Depreci	Ads co	Trav./	Consu	Others	TOTAL
Activities																									
General/Admini																									
General accountin	2463.4	222.5	116.8	77.8	179.7	95.4	62.5	276.7	110.6	0.0	462.0	0.0	8.3	24.8	92.9	24.2	0.0	616.1	0.0	194.2			133.6	188.3	5349.7
General manag.	13137.9	0.0	155.8	414.8	239.5	0.0	83.3	395.4	332.6	0.0	616.0	0.0	7.0	33.1		32.2	0.0	1852.4	167.0	258.9		4697.0		251.0	22673.9
Human Res.	821.1	133.5	38.9	25.9	59.9	31.8	20.8	23.7	57.8	0.0	154.0	0.0	7.8	8.3		8.1	0.0	322.2	0.0	64.7				62.8	1841.3
Marketing& sales	2463.4	834.2	38.9	77.8	59.9	0.0	20.8	94.9	14.5	0.0	154.0	0.0	8.7	8.3		8.1	0.0	80.5	0.0	64.7	143.0			62.8	4134.4
TOTAL	18885.8	1190.2	350.5	596.3	539.0	127.2	187.4	790.7	515.5	0.0	1386.0	0.0	31.9	74.4	92.9	72.5	0.0	2871.3	167.0	582.5	143.0	4697.0	133.6	564.9	33999.4
Facilities																				**0.0**				**0.0**	
Office manag.	821.1	0.0	38.9	25.9	59.9	31.8	20.8	15.8	14.5	0.0	154.0	0.0	7.0	8.3		8.1	0.0	80.5	0.0	64.7	0.0			62.8	1414.1
Operating Supp																									
Improvement soft	8211.2	1483.1	155.8	259.3	239.5	127.2	83.3	0.0	**99.0**	0.0	**616.0**	**0.0**	10.5	33.1		32.2	1801.7	551.7	0.0	**258.9**	0.0		33.4	251.0	14246.9
Defining fields, D	1642.2	444.9	38.9	51.9	59.9	0.0	20.8	28.5	**19.2**	48.4	**154.0**	**18.5**	13.3	8.3		8.1	0.0	107.1	0.0	235.5	0.0			62.8	2962.2
Creating database	2463.4	667.4	116.8	77.8	179.7	95.4	62.5	134.4	**43.4**	96.7	**462.0**	**37.1**	18.3	24.8		24.2	929.9	241.6	0.0	706.4	0.0			188.3	6569.9
Pc support	821.1	333.7	38.9	25.9	59.9	31.8	20.8	23.7	**14.5**	0.0	**154.0**	0.0	9.0	8.3		8.1	0.0	80.5	0.0	64.7	0.0			62.8	1757.7
Making operation	1642.2	1245.8	77.9	51.9	119.8	63.6	41.6	197.7	**38.5**	96.7	**308.0**	37.1	21.7	16.5		16.1	0.0	214.2	0.0	470.9	0.0			125.5	4785.7
Support for softw	8006.0	1897.8	233.7	252.0	359.4	190.8	124.9	11.9	97.5	290.2	924.0	111.2	34.0	49.5	0.0	48.3	240.0	543.0	0.0	1412.7	0.0	0.0	0.0	376.5	15203.3
Joker	2668.7	632.6	77.9	84.0	119.8	63.6	41.6	4.0	32.5	96.7	**308.0**	37.1	11.3	16.5	0.0	16.1	80.0	181.0	0.0	470.9	0.0	0.0	0.0	125.5	5067.8
Problem identifica	1642.2	444.9	77.9	51.9	119.8	63.6	41.6	158.1	34.7	0.0	**308.0**	0.0	9.7	16.5		16.1	0.0	193.3	0.0	470.9	0.0			125.5	3774.8
TOTAL	27097.0	7150.1	817.8	854.5	1257.7	636.1	437.2	558.2	379.3	628.7	3234.0	241.0	127.8	173.5	0.0	169.1	3051.6	2112.5	0.0	4090.8	0.0	0.0	33.4	1317.9	54368.3
System Groups									**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**		**0.0**	**0.0**								0.0
Pc&network supp	12316.8	3593.5	506.3	388.9	778.5	413.5	270.6	474.4	0.0	628.7	2002.0	241.0	47.3			104.7	0.0	0.0	0.0	3060.8	0.0			815.9	25643.1
Making operation	6569.0	4360.2	272.6	207.4	419.2	222.7	145.7	632.6	0.0	338.5	1078.0	129.8	25.5			56.4	0.0	0.0	0.0	1648.1	0.0			439.3	16544.9
TOTAL,	18885.8	7953.7	778.9	596.3	1197.7	636.2	416.4	1107.0	0.0	967.2	3080.0	370.8	72.8	0.0	0.0	161.1	0.0	0.0	0.0	4709.0	0.0		0.0	1255.2	42188.0
Software devel.																									
Financial control	4105.6	185.4	155.8	129.6	239.5	127.2	83.3	0.0	57.8	193.4	616.0	74.2	22.5	33.1	123.9	32.2	145.3	322.2	0.0	941.8	0.0			251.0	7839.8
Financial works	2463.4	444.9	116.8	77.8	179.7	95.4	62.5	15.8	43.4	145.1	462.0	55.6	20.6	24.8	92.9	24.2	145.3	241.6	0.0	**706.3**	0.0			188.3	5606.3
Instutitional b	4926.7	630.3	155.8	155.6	239.5	127.2	83.3	7.9	57.8	96.7	616.0	37.1	20.8	33.1	123.9	32.2	174.4	322.2	0.0	1132.7	0.0			251.0	9224.2
Cash man.	4105.6	519.1	194.7	129.6	299.4	159.0	104.1	47.4	101.2	193.4	770.0	74.2	24.7	41.4	154.8	40.3	319.7	563.8	0.0	1753.2	0.0			313.8	9909.4
Individual b. (1)	821.1	133.5	38.9	25.9	59.9	31.8	20.8	0.0	18.8	0.0	154.0	0.0	7.8	8.3	31.0	8.1	174.4	104.7	0.0	426.4	0.0			62.8	2128.1
Individual b. (2)	2873.9	185.4	116.8	90.7	179.7	95.4	62.5	0.0	37.6	145.1	462.0	55.6	19.0	24.8	92.9	24.2	0.0	209.4	0.0	706.4	0.0			188.3	5569.7
ATM	2052.8	333.7	116.8	64.8	179.7	95.4	62.5	47.4	43.4	145.1	462.0	55.6	19.9	24.8	92.9	24.2	0.0	241.6	0.0	706.4	0.0			188.3	4957.2
ATM operation	3284.5	296.6	77.9	103.7	119.8	63.6	41.6	23.7	28.9	145.1	308.0	55.6	18.8	16.5	61.9	16.1	0.0	161.1	0.0	855.9	0.0			125.5	5805.0
Internet	1642.2	170.6	77.9	51.9	119.8	63.6	41.6	47.4	28.9	0.0	308.0	0.0	8.0	16.5	61.9	16.1	1743.5	161.1	0.0	129.4	0.0			125.5	4814.1
Conversion (1)	4105.6	3151.5	136.3	129.6	209.6	111.3	72.9	158.1	50.6	169.3	539.0	64.9	29.1	28.9	108.4	28.2	0.0	281.9	0.0	824.1	0.0			219.7	10419.0
Investment ban.	3284.5	1112.3	155.8	103.7	239.5	127.2	83.3	0.0	57.8	193.4	616.0	74.2	28.2	33.1	123.9	32.2	0.0	322.2	0.0	941.8	0.0			251.0	7780.1
Share	2463.4	444.9	116.8	77.8	179.7	95.4	62.5	19.8	43.4	145.1	462.0	55.6	20.6	24.8	92.9	24.2	0.0	241.6	0.0	706.3	0.0			188.3	5465.0
Centrops	9032.3	306.3	311.5	285.2	479.1	254.5	166.6	23.7	130.1	386.9	1232.0	148.3	37.5	66.2	247.7	64.5	145.3	724.9	0.0	1883.6	0.0			502.1	16428.1
Conversion (2)	4926.7	3781.8	136.3	155.6	209.6	111.3	72.9	158.1	50.6	169.3	539.0	64.9	32.8	28.9	108.4	28.2	0.0	281.9	0.0	824.1	0.0			219.7	11900.1
TOTAL	50088.3	11696.2	1908.2	1581.5	2934.4	1558.6	1020.1	549.5	750.4	2127.8	7546.0	815.7	310.3	405.3	1517.2	394.8	2847.8	4180.0	0.0	12538.4	0.0	0.0	0.0	3075.3	107846.0
Education	3284.5	667.4	77.89	103.7	119.8	63.6	41.6	94.9	150.4	48.4	308.0	18.5	12.6	16.5	61.9	16.1	0.0	837.6	0.0	470.9	0.0			125.5	6519.9
Industrial	4105.6	1557.2	116.8	129.6	179.7	95.4	62.5	15.8	57.8	0.0	462.0	0.0	12.6	24.8	0.0	24.2	0.0	322.2	0.0	194.2	0.0			188.3	7548.6
TOTAL COST	123168.0	30215.0	4089.0	3889.0	6288.0	3149.0	2186.0	3132.0	1868.0	3772.0	16170.0	1446.0	575.0	702.0	1672.0	846.0	5899.0	10405.0	167.0	22650.3	143.0	4967.0	167.0	6590.0	253884.3

THE ACTIVITIES COSTS DISTRIBUTION TO THE PRODUCTS ACCORDING TO THE FIRST ABC METHOD IN 1996

	Gen. account	Gener. man	Human Re	Marketing	Office man	Improv. s	Defin. fiel	Creat. dat	Pc suppor	Perf. oper	Softw. su	Joker	Problem d	Pc&netwo	Perf. opera	F. control
Activities total costs	5349.72	22673.94	1841.32	4134.38	1414.08	14246.94	2962.22	6569.87	1757.73	4785.72	15203.29	5067.76	3774.79	25643.05	16544.95	7839.79
Distribution of general ac.	2139.89	3209.83														
Total		25883.77														
Distribution of general m.		19412.83				6470.94										
1.System support for Y b.	1328.53	8088.68	460.33	0.00	353.52	5179.47	0.00	0.00	0.00	0.00		0.00	2831.09	20514.44	16544.95	
2.Software development	659.52	10434.39	1127.81	4134.38	866.13	11394.84	2666.00	6241.38	1435.48	4211.43	760.16	5067.76	207.79	5128.61	0.00	7839.79
a.Software develop. on pc	0.00	638.84	69.05	744.19	53.03	0.00	0.00	1970.96	87.89	861.43		0.00		0.00	0.00	
b.Software develop. on mai	279.94	8304.93	897.65	2563.32	689.37	11394.84	1866.20	4270.42	1142.52	3350.00	760.16	5067.76	95.24	5128.61	0.00	7839.79
c.Conversion of Q software	379.58	1490.63	161.12	826.88	123.73	0.00	799.80	0.00	205.07	0.00		0.00	112.55	0.00	0.00	
3. Giving education	113.87	161.77	46.03	0.00	35.35	2071.79	0.00	0.00	58.59	0.00		0.00	0.00	0.00	0.00	
a. Education for MS utilitie	56.94	80.89	23.02	0.00	17.68	0.00	0.00	0.00	29.30	0.00		0.00	0.00	0.00	0.00	
b. Education for Q software	56.94	80.89	23.02	0.00	17.68	2071.79	0.00	0.00	29.30	0.00			0.00			
4.Software support for Z co	18.98	242.66	69.05	0.00	53.03	1035.89	0.00	0.00	87.89	0.00		0.00	0.00	0.00	0.00	
5.Software support for Q so	18.98	485.32	138.10	0.00	106.06	1035.89	296.22	328.49	175.77	574.29	14443.13	0.00	735.91	0.00	0.00	
TOTAL	2139.89	19412.83	1841.32	4134.38	1414.08	20717.89	2962.22	6569.87	1757.73	4785.72	15203.29	5067.76	3774.79	25643.05	16544.95	7839.79

	F. works	Instuti. ban	Cash man.	Indiv. b.(1)	Indiv. b.(2)	ATM	ATM oper	Internet	Conversi	Investmen	Share	Centrops	Conver.2	Education	Industry	TOTAL
Activities Total Costs	5606.31	9224.21	9909.37	2128.09	5569.66	4957.24	5804.95	4814.12	10418.99	7780.08	5464.97	16428.08	11900.08	6519.91	7548.62	253884.25
Distribution of general acco																
Total																
Distribution of general man																
1.System support for Y ban	0.00	0.00												0.00	0.00	55301.02
2.Software development	5606.31	9224.21	9909.37	2128.09	5569.66	4957.24	5804.95	4814.12	10418.99	7780.08	5464.97	16428.08	11900.08	0.00	0.00	162181.64
a.Software develop. on pc	0.00	2306.05	1981.87	2128.09				4814.12						0.00	0.00	15655.53
b.Software develop. on mai	5606.31	6918.16	7927.50		5569.66	4957.24	5804.95			7780.08	5464.97	16428.08		0.00	0.00	120107.69
c.Conversion of Q software	0.00	0.00	0.00						10418.99				11900.08	0.00	0.00	26418.42
3. Giving education	0.00	0.00	0.00											6519.91	0.00	9007.32
a. Education for MS utilitie	0.00	0.00	0.00											2868.76	0.00	3076.57
b. Education for Q software														3651.15		5930.75
4.Software support for Z co	0.00	0.00	0.00											0.00	7548.62	9056.12
5.Software support for Q so	0.00	0.00	0.00											0.00	0.00	18338.16
TOTAL	5606.31	9224.21	9909.37	2128.09	5569.66	4957.24	5804.95	4814.12	10418.99	7780.08	5464.97	16428.08	11900.08	6519.91	7548.62	253884.25

THE COST DISTRIBUTION TO THE ACTIVITIES ACCORDING TO THE FIRST ABC METHOD IN 1997

	Salary	Overti	Ssk	Saving	Meal	Transp	Health i	Taxi	Clean	Mach. r	IBM re	Electri	Water/	Station	Teleph	Trainin	Buildin	Manag	Deprecia	Ads cos	Trav./	Consul	Others	TOTAL
Aktivities																								
General/Administr.																								
General accounting/F	4904.9	671.8	256.5	153.9	258.0	216.8	120.0	644.6	194.6	0.0	265.5	52.6	108.9	282.7	261.0	121.3	1337.1	0.0	354.0			265.0	732.1	11201.4
General manag.	26159.2	0.0	342.0	820.6	344.0	0.0	160.0	629.3	585.1	0.0	354.0	45.8	145.2		348.0	219.7	4020.1	5671.7	472.0		4134.5		976.1	45427.6
Human Res.	3269.9	22.4	171.0	102.6	172.0	144.6	80.0	81.4	101.8	0.0	177.0	46.0	72.6		174.0	629.8	699.2	0.0	236.0				488.1	6668.3
Marketing& sales	13079.6	940.5	256.5	410.3	258.0	144.6	120.0	241.7	76.3	0.0	265.5	55.3	108.9		261.0	677.4	524.4	0.0	354.0	3180.4			732.1	21686.6
TOTAL	47413.6	1634.7	1026.1	1487.3	1032.1	506.0	480.1	1596.9	957.8	0.0	1062.1	199.7	435.6	282.7	1044.1	1648.2	6580.8	5671.7	1416.1	3180.4	4134.5	265.0	2928.4	84983.9
Facilities																			0.0				0.0	
Office manag.	1635.0	0.0	85.5	51.3	86.0	72.3	40.0	0.0	25.4	0.0	88.5	45.8	36.3		87.0	0.0	174.8	0.0	118.0	0.0			244.0	2789.9
Operating Support																								0.0
Improvement softwar	4904.9	268.7	171.0	153.9	172.0	144.6	80.0	99.1	123.4	0.0	177.0	48.5	72.6		174.0	378.2	847.7	0.0	236.0	0.0		1060.1	488.1	9599.8
Defining fields, DD	3269.9	845.1	85.5	102.6	86.0	0.0	40.0	93.2	33.8	372.9	88.5	76.8	36.3		87.0	0.0	232.5	0.0	797.1	0.0			244.0	6491.2
Creating database	4904.9	1267.7	256.5	153.9	258.0	216.8	120.0	440.0	76.3	745.9	265.5	103.5	108.9		261.0	1173.6	524.4	0.0	1712.2	0.0			732.1	13321.2
Pc support	1635.0	633.8	85.5	51.3	86.0	72.3	40.0	77.7	25.4	0.0	88.5	52.2	36.3		87.0	0.0	174.8	0.0	118.0	0.0			244.0	3507.8
Perform. operation w	3269.9	2366.3	171.0	102.6	172.0	144.6	80.0	647.1	67.7	745.9	177.0	114.6	72.6		174.0	0.0	464.9	0.0	1594.2	0.0			488.1	10852.4
Support for software	19619.4	2687.1	598.6	615.4	602.1	506.0	280.0	127.3	228.9	2610.6	619.6	225.7	254.1	0.0	609.1	226.9	1573.1	0.0	5579.6	0.0			1708.2	38671.7
Problem identificatio	4904.9	470.2	256.5	153.9	258.0	216.8	120.0	63.7	91.6	0.0	265.5	63.5	108.9		261.0	0.0	629.2	0.0	354.0	0.0			732.1	8950.0
TOTAL	42508.7	8538.9	1624.7	1333.4	1634.2	1301.1	760.1	1548.0	647.2	4475.4	1681.7	684.8	689.7	0.0	1653.2	1778.6	4446.6	0.0	10391.0	0.0	0.0	1060.1	4636.6	91394.0
System Groups																								0.0
Pc&network support	62128.1	6825.6	2394.3	1948.9	2408.3	2023.9	1120.1	1570.1	0.0	10442.5	2478.3	628.1			2436.3	1316.4	0.0	0.0	22318.2	0.0			6832.9	126872.0
Making operation wo	19619.4	8282.0	769.6	615.4	774.1	650.5	360.0	2070.7	0.0	3356.5	796.6	201.9			783.1	0.0	0.0	0.0	7173.7	0.0			2196.3	47649.9
TOTAL,	81747.5	15107.6	3163.9	2564.3	3182.4	2674.4	1480.2	3640.7	0.0	13799.0	3274.9	830.0	0.0	0.0	3219.4	1316.4	0.0	0.0	29491.9	0.0		0.0	9029.2	174521.9
Software developme																								0.0
Financial control	4904.9	108.5	171.0	153.9	172.0	144.6	80.0	17.7	50.9	745.9	177.0	91.8	72.6	188.5	174.0	0.0	349.6	0.0	1594.2	0.0			488.1	9685.0
Current works	3269.9	108.5	171.0	102.6	172.0	144.6	80.0	31.3	76.3	745.9	177.0	91.8	72.6	188.5	174.0	0.0	524.4	0.0	1594.2	0.0			488.1	8212.6
Instutitional b	8992.2	369.0	213.8	282.1	215.0	180.7	100.0	112.8	101.8	466.2	221.3	77.6	90.7	235.6	217.5	0.0	699.2	0.0	4087.0	0.0			610.1	17272.5
Cash man.	6539.8	303.9	342.0	205.1	344.0	289.1	160.0	94.0	127.2	1118.8	354.0	116.2	145.2	376.9	348.0	130.4	873.9	0.0	3735.6	0.0			976.1	16580.6
Individual b.	3269.9	108.5	171.0	102.6	172.0	144.6	80.0	0.0	66.1	745.9	177.0	91.8	72.6	188.5	174.0	0.0	454.4	0.0	1594.2	0.0			488.1	8101.2
ATM	4904.9	195.4	256.5	153.9	258.0	216.8	120.0	94.0	76.3	1118.8	265.5	115.1	108.9	282.7	261.0	122.6	524.4	0.0	2391.2	0.0			732.1	12198.2
ATM operation	8174.8	3537.9	342.0	256.4	344.0	289.1	160.0	50.0	101.8	1491.8	354.0	161.3	145.2	376.9	348.0	130.4	699.2	0.0	3883.2	0.0			976.1	21822.2
Internet	3269.9	99.9	171.0	102.6	172.0	144.6	80.0	94.0	50.9	0.0	177.0	46.8	72.6	188.5	174.0	652.0	349.6	0.0	236.0	0.0			488.1	6569.4
Conversion works	7357.3	1845.1	299.3	230.8	301.0	253.0	140.0	541.8	89.0	1305.3	309.8	143.0	127.0	329.8	304.5	0.0	611.8	0.0	2789.8	0.0			854.1	17832.4
Investment ban.	6539.8	1592.0	342.0	205.1	344.0	289.1	160.0	0.0	101.8	1491.8	354.0	151.6	145.2	376.9	348.0	195.6	699.2	0.0	3188.3	0.0			976.1	17500.8
Centrops	4904.9	106.1	171.0	153.9	172.0	144.6	80.0	35.0	228.9	745.9	177.0	91.7	72.6	188.5	174.0	0.0	1573.1	0.0	1594.2	0.0			488.1	11101.5
TOTAL	62128.1	8374.8	2650.8	1948.9	2666.3	2240.7	1240.2	1070.7	#####	9976.3	2743.9	1178.5	1125.2	2921.3	2697.3	1230.9	7358.6	0.0	26687.8	0.0	0.0	0.0	7565.0	146876.4
Education	6539.8	179.1	171.02	205.1	172.0	72.3	80.0	103.9	483.3	372.9	177.0	70.0	72.6	188.5	174.0	287.5	3321.0	0.0	915.1	0.0			488.1	14073.4
Industrial	9809.7	671.8	342.04	307.7	344.0	289.1	160.0	96.7	101.8	0.0	354.0	52.6	145.2	0.0	348.0	258.2	699.2	0.0	472.0	0.0			976.1	15428.2
TOTAL COST	251782.3	34507.0	9064.2	7898.0	9117.2	7155.9	4240.5	8057.0	#####	28623.7	9382.2	3061.4	2504.6	3392.4	9223.2	6519.8	22580.9	5671.7	69491.9	3180.4	4134.5	1325.2	25867.3	530067.8

APPENDIX D

THE ACTIVITIES COSTS DISTRIBUTION TO THE PRODUCTS ACCORDING TO THE FIRST ABC METHOD IN 1997

	Gen. account	Gener. mana	Human R	Marketin	Office mana	Improv. soft	Defin. field	Creat. dat	Pc suppor	Perf. oper	Softw. sup	Problem d	Pc&networ	Perf. operati
Activities Total Costs	11201.38	45427.55	6668.32	21686.61	2789.92	9599.75	6491.24	13321.16	3507.81	10852.43	38671.70	8949.96	126871.99	47649.90
Distribution of general accounti	4480.55	6720.83												
Total		52148.38												
Distribution of general man.		39111.29				13037.0953								
1.System support for Y bank	3236.99	18992.31	3046.02	0.00	1274.41	7922.90	0.00	0.00	0.00	0.00		6085.97	107841.19	47649.90
2.Software development	952.00	18026.60	2552.07	21686.61	1067.75	11318.42	5842.12	12655.10	2471.41	9550.13	1933.58	805.50	19030.80	0.00
a.Software develop. on pc	154.66	2471.39	349.88	2819.26	146.38	2263.68	0.00	3996.35	338.82	1953.44		89.50	0.00	0.00
b.Software develop. on mainf.	315.67	13519.95	1914.05	14530.03	800.81	9054.74	4089.48	8658.75	1853.56	7596.70	1933.58	268.50	19030.80	0.00
c.Conversion of Q software	481.67	2035.26	288.14	4337.32	120.55	0.00	1752.63	0.00	279.03	0.00		447.50	0.00	0.00
3. Giving education	92.41	321.90	164.65	0.00	68.89	1131.84	0.00	0.00	159.45	0.00		0.00	0.00	0.00
a. Education for MS utilities	46.20	160.95	82.32	0.00	34.44	0.00	0.00	0.00	79.72	0.00		0.00	0.00	0.00
b. Education for Q software	46.20	160.95	82.32	0.00	34.44	1131.84236	0.00	0.00	79.72	0.00		0.00		0.00
4.Software support for Z compa	85.96	643.81	329.30	0.00	137.77	1131.84	0.00	0.00	318.89	0.00		0.00	0.00	0.00
5.Software support for Q soft.	113.18	1126.66	576.27	0.00	241.10	1131.84	649.12	666.06	558.06	1302.29	36738.11	2058.49	0.00	0.00
TOTAL	4480.55	39111.29	6668.32	21686.61	2789.92	22636.85	6491.24	13321.16	3507.81	10852.43	38671.70	8949.96	126871.99	47649.90

	F. control	Current w.	Instutl. b	Cash man	Indiv. b.	ATM	ATM oper	Internet	Convers	Investmen	Centrops	Education	Industry	TOTAL
Activities Total Costs	9685.02	8212.63	17272.55	16580.56	8101.19	12198.19	21822.24	6569.41	17832.37	17500.80	11101.46	14073.43	15428.23	530067.80
Distribution of general accounti														
Total														
Distribution of general man.														
1.System support for Y bank		0.00	0.00									0.00	0.00	196049.69
2.Software development	9685.02	8212.63	17272.55	16580.56	8101.19	12198.19	21822.24	6569.41	17832.37	17500.80	11101.46	0.00	0.00	254768.53
a.Software develop. on pc		0.00	8636.27	4145.14				6569.41				0.00	0.00	33934.18
b.Software develop. on mainf.	9685.02	8212.63	8636.27	12435.42	8101.19	12198.19	21822.24	0.00		17500.80	11101.46	0.00	0.00	193259.86
c.Conversion of Q software		0.00	0.00	0.00					17832.37			0.00	0.00	27574.48
3. Giving education		0.00	0.00	0.00								14073.43	0.00	16012.57
a. Education for MS utilities		0.00	0.00	0.00								3518.36	0.00	3922.01
b. Education for Q software												10555.08		12090.57
4.Software support for Z compa		0.00	0.00	0.00								0.00	15428.23	18075.80
5.Software support for Q soft.		0.00	0.00	0.00								0.00	0.00	45161.20
TOTAL	9685.02	8212.63	17272.55	16580.56	8101.19	12198.19	21822.24	6569.41	17832.37	17500.80	11101.46	14073.43	15428.23	530067.80

THE DISTRIBUTION OF THE COSTS TO THE PRODUCTS ACCORDING TO THE SECOND ABC METHOD IN 1996

	Fringe B	General	General m	H/R	Marketin	Facility c	Improvem	System w	Problem	System gr	Softw. m.	Q Educa	Ms educ	Industr	Supp.of s	Softw. PC	Convers.	TOTAL
FRINGE BENEFITS																		
Various	10751																	
LABOR COSTS																		
Salaries&wages		2880.43	13708.52	1019.47	3414.31	885.92	10109.31	9740.75	2216.88	28214.66	48737.60	2066.73	2066.73	5909.29	10389.42	3476.36	16523.48	161359.84
Fringe benefits	-10751	337.54	322.82	112.51	80.70	112.51	450.05	755.78	225.03	2250.26	4613.04	112.51	112.51	337.54	675.11	337.54	787.59	11623.05
Total labor/fringes		3217.97	14031.34	1131.98	3495.02	998.43	10559.36	10496.53	2441.91	30464.92	53350.64	2179.24	2179.24	6246.83	11064.53	3813.90	17311.07	172982.89
Depreciation		194.15	258.87	64.72	64.72	64.72	258.87	1477.42	470.90	4708.98	10300.90	372.01	98.89	194.15	1412.70	1060.21	1648.14	22650.35
Celeaning and security		110.61	332.56	57.84	14.46	14.46	99.05	115.53	34.70	0.00	628.22	75.19	75.19	57.84	97.50	53.50	101.22	1867.87
IBM maintanance		0.00	0.00	0.00	0.00	0.00	0.00	241.79	0.00	967.18	1823.13	48.36	0.00	0.00	290.15	62.87	338.51	3772.00
IBM rent		462.00	616.00	154.00	154.00	154.00	616.00	1078.00	308.00	3080.00	6314.00	172.48	135.52	462.00	924.00	462.00	1078.00	16170.00
Machine rent		0.00	0.00	0.00	0.00	0.00	0.00	92.69	0.00	370.77	698.90	18.54	0.00	0.00	111.23	24.10	129.77	1446.00
Electricity		8.35	7.03	7.82	8.67	7.03	10.54	62.25	9.66	72.78	241.75	7.08	5.56	12.56	34.02	17.95	61.93	575.00
Water		24.81	33.08	8.27	8.27	8.27	33.08	57.89	16.54	0.00	339.05	8.27	8.27	24.81	49.50	24.81	57.89	702.84
Stationary		92.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1207.56	34.68	27.25	0.00	0.00	92.89	216.74	1672.00
Telephone		24.17	32.23	8.06	8.06	8.06	32.23	56.40	16.11	161.14	330.33	8.06	8.06	24.17	48.30	24.17	56.40	845.94
Building rent		616.13	1852.43	322.16	80.54	80.54	551.70	643.52	193.30	0.00	3499.26	469.07	368.55	322.16	543.00	298.00	563.78	10404.14
Management Comm.		0.00	167.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	167.00
Ads cost		0.00	0.00	0.00	143.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	143.00
Travelling&guest cost		0.00	4697.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0	0.00		0.00	0.00	4697.00
Consultancy		133.60	0.00	0.00	0.00	0.00	33.40					0.00	0					167.00
Training		0.00	0.00	0.00	0.00	0.00	1801.67	929.89	0.00	0.00	2645.92	0.00	0.00	0.00	240.00	281.87	0.00	5899.35
Taxi		276.75	395.35	23.72	94.89	15.81	0.00	384.28	158.14	1106.99	225.74	53.14	41.75	15.81	11.85	11.47	316.28	3131.99
Others		188.29	251.05	62.76	62.76	62.76	251.05	439.33	125.52	1255.24	2573.21	62.76	62.76	188.29	376.50	188.29	439.33	6589.90
Costs through specifi	**0**	**5349.72**	**22673.94**	**1841.33**	**4134.38**	**1414.08**	**14246.94**	**16075.54**	**3774.79**	**42188.00**	**84178.63**	**3508.87**	**3011.04**	**7548.62**	**15203.29**	**6416.02**	**22319.07**	**253884.26**
Assignment cost																		
Administrative Supp																		
Facilities		16.97	848.45	5.66	5.66	-1414.08	22.63	39.59	11.31	113.13	209.28	5.66	5.66	16.97	45.25	28.28	39.59	0.00
General accounting/Fin		-5366.69	3220.01	20.83	83.34		0.00	337.52	138.90	972.29	154.87	41.67	41.67	13.89	13.89	50.00	277.80	0.00
General manag.			-26742.40	68.92	68.92		6961.30	2215.77	137.85	6330.77	7598.49	68.92	68.92	206.77	551.39	1026.82	1437.55	0.00
Human Res.				-1936.74	20.17		80.70	141.22	40.35	403.49	746.45	20.17	20.17	60.52	161.40	100.87	141.22	0.00
Marketing& sales					-4312.48						2673.74	0.00	0.00			776.25	862.50	0.00
Costs through Admin							**21311.56**	**18809.65**	**4103.20**	**50007.68**	**95561.46**	**3645.29**	**3147.46**	**7846.77**	**15975.22**	**8398.24**	**25077.73**	**253884.26**
Support Distribution																		
Operating Support A																		
Improvement soft qu.							-21311.56			5327.89	11721.36	2131.16	0.00	1065.58	1065.58			0.00
System works								-18809.65			12226.27				1598.82	3649.07	1335.49	0.00
Problem Identification									-4103.20	3077.40	123.10				779.61		123.10	0.00
Costs through operat																		0.00
Support Distribution										**58412.96**	**119632.19**	**5776.45**	**3147.46**	**8912.35**	**19419.22**	**12047.32**	**26536.31**	**253884.26**

THE DISTRIBUTION OF THE COSTS TO THE PRODUCTS ACCORDING TO THE SECOND ABC METHOD IN 1997

	Fringe B	General A	General	H/R	Marketin	Facility c	Improvem	System w	Problem	System gr	Softw. (ma	"Q" Edu	Ms educ	Industry	Supp.of s	Softw. (pc	Conversi	TOTAL
FRINGE BENEFITS																		
Various	10751																	
LABOR COSTS																		
Salaries&wages		5987.02	27321.82	3565.89	14686.91	1771.75	5498.44	19201.34	5785.48	102583.34	54950.61	3547.55	3547.55	11131.24	23520.52	10419.61	9732.41	303251.48
Fringe benefits	-10751	594.89	504.06	396.60	522.61	198.30	396.60	1315.81	594.89	7337.03	4610.43	162.16	162.16	793.19	1388.09	842.77	694.04	20513.63
Total labor/fringes		6581.91	27825.88	3962.48	15209.52	1970.04	5895.04	20517.15	6380.38	109920.37	59561.05	3709.71	3709.71	11924.43	24908.61	11262.37	10426.46	323765.11
Specific Assignment																		
Depreciation		354.02	472.02	236.01	354.02	118.01	236.01	4221.41	354.02	29491.93	20684.62	796.12	118.96	472.02	5579.55	3213.42	2789.78	69491.91
Celeaning and security		194.61	585.09	101.75	76.32	25.44	123.38	203.25	91.58	0.00	848.38	241.67	241.67	101.75	228.95	133.55	89.04	3286.42
Machine rent		0.00	0.00	0.00	0.00	0.00	0.00	1864.73	0.00	13799.03	8158.21	372.95	0.00	0.00	2610.63	512.80	1305.31	28623.67
IBM rent		265.53	354.05	177.02	265.53	88.51	177.02	619.58	265.53	3274.92	2057.89	132.77	44.26	354.05	619.58	376.17	309.79	9382.20
Electricity		52.59	45.79	46.02	55.31	45.79	48.51	347.07	63.54	829.97	920.87	52.53	17.51	52.59	225.71	114.63	142.97	3061.40
Water		108.89	145.19	72.60	108.89	36.30	72.60	254.09	108.89	0.00	843.93	36.30	36.30	145.19	254.09	154.27	127.04	2504.57
Stationary		282.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2190.95	141.35	47.12	0.00	0.00	400.50	329.82	3392.44
Telephone		261.03	348.04	174.02	261.03	87.01	174.02	609.08	261.03	3219.41	2023.01	87.01	87.01	348.04	609.08	369.80	304.54	9223.18
Building rent		1337.13	4020.13	699.15	524.36	174.79	847.72	1396.56	629.24	0.00	5829.19	2490.73	830.24	699.15	1573.09	917.64	611.76	22580.90
Management comm.		0.00	5671.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5671.73
Ads cost		0.00	0.00	0.00	3180.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3180.41
Travelling&guest cost		0.00	4134.53	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	4134.53
Consultancy		265.03	0.00	0.00	0.00	0.00	1060.14					0.00	0.00					1325.17
Training		121.27	219.72	629.82	677.41	0.00	378.15	1173.57	0.00	1316.35	546.36	287.52	0.00	258.19	226.89	684.58	0.00	6519.84
Taxi		644.56	629.25	81.38	241.71	0.00	99.10	1257.93	63.65	3640.74	355.04	77.95	25.98	96.68	127.30	173.95	541.75	8057.00
Others		732.09	976.13	488.06	732.09	244.03	488.06	1708.22	732.09	9029.16	5673.73	244.03	244.03	976.13	1708.22	1037.13	854.11	25867.32
Costs through specifi	0	11201.38	45427.55	6668.32	21686.61	2789.92	9599.75	34172.63	8949.96	174521.89	109693.23	8670.64	5402.79	15428.23	38671.70	19350.82	17832.37	530067.80
Assignment cost																		
Administrative Supp.																		
Facilities		33.15	1673.95	22.10	33.15	-2789.92	22.10	77.34	33.15	408.82	256.89	11.05	11.05	44.20	77.34	46.96	38.67	0.00
General accounting		-11234.53	6740.72	53.93	160.13		65.65	833.43	42.20	2412.03	247.58	34.42	34.42	64.06	84.34	102.68	358.94	0.00
General manag.			-53842.22	274.71	412.06		13735.26	3102.92	412.06	16401.15	13288.86	137.35	137.35	549.41	961.47	2429.15	2000.47	0.00
Human Res.				-7019.05	219.35		146.23	511.81	219.35	2705.26	1699.93	73.12	73.12	292.46	511.81	310.74	255.90	0.00
Marketing& sales					-22511.29						15082.56	0.00	0.00			2926.47	4502.26	0.00
Costs through Adm.							23569.00	38698.13	9656.71	196449.15	140269.06	8926.58	5658.72	16378.36	40306.65	25166.82	24988.62	530067.79
Support Distribution																		
Operating Support																		
Improvement soft qu.							-23569.00			8249.15	9427.60	1178.45	0.00	1178.45	1178.45	2356.90		0.00
System works								-38698.13			25153.79				3289.34	7507.44	2747.57	0.00
Problem Identification									-9656.71	6566.56	289.70				2221.04	96.57	482.84	0.00
Costs through operat																		0.00
Support Distribution										211264.86	175140.14	10105.03	5658.72	17556.81	46995.48	35127.72	28219.02	530067.79

APPENDIX G
TOTAL PRODUCT COSTS ACCORDING TO TWO ABC METHODS AND THE COMPANY

	1996				1997			
PRODUCTS		COSTS		INCOME		COSTS		INCOME
	ABC (1)	ABC (2)	COMPANY		ABC (1)	ABC (2)	COMPANY	
1.System support for Y bank	55301	58413	99015	80200	196050	211265	210756	239847.3
2.Software development	162182	158216	121610	106783	254769	238487	234742	284508.9
a.Software develop. on mainframe	120108	119632	101807	66783	193260	175140	176057	159016
b.Software develop. on pc	15656	12047	7109	5100	33934	35128	32182	39754
c.Conversion of Q software	26418	26536	12694	34900	27574	28219	26503	85739
3. Giving education	9007	8924	5078	4820	16013	15764	9623	7028
a. Education for MS utilities	3077	3147	2539	1620	3922	5659	4811	1265
b. Education for Q software	5931	5776	2539	3200	12091	10105	4811	5763
4.Software support for Z company	9056	8912	9140	0	18076	17557	17735	4941
5.Software support for Q soft.	18338	19419	19041	11500	45161	46995	57212	116676
TOTAL	253884	253884	253884	203303	530068	530068	530068	653000

		PERCENTAGES				PERCENTAGES		
PRODUCTS	1996				1997			
		COSTS		INCOME		COSTS		INCOME
	ABC (1)	ABC (2)	COMPANY		ABC (1)	ABC (2)	COMPANY	
1.System support for Y bank	0.22	0.23	0.39	0.39	0.37	0.40	0.40	0.37
2.Software development	0.64	0.62	0.48	0.53	0.48	0.45	0.44	0.44
a.Software develop. on mainfr.	0.47	0.47	0.40	0.33	0.36	0.33	0.33	0.24
b.Software develop. on pc	0.06	0.05	0.03	0.03	0.06	0.07	0.06	0.06
c.Conversion of Q software	0.10	0.10	0.05	0.17	0.05	0.05	0.05	0.13
3. Giving education	0.04	0.04	0.02	0.02	0.03	0.03	0.02	0.01
a. Education for MS utilities	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00
b. Education for Q software	0.02	0.02	0.01	0.02	0.02	0.02	0.01	0.01
4.Software support for Z company	0.04	0.04	0.04	0.00	0.03	0.03	0.03	0.01
5.Software support for Q soft.	0.07	0.08	0.07	0.06	0.09	0.09	0.11	0.18
TOTAL	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

APPENDIX H
PROFITABILITY PERCENTAGES OF THE PRODUCTS ACCORDING TO TWO ABC METHODS AND THE COMPANY

	1996			1997		
PRODUCTS	PROFITABILITY PERCENTAGES			PROFITABILITY PERCENTAGES		
	ABC (1)	ABC (2)	COMPANY	ABC (1)	ABC (2)	COMPANY
1.System support for Y bank	0.45	0.37	-0.19	0.22	0.14	0.14
2.Software development	-0.34	-0.33	-0.12	0.12	0.19	0.21
a.Software develop. on mainframe	-0.44	-0.44	-0.34	-0.18	-0.09	-0.10
b.Software develop. on pc	-0.67	-0.58	-0.28	0.17	0.13	0.24
c.Conversion of Q software	0.32	0.32	1.75	2.11	2.04	2.24
3. Giving education	-0.46	-0.46	-0.05	-0.56	-0.55	-0.27
a. Education for MS utilities	-0.47	-0.49	-0.36	-0.68	-0.78	-0.74
b. Education for Q software	-0.46	-0.45	0.26	-0.52	-0.43	0.20
4.Software support for Z company	0.00	0.00	0.00	-0.73	-0.72	-0.72
5.Software support for Q soft.	-0.37	-0.41	-0.40	1.58	1.48	1.04

APPENDIX I

UNIT PRODUCT COSTS AND PRICES ACCORDING TO TWO ABC METHODS AND THE COMPANY

	1996					1997				
PRODUCTS	HUMAN DAY	UNIT COST (1)	UNIT COST (2)	UNIT COST (C)	UNIT PRICE	HUMAN DAY	UNIT COST (1)	UNIT COST (2)	UNIT COST C.	UNIT PRICE
1.System support for Y bank	4500	12	13	22	18	8325	24	25	25	29
2.Software development	5355	30	30	23	20	5014	51	48	47	57
a.Software develop. on pc	3510	34	34	29	19	3557	54	49	49	45
b.Software develop. on mainf.	270	58	45	26	19	669	51	52	48	59
c.Conversion of Q software	1575	17	17	8	22	788	35	36	34	109
3. Giving education	80	113	112	63	60	122	131	129	79	58
a. Education for MS utilities	35	88	90	73	46	30	131	189	160	42
b. Education for Q software	45	132	128	56	71	92	131	110	52	63
4.Software support for Z company	675	13	13	14	0	900	20	20	20	5
5.Software support for Q soft.	1800	10	11	11	6	1575	29	30	36	74

THE COST RATIOS OF THE ACTIVITIES AND THE PRODUCTS TO THEIR TOTAL COSTS IN 1996

	Fringe Be	General Ac	General m	H/R	Marketin	Facility cos	Improvem.	System wor	Registr.of	System g	Softw. (ma	QuantisE	ms educa	Industria	Supp.of so	Softw. (	Conversi
FRINGE BENEFITS																	
Various																	
LABOR COSTS																	
Salaries&wages		0.537	0.513	0.526	0.792	0.626	0.474	0.518	0.540	0.483	0.407	0.358	0.657	0.663	0.535	0.289	0.623
Fringe benefits		0.063	0.012	0.058	0.019	0.080	0.021	0.040	0.055	0.039	0.039	0.019	0.036	0.038	0.035	0.028	0.030
Total labor/fringes		0.600	0.525	0.584	0.810	0.706	0.495	0.558	0.595	0.522	0.446	0.377	0.692	0.701	0.570	0.317	0.652
Specific Assignment cost																	
Depreciation		0.036	0.010	0.033	0.015	0.046	0.012	0.079	0.115	0.081	0.086	0.064	0.031	0.022	0.073	0.088	0.062
Celeaning and security		0.021	0.012	0.030	0.003	0.010	0.005	0.006	0.008	0.000	0.005	0.013	0.024	0.006	0.005	0.004	0.004
IBM maintanance		0.000	0.000	0.000	0.000	0.000	0.000	0.013	0.000	0.017	0.015	0.008	0.000	0.000	0.015	0.005	0.013
IBM rent		0.086	0.023	0.080	0.036	0.109	0.029	0.057	0.075	0.053	0.053	0.030	0.043	0.052	0.048	0.038	0.041
Machine rent		0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.006	0.006	0.003	0.000	0.000	0.006	0.002	0.005
Electricity		0.002	0.000	0.004	0.002	0.005	0.000	0.003	0.002	0.001	0.002	0.001	0.002	0.001	0.002	0.001	0.002
Water		0.005	0.001	0.004	0.002	0.006	0.002	0.003	0.004	0.000	0.003	0.001	0.003	0.003	0.003	0.002	0.002
Stationary		0.017	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.006	0.009	0.000	0.000	0.008	0.008
Telephone		0.005	0.001	0.004	0.002	0.006	0.002	0.003	0.004	0.003	0.003	0.001	0.003	0.003	0.002	0.002	0.002
Building rent		0.115	0.069	0.166	0.019	0.057	0.026	0.034	0.047	0.000	0.029	0.081	0.117	0.036	0.028	0.025	0.021
Management Comm.		0.000	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ads cost		0.000	0.000	0.000	0.033	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Travelling&guest cost		0.000	0.176	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Consultancy		0.025	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Education		0.000	0.000	0.000	0.000	0.000	0.085	0.049	0.000	0.000	0.022	0.000	0.000	0.000	0.012	0.023	0.000
Taxi		0.052	0.015	0.012	0.022	0.011	0.000	0.020	0.039	0.019	0.002	0.009	0.013	0.002	0.001	0.001	0.012
Others		0.035	0.009	0.032	0.015	0.044	0.012	0.023	0.031	0.021	0.022	0.011	0.020	0.021	0.019	0.016	0.017
Costs through specific		0.997	0.848	0.951	0.959	1.000	0.669	0.855	0.920	0.722	0.704	0.607	0.957	0.847	0.783	0.533	0.841
Assignment cost		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Administrative Support Ac		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Facilities		0.003	0.032	0.003	0.001	1.000	0.001	0.002	0.003	0.002	0.002	0.001	0.002	0.002	0.002	0.002	0.001
General accounting/Fin		1.000	0.120	0.011	0.019		0.000	0.018	0.034	0.017	0.001	0.007	0.013	0.002	0.001	0.004	0.010
General manag.			1.000	0.036	0.016		0.327	0.118	0.034	0.108	0.064	0.012	0.022	0.023	0.028	0.085	0.054
Human Res.				1.000	0.005		0.004	0.008	0.010	0.007	0.006	0.003	0.006	0.007	0.008	0.008	0.005
Marketing& sales					1.000		0.000	0.000	0.000	0.000	0.022	0.000	0.000	0.000	0.000	0.064	0.033
Costs through Administrat							1.000	1.000	1.000	0.856	0.799	0.631	1.000	0.880	0.823	0.697	0.945
Support Distribution										0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Operating Support Act.										0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Improvement soft quality										0.091	0.098	0.369	0.000	0.120	0.055	0.000	0.000
System works										0.000	0.102	0.000	0.000	0.000	0.082	0.303	0.050
Problem Identification										0.053	0.001	0.000	0.000	0.000	0.040	0.000	0.005
Costs through operating										0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Support Distribution										1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

APPENDIX K

THE COST RATIOS OF THE ACTIVITIES AND PRODUCTS TO THEIR TOTAL COSTS IN 1997

	Fringe Be	General	General	H/R	Marketin	Facility c	Improve	System	Problem	System	Softw. (	"Q"Educ	Ms educ	Industry	Supp.of	Softw. (p	Conversi
FRINGE BENEFITS																	
Various																	
LABOR COSTS																	
Salaries&wages		0.533	0.507	0.508	0.652	0.635	0.233	0.496	0.599	0.486	0.314	0.351	0.627	0.634	0.500	0.297	0.345
Fringe benefits		0.053	0.009	0.057	0.023	0.071	0.017	0.034	0.062	0.035	0.026	0.016	0.029	0.045	0.030	0.024	0.025
Total labor/fringes		0.586	0.517	0.565	0.676	0.706	0.250	0.530	0.661	0.520	0.340	0.367	0.656	0.679	0.530	0.321	0.369
Specific Assignment co		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Depreciation		0.032	0.009	0.034	0.016	0.042	0.010	0.109	0.037	0.140	0.118	0.079	0.021	0.027	0.119	0.091	0.099
Celeaning and security		0.017	0.011	0.014	0.003	0.009	0.005	0.005	0.009	0.000	0.005	0.024	0.043	0.006	0.005	0.004	0.003
Machine rent		0.000	0.000	0.000	0.000	0.000	0.000	0.048	0.000	0.065	0.047	0.037	0.000	0.000	0.056	0.015	0.046
IBM rent		0.024	0.007	0.025	0.012	0.032	0.008	0.016	0.027	0.016	0.012	0.013	0.008	0.020	0.013	0.011	0.011
Electricity		0.005	0.001	0.007	0.002	0.016	0.002	0.009	0.007	0.004	0.005	0.005	0.003	0.003	0.005	0.003	0.005
Water		0.010	0.003	0.010	0.005	0.013	0.003	0.007	0.011	0.000	0.005	0.004	0.006	0.008	0.005	0.004	0.005
Stationary		0.025	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013	0.014	0.008	0.000	0.000	0.011	0.012
Telephone		0.023	0.006	0.025	0.012	0.031	0.007	0.016	0.027	0.015	0.012	0.009	0.015	0.020	0.013	0.011	0.011
Building rent		0.119	0.075	0.100	0.023	0.063	0.036	0.036	0.065	0.000	0.033	0.246	0.147	0.040	0.033	0.026	0.022
Management comm.		0.000	0.105	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ads cost		0.000	0.000	0.000	0.141	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Travelling&guest cost		0.000	0.077	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Consultancy		0.024	0.000	0.000	0.000	0.000	0.045	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Education		0.011	0.004	0.090	0.030	0.000	0.016	0.030	0.000	0.006	0.003	0.028	0.000	0.015	0.005	0.019	0.000
Taxi		0.057	0.012	0.012	0.011	0.000	0.004	0.033	0.007	0.017	0.002	0.008	0.005	0.006	0.003	0.005	0.019
Others		0.065	0.018	0.070	0.033	0.087	0.021	0.044	0.076	0.043	0.032	0.024	0.043	0.056	0.036	0.030	0.030
Costs through specific		0.997	0.844	0.950	0.963	1.000	0.407	0.883	0.927	0.826	0.626	0.858	0.955	0.879	0.823	0.551	0.632
Assignment cost		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Administrative Support		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Facilities		0.003	0.031	0.003	0.001	1.000	0.001	0.002	0.003	0.002	0.001	0.001	0.002	0.003	0.002	0.001	0.001
General accounting/Fin		1.000	0.125	0.008	0.007		0.003	0.022	0.004	0.011	0.001	0.003	0.006	0.004	0.002	0.003	0.013
General manag.			1.000	0.039	0.018		0.583	0.080	0.043	0.078	0.076	0.014	0.024	0.031	0.020	0.069	0.071
Human Res.				1.000	0.010		0.006	0.013	0.023	0.013	0.010	0.007	0.013	0.017	0.011	0.009	0.009
Marketing& sales					1.000		0.000	0.000	0.000	0.000	0.086	0.000	0.000	0.000	0.000	0.083	0.160
Costs through Administ							1.000	1.000	1.000	0.930	0.801	0.883	1.000	0.933	0.858	0.716	0.886
Support Distribution							0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Operating Support acti							0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Improvement soft quality							1.000	0.000	0.000	0.039	0.054	0.117	0.000	0.067	0.025	0.067	0.000
System works								1.000	0.000	0.000	0.144	0.000	0.000	0.000	0.070	0.214	0.097
Problem Identification									1.000	0.031	0.002	0.000	0.000	0.000	0.047	0.003	0.017
Costs through operatin										0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Support Distribution										1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

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