

**The Excellence of Activity-Based Costing in Cost Calculation:
Case Study of A Private Hospital in Turkey**

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ABSTRACT

Due to the instable global economic conditions, rising healthcare costs, competitive environment, a long term program for the betterment of the health system (health transformation program) in Turkey and increase in the population, better knowledge on cost components, accurate cost calculation for activities, identification of non-value-added activities, and recognition of the activities consuming bigger resources are much more important in today's economy. Therefore, activity-based costing (ABC) is an answer to all concerns. It provides private, government, and university hospitals with reliable cost information and it helps managers identify costly, unprofitable services and improve the pricing policy. The aim of the paper is to prove the excellence of ABC approach in the health sector by implementing activity-based costing in a private hospital in Istanbul, Turkey and by comparing superior ABC results with those of traditional costing. This paper is the first study on ABC having detailed analysis of literature survey and in depth case study of the implementation of ABC in a service firm. In simpler terms, previous papers did not analyze the "various aspects" of the ABC on one paper, which is the main contribution of the paper. Finally, it raises the attention of the practitioners, government, and academics to the superiority of the ABC method for the "health sector".

I. INTRODUCTION

In the United States and Europe, the economic downturn has exacerbated the problem of rising healthcare costs requiring the healthcare industry to provide more care to more people with fewer resources (Goldberg & Kosinski, 2011). Hospitals in the U.S., particularly, face intense pressure from customers, regulators, and resource providers to efficiently produce quality health care (McGowan, Holmes, & Martin, 2007). The massive degree of regulation of the health care industry from the enactment of the Patient Protection and Affordable Health Care Act of 2010 will probably offer some relief on this pressure on rising health care costs, but there is a risk that in the long run, the new law may aggravate the situation. It has thus far. Since the 1980s, there has been a trend in many industrialized countries toward change in managing public institutions, especially in the public health sector (Eriksen & Urrutia, 2005). Likewise, in Turkey, the Ministry of Health initiated a long-term program for the public health sector (the health transformation program) to increase the efficiency and effectiveness of health care management to reduce cost and improve health care quality (Basbakanlik, 2010; Ministry of Health, 2003). Consequently, the calculation of reliable and accurate cost and the identification and elimination of non-value added activities are becoming more significant in the health care sector regardless of nationalized or non-nationalized health care. Activity-based costing (ABC), as a management accounting tool, offers a remedy for accurate costing as well as improvement in efficiency, effectiveness, and quality.

In recent years, especially from 2005 to 2011, there has been an increase in the number of studies on cost-of-illness in the health care sector. These studies included some working papers and published articles discussing the advantages of ABC without disclosing the details of an ABC calculation and its comparison with the traditional costing method¹. The authors believe it helps practitioners and academics to grasp the importance of ABC in the health care industry by visualizing the application processes of ABC. Hence, this paper offers such a comparison in a case study approach.

This study explains the implementation of ABC at a private hospital in Istanbul, Turkey by comparing ABC results with the traditional costing method. Even though the study was of a non-U.S. hospital, the goal of this study and its contribution to the health care industry and academe are to raise the attention of hospital administrators, hospital accounting practitioners, government regulators, and academics to the significance of using ABC in the health care industry (for both profit and nonprofit hospitals and clinics) by providing a relevant detailed literature review, which the authors believe has not been done to date for health care entities, description of the implementation of ABC in a private hospital in Turkey, and comparison and analysis of the results of ABC with those determined under traditional costing.

This paper is organized in three parts. The first part is a discussion of ABC in which the authors, through review of the relevant literature, investigate the contextual, behavioral and technical aspects of ABC, the positive impact of its usage on firm performance and economic efficiency, and the benefits and problems in implementing ABC in hospitals and clinics. The second is the empirical part which includes a discussion of the research design, data collection and analysis. The final part includes the findings, conclusion, limitations and future research opportunities.

¹ The concept and method of "traditional costing", referred to throughout this paper, means the acceptable practice within cost accounting which assumes that products directly consume resources.

II. ACTIVITY-BASED COSTING: THEORY AND APPLICATION

General Electric Company developed ABC in the 1980s as a means to improve the usefulness of accounting information (Johnson, 1992; Kee, 1995). Since its inception at General Electric, the ABC concept has become an accepted practice in management accounting and has been used by many firms, including IBM, Hewlett-Packard, Allen-Bradley, Westinghouse, General Motors, Eastman Kodak, and Lockheed. In order to remain competitive globally, some companies adopted ABC in conjunction with modernization of factories in the U.S. for the purpose of increasing quality and lowering costs (Blocher, Chen, & Lin, 1999). Cooper and Kaplan introduced the ABC system to the academic literature (Kee, 1995).

ABC starts by rejecting the assumption of the traditional costing, that products directly consume resources (Awasthi, 1994), and replaces it with the more accurate assumption that *activities consume resources*. When products or services require those activities, costs are allocated to that product or service (Cooper & Kaplan, 1999). The ABC model is made up of resources, activities, and cost objects. They are connected with each other by cost drivers –resource and activity drivers (Suthummanon et al., 2011). With ABC, manufacturing or service overhead costs are assigned to cost objects, such as products or services, by identifying resources, activities, costs, and quantities needed to produce output. A cost driver is used to calculate the resource cost of a unit of activity. Then, each resource cost is assigned to the product or service by multiplying the cost of each activity by the quantities of each activity consumed in a given period (Blocher et al., 1999). By transforming general ledger costs into activity costs and activity costs into product costs, ABC represents an extension of traditional costing and provides more accurate product cost information (Abu Mansor, Tayles & Pike, 2012; Kee, 1995).

ABC differs in other aspects from traditional costing. ABC focuses on estimating the cost of many cost objects of interest: units, batches, product lines, business processes, customers, and suppliers, whereas traditional costing focuses on estimating the cost of a single cost object—the unit of product or service. Because of the ability to align allocation bases with cost drivers, ABC provides more accurate information to support managerial decisions. Conversely, traditional cost accounting leads to over-costing and under-costing problems because of the inability to align allocation bases with cost drivers. From the cost control view point, ABC allows prioritization of cost-management efforts by providing summary costs of organizational activities (Granof, Platt, & Vaysman, 2000).

ABC offers solutions to weaknesses or problematic areas in using traditional costing. Benefits of using ABC may be numerous, but there may be some disadvantages as well. Before discussing prior studies of ABC from theoretical or practical perspectives, the following describes the advantages and disadvantages of using ABC over traditional costing systems.

An ABC system provides accurate cost information for decision making and planning (Homburg, 2004). The main benefits of ABC may be described as follows: (1) increases awareness of cause and effect relationships, (2) promotes performance improvement, (3) identifies non-value-added activities, (4) motivates cost reduction, (5) reduces arbitrariness in cost measurement, and (6) optimizes use of constrained resources (Eldenburger & Wolcott, 2005).

ABC links cost calculation with activities that characterize each process. For this reason, the system becomes a management tool, which service providers and management within the company may find familiar or understandable. One of the most important advantages of ABC is based on the improvement of decision making regarding financing necessary services in-house, providing new services, and reorganizing of services (Moreno, 2007). It

is a valuable tool for managing costs and improving performances. When conducted effectively, ABC can provide rich insight into a firm's core business processes and help managers change inefficient business practices (Pretko, 2010). This system provides better information about the production process, both to the shareholders and to the managers (Mishra & Vaysman, 2001). Further, it may support implementation of other quality/process improvement programs, such as total quality management (TQM), value chain, and life cycle analysis (LCA) (Banker et al., 2008; Wegmann, 2009). Particularly important for hospitals and clinics, ABC provides information flow that helps managers maximize their resources (Ramsey, 1994), and it creates new options to enhance quality development of service (Yereli, 2009).

Notwithstanding the benefits already enumerated in using an ABC system, there are some potential pitfalls and disadvantages which should be considered during the implementation process. Compared to a traditional costing system, ABC is expensive to implement, time consuming, and hard to adjust (Wegmann, 2009). The successful implementation of ABC depends on various organizational, behavioral, and technical factors. Similarly, Malmi (1999) argues that adoption depends on firm size, production type, degree of centralization, product diversity, and the ratio of indirect to total costs (Kennedy & Affleck-Graves, 2001). Finally, Eriksen et al. (2005) stated that successful design, implementation and subsequent operation of an ABC system in a hospital absolutely need the full collaboration of the clinical personnel in the organization. **Despite the higher expense of implementation, the benefits outweigh its cost for the company having stronger competition and product diversity high in volume, size or complexity (Blocher et al., 1999).**

Review of Prior Research on ABC Systems:

From 1995 to 2012, the majority of scholars have focused on English speaking countries, such as the USA, the UK, Canada, and Australia. There have also been some studies focusing on non-English speaking countries or entities from those countries, including Spain, Finland, Thailand, China, and Turkey². Even though most of the researchers have applied qualitative methods, there are some papers which have utilized empirical and mixed methods. Case studies (qualitative method) of the application of ABC systems have been utilized for a number of industries and organizational types, including non-government organizations (Chiu Ip, Wai Li, & Yau, 2003), manufacturing companies (Roodhooft & Konings, 1996), furniture manufacturers (Suthummanon et al., 2011), and hospitals (Eriksen & Urrutia, 2005; Moreno, 2007; Yereli, 2009). Additionally, research data has been collected, either from primary or secondary sources, in banking (Drennan & Kelly, 2002), automotive (Anderson & Young, 1999; Andersona, Hesford, & Young, 2002), manufacturing (Anderson & Young, 1999; Andersona et al., 2002; Banker, Bardhan, & Chen, 2008; Gosselin, 1997; Krumwiede, 1998), telecommunications (Abu Mansor et al., 2012), information technology (Wegmann, 2009) and hospital firms (Li & Benton, 2003; McGowan et al., 2007) in performing empirical, exploratory, descriptive, and analytical studies.

The research that has been performed on ABC systems have applied a broad range of interdisciplinary theories and views, such as resource-based view (Shapiro, 1999), institutional sociology theory (Eriksen & Urrutia, 2005), management theories, e.g.

² One of the authors has compiled an extensive summarization of published articles on activity-based costing contained in journals for the period 1995-2012. The summarization, which could not be included in this article due to scope limitation, includes a description of the name of the author, journal, year, country, type of research (quantitative, mixed or qualitative), method, theory, sample and main findings. If the reader is interested in this summarization, the reader may contact the corresponding author.

organizational change (Abu Mansor et al., 2012), organizational innovation theory (Gosselin, 1997), institutional theory (Drennan & Kelly, 2002), diffusion theory (Bjornenak & Mitchell, 2002; Malmi, 1999), economic theory (Kennedy & Affleck-Graves, 2001; McGowan et al., 2007), theory of constraints (Kee, 1995; Kee & Schmidt, 2000), process theory (Anderson & Young, 1999; Anderson et al., 2002; Krumwiede, 1998; Shields, 1995) and expectancy theory (Snead, Johnson, & Ndede-Amadi, 2005). Thus, the literature on ABC has been developed over time using a broad swath of research methods and analytical foci.

In addition to empirical research, there has been a wealth of applied research on ABC systems through "propagator" studies (Banker et al., 2008; Chiu Ip et al., 2003; Innes, Mitchell, & Sinclair, 2000; Kaplan & Anderson, 2004; Li & Benton, 2003; Mishra & Vaysman, 2001; Moreno, 2007; Pretko, 2010; Roodhooft & Konings, 1996; Suthummanon et al., 2011; Wegmann, 2009; Yereli, 2009). In general, propagator studies, via the use of case studies, tended to prove the substantial benefits obtainable from implementation of ABC systems in various industries and organizational types. Consequently, the main focus of these studies was not theory building or theory development; rather, it was application of proven theory to expand utilization of the ABC concept.

Even though this paper is a strong propagator study, it also depends on resource-based view of the firm in line with Shapiro (1999), which holds that there is a connection between ABC and the resource-based view of the firm. ABC is concerned with strategic resource planning of the firm by defining resources the firm uses to compete in its market and the costs. The resource-based view is a fairly recently articulated theory (Wernerfelt (1984), still under development, holding that a firm's competitive advantage depends heavily on its heterogeneous resources (Shapiro, 1999).

Application of ABC Systems to Health Care Organizations:

As alluded to in the foregoing discussion, ABC has been successfully implemented in health care organizations in the U.S. since the 1990s, especially in hospitals (Ildir, 2008; Yereli, 2009). The discussion that follows describes how ABC systems have been applied in the health care industry and benefits that have been obtained or specific problems or difficulties that have been noted in practice. Although discussion will principally focus on hospitals (profit and non-profit), much of the discussion would be applicable to large medical clinics as well.

When considering whether to implement ABC in a hospital, a number of factors are relevant and require consideration. These factors may include services offered at the facility, demographic factors like hospital size, location, and staff teaching, and equipment/technology, all of which have causal effects on hospital capacity management decisions. Li and Benton (2003) performed a quantitative study of 157 hospitals in the U.S. and found that hospital capacity management decisions also influenced cost and quality performance. McGowan, Holmes and Martin (2007) surveyed chief financial officers at 114 Texas hospitals and, testing for between-subjects effects, found that the pre- to post- adoption change in return on beds (ROB) is more positive for ABC adopters than for non-adopters when the adopting hospital operates in a for-profit environment. In other words, non-profit hospitals implementing ABC systems did not see a benefit in the ROB metric. The authors of this paper elected to study a private, for-profit hospital in Turkey.

Research on the use of ABC systems in health care organizations need not be limited to studies of U.S. organizations. Though not as extensive as in the U.S., research has been performed abroad. Notwithstanding the fact that many countries around the world have nationalized health care, many countries still are benefited by private, for-profit hospitals. For example, a physician at a private medical clinic recommended that a patient who was

teaching at a university in Sofia, Bulgaria as a Fulbright Senior Scholar, enter a Japanese private hospital for treatment. As a non-citizen, non-resident alien, he was not eligible for care at a public health care institution.

Moreno (2007), using interviews, analyzed the organizational and management structure of mental health public services in Spain. Moreno concluded that using an ABC system improved management since cost calculation based on activities characterized each process. The concept of consideration of each activity and the effect of each activity is similar in effect to other management tools like use of balanced scorecard (Kocakülâh & Austill, 2007) or lean production practices (Kocakülâh, Austill & Schenk, 2011) in health care organizations. Eriksen and Urrutia (2005) investigated the management structure of the Alcorcon Foundation Hospital in Spain. They determined that two factors are important in the health care sector: (1) appropriate utilization of resources, (2) control of costs per unit of services. This conclusion is consistent with recent policy arguments in the U.S. today as reflected by new regulatory provisions for hospitals under the Patient Protection and Affordable Care Act. Therefore, successful design and implementation of an ABC system in a hospital are absolutely necessary.

These studies also depend on institutional sociology theory which posits that hospitals should respond to external environmental pressure to adopt the ABC system. Yereli (2009) studied a public, non-profit Turkish university hospital specifically considering through case study the implementation and comparison of an ABC system with traditional costing. An ABC system had been implemented into the general surgery department of the hospital. Yereli concluded that obtaining costs made more accurate under an ABC system enables hospital managers to analyze and interpret their costing decisions. Moreover, it allows hospital managers to make better decisions in determining their pricing policies and to make more accurate decisions on budgeting and strategy planning (Yereli, 2009).

In addition to the findings from research described above, Chan (1993), Goldberg et al. (2011) and Ramsey (1994) noted that a traditional costing system is not adequate for the demands of the service-intensive, high-technology environment that surrounds a hospital. By using ABC, health care facilities increase cost effectiveness without compromising the quality of service (Hoyt & Lay, 1995; McGowan et al., 2007; Yereli, 2009). ABC helps health care administrators to better plan and control the cost of health services provided (Chan, 1993). All of these improvements in health care management work toward alleviating to some degree the burden of rising health care costs.

Implementation Issues in Adopting ABC Systems:

Factors affecting implementation of an ABC system are important in assessing ABC's cost-benefit and whether maximum utility may be obtained by the organization. Anderson and Young (1999), Anderson, Hesford and Young (2002), Krumwiede (1998), and Shields (1995) studied process theory and contextual, behavior, and process factors for the success of ABC. Based on Anderson and Young (1999), the process of implementation and contextual framework clearly influence the outcomes of ABC implementation. Six independent implementation variables are associated with ABC success or obtaining financial benefit from implementation: (1) top management support, (2) linkage to competitive strategies, particularly quality and JIT/speed, (3) linkage to performance evaluation and compensation, (4) training in implementing ABC, (5) non-accounting ownership, and (6) adequate resources (Shields, 1995).

Furthermore, Drennan and Kelly (2002) and Kennedy and Affleck-Graves (2001) endeavored to prove that ABC has a positive impact on firm performance and economic efficiency. They found that firms adopting ABC systems outperform firms using traditional costing by 27 percent, and they have the largest positive abnormal returns, compared to

non-adopters (Kennedy & Affleck-Graves, 2001). ABC improves economic efficiency of the firm (1) by providing an appropriate cost assignment methodology to support product and customer group profitability, (2) by guiding strategic decision making, and (3) by providing a better basis for identifying inefficiencies through activity analysis (Drennan & Kelly, 2002). Roodhooft and Konings (1996) concluded that an ABC system facilitated the selection and evaluation of suppliers since it focuses on total additional cost minimization in the purchasing process. Of course, based on the McGowan et al. (2007) study, as noted earlier, benefits are more apt to be derived by for-profit, private hospitals than for non-profit or public hospitals.

III. RESEARCH DESIGN AND DATA COLLECTION

Based on a review of the accounting literature on ABC systems, one could logically conclude, as a general proposition, that ABC offers a superior opportunity for management of a firm in spite of some disadvantages like requiring more time and effort to calculate cost. The question then remains as to whether or not a hospital would achieve such benefits. In order to commence the case study, the following proposition was developed:

Hypothesis: Although ABC implementation has some pitfalls, e.g., more time and effort needed to calculate cost, compared to the traditional costing method; it provides more accurate cost and profit information, especially for the service providers having various products, such as private hospitals.

In this study, the goal of the paper is to provide evidence the superiority of ABC over traditional costing. The proposition was tested by the case study approach. The aim of the case studies is the precise description or reconstruction of a case (Flick, 2009). Furthermore, Yin (1994) stated that the case study allows an investigation to retain the holistic and meaningful characteristics of real-life events—such as individual life cycles, organizational and managerial processes, neighborhood change, international relations, and the maturation of industries. The inquiry under a case study approach is subject to certain nuances: (1) the inquiry deals with technically distinctive situation in which there will be many more variables of interest than data points and, as one result, (2) the researcher relies on multiple sources of evidence, with data needing to converge in a triangulating fashion and, as another result, (3) the researcher benefits from the prior development of theoretical propositions to guide data collection and analysis (Abu Mansor et al., 2012; Yin, 1994).

Description of the Subject Hospital:

This case involves a private, for-profit hospital in Istanbul, Turkey. This hospital, established in 1991, belongs to a holding company and is one of the largest private hospitals in Istanbul. It has 11 treatment units. The authors selected the hospital's Gynecology Department as the treatment unit for this case study. The Gynecology Department has 3 sub-units: gynecological problems/disorders, childbirth, and the in vitro fertilization (IVF) units. The childbirth sub-unit of the Gynecology Department provides two services – natural childbirth and caesarean operation. This case study involves inquiry into the effectiveness of implementing an activity-based costing system for the Gynecology Department, specifically the department's childbirth sub-unit, and comparison of the findings under the hospital's traditional costing system with what could have been derived from implementation of an ABC system.

Before analyzing the hospital's accounting system applicable to the Gynecology Department, interviews were performed with the accounting manager and departmental

personnel in the hospital. It was noted from the interviews that the cost accounting system of the hospital was a traditional costing system and the accounting manager was not aware of advantages that could be derived from implementing an ABC system for service sectors having high product diversity.

IV. DATA ANALYSIS

First, the costs of natural childbirth and caesarean operation were calculated by using the current cost accounting method of the hospital (traditional costing). The authors then recalculated costs of services in the Gynecology Department using an activity-based costing system. This afforded an opportunity to compare the two costing systems and to comment on the differences.

The service prices in the Gynecology Department are presented here based on costs, revenues, and activity levels in 2002. Costs and prices were translated from Turkish lira (TL) to U.S. dollars using a current exchange rate of \$1:1.8 TL. Neither the age of the prices/costs nor the translation to U.S. dollars has any impact on the authors' analysis. For discussion purposes, prices, costs and activities will be assumed to have remained static since 2002; hence, present tense is used hereinafter.

The hospital charges a service price of \$328 for natural childbirth and \$583 for childbirth by caesarean operation. In general, the usual in-patient hospitalization period for natural childbirth is one day and three days for childbirth by caesarean operation. On average, the hospital handled 20 natural childbirths and 30 caesarean childbirths. Also, the Gynecology Department averaged monthly salaries for the physician, nurse, laboratory worker, secretary, and the employee working in the dining hall/kitchen of \$722, \$222, \$222, \$278, and \$194, respectively. In addition to his or her fixed monthly salary, the physician also gets a premium for each operation (childbirth handled), either by natural or caesarean childbirth. Nurses and other hospital employees working in or for the department received no premium in addition to his or her salary.

Traditional Costing Method:

Based on information provided by the accounting manager, the direct costs of natural childbirth and caesarean operation were calculated on Table 1. The physician's premium for each childbirth is considered a direct cost, but the fixed salary of the physician is allocated to the indirect cost. Total direct costs of natural childbirth and caesarean operation are \$143 and \$318, respectively.

Table 1: Direct Cost Calculation for the Natural Childbirth and Caesarean Operation

Name of the Costs	Natural Childbirth (stay 1 day in the hospital)	Caesarean Operation (stay 3 days in the hospital)
Doctor's Premium:	\$ 80	\$146
Room Cost:	\$ 28	\$ 83
Medicine Cost:	\$ 17	\$ 44
Operation Cost:	\$ 18	\$ 44
Total Direct Cost:	\$143	\$318

After the calculation of direct costs, the indirect costs items were defined as follows: cost of management, indirect labor, equipment depreciation, maintenance and repairs of equipment, rent, insurance, electricity/heating, cleaning, medical consumables, accounting, information technology (IT), dining hall, laundry services, communications, and office stationery/materials. The first step is to determine the indirect costs allocable to the Gynecology Department.

a) Cost of Management: In the Gynecology Department, there are two physicians and two secretaries.

i) 2 Doctors x \$722 (monthly salary) = \$1,444 x 12 months = **\$17,328**

ii) 2 Secretaries x 278 (monthly salary) = \$556 x 12 months = **\$6,672**

Total Cost of Management = \$24,000

b) Indirect Labor: Four nurses work solely in the Gynecology Department, and 11 departments equally share the allocation of 11 laboratory and six dining hall hospital employees.

i) 4 nurses x \$222 (monthly salary) = \$888 x 12 months = **\$10,656**

ii) 11 laboratory workers x \$222 (monthly salary) = \$2,442 x 12 months = \$29,304/11 departments = **\$2,664**

iii) 6 dining hall workers x \$194 (monthly salary) = \$1,164 x 12 months = \$13,968/11 departments = **\$1,270**

Total Indirect Labor = \$14,590

c) Equipment Depreciation:

Depreciable equipment used in the hospital includes items that are shared by the various departments and items used exclusively in certain departments, such as Gynecology.

i) There are 15 pieces of equipment in the laboratory, and 11 departments equally utilize this equipment. The annual depreciation of this equipment is \$2,778.

\$2,778/11 departments = **\$253**

ii) The annual amortization of two pieces of equipment used only for natural childbirth is **\$1,667**.

iii) The annual amortization of five pieces of equipment used only for caesarean operation is **\$2,778**.

Total Depreciation of the Equipments = \$4,698

d) Repair and Maintenance of Equipment:

The equipment described in the preceding paragraph, for which depreciation was allocated to activities, requires repair and maintenance from time to time.

i) The 15 pieces of equipment in the laboratory has an annual repair and maintenance cost of \$3,333 equally shared by 11 departments.

3,333/11 departments = **\$303**

ii) The annual repair and maintenance cost of the equipment exclusively used for natural childbirth is **\$1,111**.

- iii) The annual repair and maintenance cost of the equipment exclusively used for caesarean operation is **\$1,667**.

Total Repair and Maintenance of Equipment = \$3,081

- e) Rent: Total monthly rent of the hospital is \$1,667. Allocation of this cost is based on usage. The total floor space of the hospital is 2,250 square meters of which the Gynecology Department occupies 375 square meters or one-sixth (1/6) of the hospital floor space. Therefore, the allocation of rent to the Gynecology Department is $1,667/6 = \$278 \times 12 \text{ months} = \$3,336$.

Total Rent: \$3,336

- f) Insurance: The insurance on the building space used by the Gynecology Department is 10% of the annual rent allocated to the department.

$$\$3,333 \times 10\% = \$333$$

Total Insurance Cost: \$333

- g) Electricity/heating: The monthly cost of electricity and heating of the hospital is \$8,333. Since the consumption of electricity and heating expenses are directly related to the area of the Gynecology Department occupies in the hospital (1/6), then the cost of electricity/heating of the department is calculated as follows: $\$8,333 \times 12 \text{ months} = \$99,996/6 = \$16,666$

Total Electricity/Heating Cost: \$16,666

- h) Cleaning: Total annual cleaning cost of the hospital is \$18,667. Since the consumption of cleaning expenses are directly related to the area of the Gynecology Department occupies in the hospital (1/6), then the cost of cleaning of the department is calculated as follows: $\$18,667/6 = \$3,112$

Total Cleaning Cost: \$3,112

- i) Medical Consumables: Medical consumables are surgical supplies, plasters, sterile gloves, injectors, laboratory kits, rolls of paper, etc. Total annual medical consumables cost the hospital \$66,667. It is assumed that these medical consumables are utilized equally by 11 departments within the hospital; thus, the allocation to the Gynecology Department is as follows: $\$66,667/11 \text{ departments} = \$6,061$.

Total Medical Consumables Cost: \$6,061

- j) Accounting: The monthly salary of the accounting personnel is \$1,667. They are responsible for hospital bookkeeping and general management accounting, which encompasses all 11 departments. Since activities of the hospital, for which accounting's services apply, it is assumed that the cost of accounting personnel is shared equally by the 11 departments as follows: $\$1,667 \times 12 \text{ months} = \$20,004/11 \text{ departments} = \$1,819$

Total Accounting Cost: \$1,819

- k) IT: The costs of the IT function are composed of labor compensation, depreciation on computers used in the hospital, and maintenance on those computers. There are two employees in the IT department responsible for servicing all 11 departments. The total compensation paid to both IT employees is \$6,667 annually, and they serve all 11 departments equally. The hospital has 150 computers having annual depreciation of \$16,667 with equal utilization by the 11 departments. The monthly maintenance

cost of these computers is \$556. These computers were not included in the items of equipment described in paragraph c) above.

- i) IT employee salaries: $\$6,667/11$ departments = **\$606**
 - ii) Computer depreciation: $\$16,667/11$ departments = **\$1,515**
 - iv) Computer maintenance: $\$556 \times 12$ months = $\$6,672/11$ departments = **\$607**
- Total IT Cost: \$2,728**

- l) Dining Hall: The annual cost of providing dining and food services within the hospital is \$27,778. Assuming each of the 11 departments equally shared dining services, then the allocation of the dining hall's expense to Gynecology would be as follows: $\$27,778/11$ departments = \$2,525

Total Dining Cost: \$2,525

- m) Laundry: The annual laundry services cost of the hospital is \$2,000. The Gynecology Department only consumes 35% of the laundry services and calculated as: $\$2,000 \times 35\% = \700 .

Total Laundry Cost: \$700

- n) Communication: The annual communication cost, \$21,944, consumed equally by each of the 11 departments. Gynecology's allocation is calculated as: $\$21,944/11$ departments = \$1,995

Total Communication Cost: \$1,995

- o) Office Stationery/materials: The monthly stationery cost of \$833 is consumed equally by each department. Gynecology's allocation is calculated as: $\$833 \times 12$ months = $\$9,996/11$ departments = \$909

Total Stationery Cost: \$909

Gynecology Department Total Indirect Cost: \$86,563

Given the foregoing indirect costs that must be allocated, the Gynecology Department would have total indirect costs of \$86,563 allocated to it. The next step is to determine the indirect cost allocable to the natural childbirth and caesarean operation childbirth according to traditional costing. Initially, this calculation is on a per day basis calculated as follows:

Indirect expenses per day = Total annual indirect expenses / number of patient-days per year

As stated earlier, the Gynecology Department, in addition to providing other services including IVF and gynecological disorders (sub-units), has 50 deliveries per month, 20 by natural childbirth and 30 by caesarean operation. Usually, natural childbirth requires one day stay as an inpatient and caesarean delivery requires three days as an inpatient. Thus, the number of patient-days per year for childbirth is 1,320, composed of 240 by natural childbirth and 1,080 by caesarean operation.

- i) Natural childbirth: 20 deliveries \times 12 months \times 1 day (hospitalization period) = 240
- ii) Caesarean: 30 deliveries \times 12 months \times 3 days (hospitalization period) = 1,080

To assess the allocable share of childbirth via natural or caesarean delivery in the Gynecology Department, calculation of the patient-days for other sub-units is essential. The total patient days for the year for IVF and gynecological disorder services are **1,800**.

The sum total of patient days for the Gynecology Department for the year is 3,120 (1,320+1,800). This provides for the calculation of the indirect costs per hospital inpatient day of \$27.75.

$$\text{Indirect expenses per day} = \$86,563 \text{ total indirect costs} / 3120 \text{ hospital inpatient days} = \mathbf{\$27.75}$$

Based on the usual hospital stay as an inpatient following natural and caesarean delivery, one and three days, respectively, then the indirect cost for natural birth is **\$27.75** (\$27.75 x 1 day per delivery) and the indirect cost for caesarean operation is **\$83.25** (\$27.75 x 3 days per delivery). After calculating the indirect and direct costs for childbirth by natural delivery and caesarean operation under the traditional costing method, the following information summarized in Table 2 regarding cost and revenue becomes relevant for decision making: (1) per delivery cost, revenue, and profit margin of natural births are \$170.52, \$157.26, and \$157.25, respectively and (2) per delivery cost, revenue, and profit margin of caesarean operations are \$401.29, \$182.04, \$181.75, respectively.

Table 2: Cost Details for the Natural Childbirth and Caesarean Operation, based on Traditional Costing Method

	Natural Childbirth	Caesarean Operation
Direct Cost	\$143	\$318
Indirect Cost	\$27.75	\$83.25
Total Cost	\$170.75	\$401.25
Service Price	\$328.00	\$583.00
Service Profit	\$157.25	\$181.75

Activity-Based Costing Method:

As described under the theoretical part of this paper, the ABC system first requires activities and activity pools to be defined. Following that, ABC is performed in two stages: (1) indirect costs are allocated to activity pools and (2) indirect costs are allocated to services.

To begin, the activities are grouped under the related activity pools. As shown on Table 3, there are eight activity pools in rendering childbirth services: patient acceptance and discharge process (A1), laboratory tests (A2), preparation of the patient to the operation (A3), nurses examination (A4), operation/childbirth (A5), baby care (A6), mother care (A7), and food services (A8).

First-stage cost drivers, such as number of employees, patients, computers, meals, area (m²), amount of laundry washed, quantity of medical equipment, and materials used, were then determined for the indirect costs on Table 4. From there, these first-stage cost drivers were allocated to activity pools on Table 5.

Table 3: Activity Pools and Activities Defined for Childbirth Services (based on ABC)

Activity Pools	Activities	
A1- Patient Acceptance and Discharge Process	Registration, approval of the health insurance, patient room allocation and discharge process	
A2- Laboratory Tests	Taking a blood sample, lab tests, receiving the lab report	
A3- Preparation of the Patient to the Operation	Removing cloths, NST (Fetal Non-Stress Test to measure the heart rate of the baby), serum	
A4- Nurses Examination	Nurses examination and informing the patient of the operational/childbirth process	
A5- Operation/Childbirth	Caesarean Operation Taking the patient into operation room, anesthesia process, operation, using medical consumables, birth process	Natural Childbirth Taking the patient into operation room, using medical consumables, birth process, giving medicine/painkiller
A6- Baby Care	Daily baby care (for natural childbirth, it is 1 day, for caesarean operation, it is 3 days)	
A7- Mother Care	Daily mother care (for natural childbirth, it is 1 day, for caesarean operation, it is 3 days)	
A8- Food Services	Food services, 3 times daily (for natural childbirth, it is 1 day, for caesarean operation, it is 3 days)	

Table 4: Indirect Costs and Determination of the First Stage Cost Drivers (based on ABC)

Indirect Costs	Cost Drivers
Cost of Management	Number of employees
Indirect Labor	Number of employees
Equipment Depreciation	Quantity of the medical machines/devices
Maintenance and Repairs of Equipment	Quantity of the medical machines/devices
Rent	Area (m ²)
Insurance	Area (m ²)
Electricity/Heating	Area (m ²)
Cleaning	Area (m ²)
Medical Consumables	Quantity of materials used
Accounting	Number of patients
IT	Number of computers
Dining Hall	Number of meals
Laundry	Amount of laundry cleaned/washed
Communication	Number of patients
Office Stationery/Materials	Number of patients

Table 5: Allocation of the First-Stage Cost Drivers to the Activity Pools (based on ABC)

Activity Pools	Number of Employee	Quantity of the medical equipments		Area (m ²)	Number of Patients	Number of Meals	Number of Computers	Amount of Laundry Washed	Quantity of materials used
A1- Patient Acceptance and Discharge Process	2 Secretary	-		45 m ²	600 ³	-	1	-	-
A2- Laboratory Tests	11/11 Lab ⁴	15/11 ⁵		110m ² /11 ⁶	600	-	2	-	2400 ⁷
A3- Preparation of the Patient to the Operation	0.5 nurse ⁸	-		10 m ²	600	-	-	5110 kg ⁹	6000 ¹⁰
A4- Nurses Examination	0.5 nurse	-		10 m ²	600	-	-	-	-
A5- Operation/Childbirth	2 nurses and 2 doctors	2 for Natural childbirth	5 for caesarean operation	250 m ² (50 for natural childbirth and 200 for	600	-	1	3285 kg ¹¹	19200 ¹²

³ Total 600 patients were calculated as follows: 20 monthly natural childbirth patients *12months= 240 and 30 monthly caesarean operation patients *12months = 360. In all activity pools, all 600 patients received services.

⁴ In the Laboratory, 11 laboratory workers provide services for the 11 departments of the hospital.

⁵ 15 pieces of equipments (machines and devices) in the laboratory are utilized by the 11 departments.

⁶ The area (m²) of the laboratory was divided by 11 departments equally.

⁷ 4 materials were used for each 600 patient (600*4= 2400).

⁸ Only 1 nurse provides both activities: preparation of the patient to the operation (A3) and nurse examination (A4). That is why the cost of the nurse was allocated to A3 and A4 equally.

⁹ Amount of the laundry washed in A3 was 14 kg daily. It was multiplied by 365 days to find the annual amount.

¹⁰ 10 materials were used for each of the 600 patients (600*10=6000).

¹¹ Amount of the laundry washed in A5 was 9 kg daily- 3 kg for natural childbirth and 6 kg for caesarean operation. It was multiplied by 365 days to find the annual amount.

¹² 20 materials * 240 natural childbirth patients and 40 materials*360 caesarean operation patients = 19,200 materials used.

				caesarean)					
A6- Baby Care	0.5 nurse ¹³	-	25 m ²	600	-	-	730 kg ¹⁴	6000 ¹⁵	
A7- Mother Care	0.5 nurse	-	15 m ²	600	-	-	5110 kg ¹⁶	15000 ¹⁷	
A8- Food Services	6/11 ¹⁸	-	110m ² /11 ¹⁹	600	18600	-	2990 kg ²⁰	-	
Total			375 m²	4800	18600	4	17225 kg	48600	

After allocating the cost drivers to activity pools, indirect costs are distributed by using the first-stage cost drivers below. It is summarized on Table 6.

a) Cost of Management:

A1: 2 secretary* 278 monthly salary = 556*12 months= \$6,672

A5: 2 doctors*722 monthly salary= 1,444*12 months = \$17,328

b) Indirect Labor:

A2: 11/11 lab worker*222 monthly salary=222* 12 months= \$2,664

A3: 0.5 nurse* 222 monthly salary=111*12 months= \$1,332

A4: 0.5 nurse* 222 monthly salary=111*12 months= \$1,332

A5: 2 nurses*222 monthly salary= 444*12 months= \$5,328

A6: 0.5 nurse* 222 monthly salary=111*12 months= \$1,332

A7: 0.5 nurse* 222 monthly salary=111*12 months= \$1,332

A8:6/11 employees in dining hall*194 monthly salary=105.82*12 months=\$1,270

c) Equipment Depreciation:

There are 15 equipments in the laboratory and 11 departments utilize these equipments "equally". The annual amortizations of the equipments are \$2,778.

A2: 2,778/11 departments = \$253

The annual amortization of two equipments for natural childbirth is **\$1,667**.

The annual amortization of five equipments for caesarean operation is **\$2,778**.

¹³ Only 1 nurse provides both activities: baby care (A6) and mother care (A7). As a result, the cost of the nurse was allocated to A6 and A7 equally.

¹⁴ Amount of the laundry washed in A6 was 2 kg daily. It was multiplied by 365 days to find the annual amount.

¹⁵ 10 materials were used for each 600 patient (600*10=6000).

¹⁶ Amount of the laundry washed in A7 was 14 kg daily. It was multiplied by 365 days to find the annual amount.

¹⁷ 25 materials * 600 childbirth patients = 15000 materials used.

¹⁸ 6 employees in the dining hall render services for the 11 departments of the hospital.

¹⁹ The area (m²) of the dining hall was divided by 11 departments equally.

²⁰ Amount of the laundry washed in A8 was 8.19 kg daily. It was multiplied by 365 days to find the annual amount.

A5 = \$4,445

d) Maintenance and Repairs of the Equipments:

As stated above, for the 15 equipments in the laboratory, the annual cost of maintenance is \$3,333.

A2: $3,333/11$ departments = \$303

The annual maintenance cost of two equipments for natural childbirth is **\$1,111**.

The annual maintenance cost of five equipments for caesarean operation is **\$1,667**.

A5 = \$2,778

e) Rent, Insurance, Electricity/heating, Cleaning:

Rent: \$3,333 (for details, please refer to page 10)

Insurance: \$333 (for details, please refer to page 11)

Electricity/heating: \$16,667 (for details, please refer to page 11)

Cleaning: \$3,111 (for details, please refer to page 11)

Total: \$23,444

Allocation/loading rate: $\$23,444 / 375 \text{ m}^2 = \$62.52/\text{m}^2$

A1: $45 \text{ m}^2 * \$62.52/\text{m}^2 = \$2,813$

A2: $10 \text{ m}^2 * \$62.52/\text{m}^2 = \625

A3: $10 \text{ m}^2 * \$62.52/\text{m}^2 = \625

A4: $10 \text{ m}^2 * \$62.52/\text{m}^2 = \625

A5: $250 \text{ m}^2 * \$62.52/\text{m}^2 = \$15,629$

A6: $25 \text{ m}^2 * \$62.52/\text{m}^2 = \$1,563$

A7: $15 \text{ m}^2 * \$62.52/\text{m}^2 = \938

A8: $10 \text{ m}^2 * \$62.52/\text{m}^2 = \625

f) Medical Consumables: \$6,061 (for details, please refer to page 11) and 48600 quantity of materials used (for details, please refer to table 5)

Allocation/loading rate: $\$6,061/48600 = 0.1247$

A2: $2400 * 0.1247 = 298$

A3: $6000 * 0.1247 = 748$

A5: $19200 * 0.1247 = 2,394$

A6: $6000 * 0.1247 = 748$

A7: $15000 * 0.1247 = 1,871$

g) Accounting: \$1,818 (for details, please refer to page 11), 4800 patients (for details, please refer to table 5)

Allocation/loading rate: $1,818/4800 = 0.3788$

A1 to A8: $600 \text{ patients} * 0.3788 = \227

h) IT: \$2,727 (for details, please refer to page 12), 4 computers (for details, please refer to table 5)

Allocation/loading rate: $2,727/4 = 682$

A1: $1 * 682 = 682$

A2: $2 * 682 = 1,364$

A5: $1 * 682 = 682$

- i) Dining Hall: \$2,525 (for details, please refer to page 12)

All meal expenses are related to A8, so **A8:** \$2,525

- j) Laundry: \$700 (for details, please refer to page 12) and 17225 kg (for details, please refer to table 5)

Allocation/loading rate: $\$700/17225\text{kg} = 0.0406$

A3: $5110\text{kg} * 0.0406 = 208$

A5: $3285\text{kg} * 0.0406 = 133$

A6: $730\text{kg} * 0.0406 = 29$

A7: $5110\text{kg} * 0.0406 = 208$

A8: $2990\text{kg} * 0.0406 = 122$

- k) Communication: \$1,995 (for details, please refer to page 12) and 4800 patients for details, please refer to table 5)

Allocation/loading rate: $1,995/4800 = 0.4156$

A1 to A8: $600 \text{ patients} * 0.4156 = 249$

- l) Office Stationery/materials: \$909 (for details, please refer to page 12) and 4800 patients for details, please refer to table 5)

Allocation/loading rate: $909/4800 = 0.1894$

A1 to A8: $600 \text{ patients} * 0.1894 = 114$

After distribution of indirect costs by using the appropriate first-stage cost driver, the total indirect costs for patient acceptance and discharge process (A1), laboratory tests (A2), preparation of the patient to the operation (A3), nurses examination (A4), operation/childbirth (A5), baby care (A6), mother care (A7), and food services (A8) are determined to be \$10,752.63, \$6,099.38, \$3,504.72, \$2,548.61, \$49,318.19, \$4,264.16, \$4,940.83 and \$5,134.38, respectively, as shown on Table 6.

Table 6: Distribution of Indirect Costs by using the First Stage Cost Drivers, based on ABC

Indirect Costs	A1	A2	A3	A4	A5	A6	A7	A8
Cost of Management	6,672	-	-	-	17,328	-	-	-
Indirect Labor	-	2,664	1,332	1,332	5,328	1,332	1,332	1,270
Equipment Depreciation	-	253	-	-	4,445	-	-	-
Maintenance and Repairs of the Equipments	-	303	-	-	2,778	-	-	-
Rent, Insurance, Electricity/heating, Cleaning	2,813	625	625	625	15,629	1,563	938	625
Medical Consumables	-	298	748	-	2,394	748	1,871	-
Accounting	227	227	227	227	227	227	227	227
IT	682	1,364	-	-	682	-	-	-
Dining Hall	-	-	-	-	-	-	-	2,525
Laundry	-	-	208	-	133	29	208	122
Communication	249	249	249	249	249	249	249	249
Office Stationery	114	114	114	114	114	114	114	114
Total	10,752 .63	6,099 .38	3,504 .72	2,548 .61	49,318 8.19	4,264 .16	4,940 .83	5,134 .38

In the second step, second-stage cost drivers are defined for activity pools, as depicted on Table 7. Number of patients admitted, medical tests, meals, hospitalization period, time spent for preparation and for examination, and area (m²) are the cost drivers defined for the activity pools.

Table 7: The Determination of the Second Stage Cost Drivers for Activity Pools (based on ABC)

Activity Pools	Cost Drivers
A1- Patient Acceptance and Discharge Process	Number of patients <i>admitted</i>
A2- Laboratory Tests	Number of medical tests
A3- Preparation of the Patient to the Operation	Time spent for preparation (hour)
A4- Nurses Examination	Time spent for examination (hour)
A5- Operation/Childbirth	Area(m ²)
A6- Baby Care	Hospitalization period
A7- Mother Care	Hospitalization period
A8- Food Services	Number of meals

To find the indirect costs for natural childbirth and caesarean operation, the allocation/loading rates for each activity pool should be calculated in the last stage of the ABC method.

A1 (patient acceptance and discharge process): Upon interviewing the manager of the Gynecology Department, it was noted that 12,350 patients had been admitted in the Gynecology Department in a year.

Allocation/loading rate: $\$10,752.63/12,350 = \$0.88/\text{patient}$

A2 (laboratory tests): The number of medical tests performed in the Gynecology Department in a year had been 20,400.

Allocation/loading rate: $\$6,099.38/20400 = \$0.30/\text{test}$

A3 (preparation of the patient to the operation): The time spent in a year preparing patients for childbirth was estimated to be 828 hours.

Allocation/loading rate: $\$3,504.72/828 = \$4.23/\text{hour per patient}$

A4 (nurses examination): The nurse examination period was estimated to be 733 hours annually.

Allocation/loading rate: $\$2,548.61/733 = \$3.48/\text{hour per patient}$

A5 (operation/childbirth): As seen on Table 6, the biggest indirect cost (\$49,318.19) occurs in activity 5, which is the natural childbirth or operation. Consequently, it is the most important item in the cost allocation process. As indicated on Table 7, the second-stage cost drivers for A5 is the area (m²), i.e., the physical or floor space. Deliveries by natural childbirth and caesarean operation are performed in different rooms. Natural childbirth deliveries are performed in the maternity room, but the operating room of the hospital is used for caesarean operations. Maternity room is used exclusively for natural childbirth and measures 50 square meters (m²). Over a year's time, the hospital's operating room is used for 3000 operations in addition to caesarean operation childbirths. The operating room measures 200 square meters (m²). On average, an operation takes one hour of operating room time, so no additional cost difference is considered for caesarean operations. The total hospital floor space required for these two childbirth services is 250 square meters (50 + 200).

i) Indirect cost of each delivery by natural childbirth: $\$49,318.19 \times (50 \text{ m}^2/250 \text{ m}^2) = \$9,863.64/240 \text{ natural childbirths annually} = \mathbf{\$41.10}$

- ii) Indirect cost of each delivery by caesarean operation: $\$49,318.19 \times (200 \text{ m}^2/250 \text{ m}^2) = \$39,454.55/(3,000 \text{ operations} + 360 \text{ caesareans per year}) = \mathbf{\$11.74}$

A6 (baby care): As noted earlier, 1,320 patient-days (natural and caesarean childbirth) in a year are for maternity and baby care, as the baby usually is released when the mother is released from the hospital.

Allocation/loading rate: $\$4,264.16/1,320 \text{ patient days} = \$3.23 \text{ per patient-day}$

A7 (mother care): As noted earlier in the calculation of cost allocation under the traditional costing method, the Gynecology Department's four services result in a total of 3,120 patient-days for mother and women care in a year.

Allocation/loading rate: $\$4,940.83/3120 = \$1.58 \text{ per patient-day}$

A8 (food services): Total annual patient days (3,120) are also valid for the food services in the Gynecology Department in a year. Three meals are served each of these 3,120 patient days.

Allocation/loading rate: $\$5,134.38/3,120 \text{ total patient days} = \$1.65 \text{ per day or } 3 \text{ meals.}$

Finally, the indirect costs for natural childbirth and caesarean operation are computed using loading rates above. As summarized on Table 8, based on an ABC system, the indirect costs for natural childbirth and caesarean operation are \$49.74 and \$40.36, respectively.

Table 8: Indirect Cost Calculation for Natural Childbirth and Caesarean Operation (based on ABC)

Activity Pools	Loading Rate	Cost Driver for Natural Childbirth	Cost Driver for Caesarean Operation	Indirect Cost for Natural Childbirth	Indirect Cost for Caesarean Operation
A1- Patient Acceptance and Discharge Process	0.88	1 Patient	1 Patient	\$0.88	\$0.88
A2- Laboratory Tests	0.30	2 tests	8 tests	\$0.60	\$2.40
A3- Preparation of the Patient to the Operation	4.23	0.1 hours (6 min)	1 hour	\$0.42	\$4.23
A4- Nurses Examination	\$3.48	0.083 hour (4.98 min)	0.5 hour (30 min)	\$0.29	\$1.74
A5- Operation/Childbirth	1 operation	41.10 ²¹	11.74 ²²	\$41.10	\$11.74
A6- Baby Care	3.23	1 day	3 days	\$3.23	\$9.69
A7- Mother Care	1.58	1 day	3 days	\$1.58	\$4.74
A8- Food Services	1.65	1 day (3 meals)	3 days (9 meals)	\$1.65	\$4.95
Total				\$49.74	\$40.36

²¹ See earlier detailed calculations.

²² See earlier detailed calculations.

V. FINDINGS

A comparison of the Gynecology Department's costs for providing natural childbirth and caesarean operation labor, delivery, and maternity services under the tradition costing and activity-based costing systems is shown on Table 9.

Table 9: Comparison of the Costs of Natural Childbirth and Caesarean Operation, based on Traditional Costing and ABC Systems²³

	Traditional Costing for Natural Childbirth		ABC for Natural Childbirth		Change in \$	Change in %	Traditional Costing for Caesarean Operation		ABC for Caesarean Operation		Change in \$	Change in %
Direct Cost	\$143	43.56%	\$143	43.56%	-	-	\$318.06	54.52%	\$318.06	54.52%	-	-
Indirect Cost	\$27.75	8.46%	\$49.74	15.18%	+21.99	+79.29%	\$83.23	14.27%	\$40.36	6.92%	-42.87	-51.51%
Total Cost	\$170.75	52.02%	\$192.52	58.74%	+21.99	+12.9%	\$401.29	68.79%	\$358.42	61.44%	-42.87	-10.68%
Service Price	\$328	100%	\$328	100%	-	-	\$583	100%	\$583	100%	-	-
Service Profit	\$157.25	47.98%	\$135.26	41.26%	-21.99	-13.99%	\$181.71	31.21%	\$224.58	38.56%	+42.87	+23.55%

As indicated on Table 9, based on traditional costing, the Gynecology Department's indirect cost of natural childbirth services is \$27.75 and service profit (gross profit) is \$157.25. On the other hand, the indirect cost calculated using an ABC system (\$49.74) is 79.29% higher than the cost using traditional costing. This results in a 13.99 % decrease in the service profit (\$135.26).

In contrast to natural childbirth, the department's indirect cost for providing labor, delivery, and maternity services by caesarean operation under an ABC system (\$40.36) is lower than the cost under a traditional costing system (\$83.23). In line with the decrease in indirect cost under ABC, the service profit increased from \$181.71 to \$224.58, which is a 23.55% difference.

Moreover, for the natural childbirth, indirect cost is 8.46% of the service price in traditional costing method; however, it is 15.18% of the service price in ABC. Therefore, service profit is 13.99% lower in ABC costing for natural childbirth service, compared to traditional method.

²³ Due to the disclosure with only two digits, there are minor and insignificant differences occur in the percentage calculations.

Conversely, for the caesarean operation, indirect cost is 14.27% of the service price under traditional costing method; however, it is 6.92% of the service price under ABC. Therefore, service profit is 23.55% higher under an ABC system for caesarean operation service, compared to traditional costing.

As discussed above and on Table 9, the indirect costs are significantly different in both methods due to the logic behind the cost allocation process. Even though indirect cost of natural childbirth increased under an ABC system, compared to traditional costing, it decreased for caesarean operation service under ABC. The main difference came from the activity 5- operation, which is the highest amount as seen on Table 6. Since caesarean operations are performed in the operating room of the hospital, it shares the cost with the other departments. However, natural childbirth happens only in the maternity room. Hence, the indirect costs of caesarean operations decreased and those for natural childbirth increased under activity-based costing compared to traditional costing.

VI. DISCUSSION AND CONCLUSION

By using an ABC system, hospital managers are able to get more accurate and meaningful indirect cost allocations which provides for better analysis for revenue and cost decisions. In this case study using an ABC system, deliveries by natural childbirth is less profitable (-13.99%), but deliveries by caesarean operation is more profitable (+23.55%) than was shown under traditional costing. If the managers of this hospital in Istanbul identified the key activities consuming more resources, such as operation-activity 5 under ABC, then, for caesarean operation service, they could overcome the over-costing problem resulting from the use of the traditional costing method. Thus, they could compete better with the other private hospitals in the city by improving their pricing policy. Competition among Istanbul's private hospitals is very robust. This finding also proves the theory of RBV (resource-based valuation), which posits that a firm's competitive advantage heavily depends on the resources and the identification of the key activities (Shapiro, 1999).

As hospitals must become more cost conscious, they must closely scrutinize service price and cost. To be sure, this Turkish hospital cannot specialize in caesarean births, nor can it choose to perform deliveries of babies by caesarean but not by natural childbirth. It can, however, more closely monitor the cost of those activities in a manner not inconsistent with kaizen continuous process improvement and lean production practices. Furthermore, costs or activities may be shed that are not necessary or do not add value to the hospital or patients. In this case the cost of delivery by natural childbirth may be reduced by increasing the number of deliveries, making the use of the delivery room more efficient. Physicians and nurses may be more efficient as well.

The indirect cost and gross profit of the services or products are significantly different if ABC is selected as an indirect cost allocation method. These differences are gaining more importance if the company has stronger competition and has more product diversity high in volume, size and/or complexity.

ABC method is an essential management decision tool to provide more accurate product costing information, to compare the profitability of the product/service diversity, and to identify lost leaders and unprofitable products and services. Furthermore, by using ABC, managers can make more accurate decisions on budgeting and strategy planning (Yereli, 2009).

Although the ABC system is a time-consuming, labor-intensive process and its success depends on various factors, e.g. organizational, behavioral, and technical factors, all in all,

it should be acknowledged that the ABC system is a useful tool for better management of the business and it can play a significant role in a firm's success (Suthummanon et al., 2011).

VII. IMPLICATIONS, LIMITATION AND FUTURE RESEARCH

The finding of the paper is significant especially for the service firms having high service/product diversity and operating highly competitive environment. Since this paper considers every aspect of the ABC systems, such as success factors, pitfalls, theoretical backgrounds and practical implications, both practitioners and academics can benefit from this study. It is such a guide for the service managers, e.g. hospital managers, if they are interested in getting the accurate costing and increasing the profitability of their firms.

However, the limitations of the study are that the authors focused on only the private hospital and merely 2 services/products in the Gynecology Department. However, it could be better to analyze other departments, services, and even a not-for profit hospital, to compare the findings, which will be a future research topic in this area.

To sum up, the significance of getting accurate costing is inevitable for business, especially for hospitals, in today's economy due to the rising health care costs, instable global economy and high competition in the private health sector. Therefore, there is a current need to remind the prominence of ABC by the help of future studies in academy and practice in addition to this paper.

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