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TIME-DRIVEN ACTIVITY BASED COSTING

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--Abstract--

The most discussed issue in recent times in cost accounting literature is the inadequacy of traditional methods for the distribution of general production expenses into product costs due to the proportional increase of general production expenses in unit costs. The introduction of advanced automated production systems and the implementation of new production techniques and methods, as well as the increase in competition and globalization has forced companies to be more precise in the determination of unit costs.

The fact that the share of direct labor costs in the unit costs have fallen with the use of new production techniques has led to an increase in general expenses in unit costs. This has also led to the mandatory emergence of new methods in the loading of general expenses onto product costs.

Time-Driven Activity Based Costing method has attracted the attention of researchers in recent years since it is simple and quick to install, easy to update, it takes the idle capacity into account in cost calculation, and it is able to provide

managers with features such as resource planning. Therefore, in this study, Time-Driven Activity Based Costing method is compared with traditional methods.

Keywords: Activity-Based Costing, Time-Driven Activity-Based Costing, Traditional Costing

JEL Classification: M41

1. INTRODUCTION

Accounting practices and theory has survived for over 6,000 years. The first know document about accounting is "Summa Arithmetica, Geometria, Proportione et Proportionalita" which was written by Luca Pacioli at 15th century. Pacioli is considered the father of modern double-sided accounting. The first financial reporting text which is integrated with cost accounts belongs to Garcke, E. and Fells (1887) is considered as the written text by historians.

Cost and management accounting has been developed as an application in the second half of the 19 th century. Cost and management accounting are considered to provide information to managers for large capital-intensive firms. However, on increasing investment in fixed assets is not enough to solve the complex problems. During this period, the textile industry began to develop with the development of cost and management accounting systems.

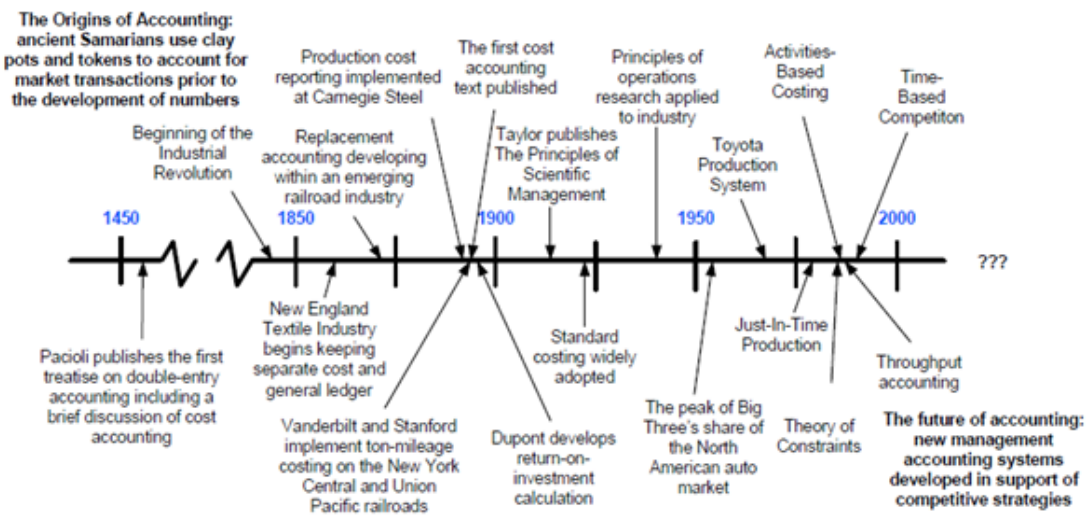
Between 1850 and 1925 due to the expansion of production and distribution enterprises, the development of transportation, capital-intensive businesses are geographically dispersed, and the causes of the proliferation of these businesses with the emergence of new methods of modern management accounting needs have continued to evolve. This is the standard costs in the factories are beginning

to be widely implemented. Distribution of overhead expenses to products to gain importance in this period.

The most brilliant period of mass production in the USA in 1955 is automobile industry. The industrial market are controlled by General Motors, Ford and Chrysler known as the big three. Despite the radical changes in modern manufacturing strategies and technologies in the accounting system does not appear to change too much. During this period, the first direct determination of product costs, raw materials, direct labor and manufacturing overhead costs are included to a certain extent. By the year 2000 just in time production, activity-based costing, activity-based costing is based on the time, the process in the face of accounting and emerging needs of modern methods, such as kaizen costing systems.

Figure 1 is examined nuhasebesi management, cost accounting, and is parallel to the development of the industry.

Figure 1: A Time-Line of Managerial Accounting and Industrial Developments.



Source: Robert Hutchinson: 2007

Kaplan and Cooper illustrate the four stages of cost systems. According to these authors, some businesses today takes place at stage 1 and the systems have some missing features. They provides insufficient information for the purposes of financial reporting Even a lot of information may be incorrect. Even very large companies continue to use the old and inadequate cost systems. The second stage cost systems compatible with the auditing standards, it is appropriate for the needs of financial reporting, but it provides limited information to the people.

Product costs are calculated incorrectly. The third stage is the activity-based costing systems. Activity-based costing systems provides accurate information about products, services and customers' costs, operating costs and business

process costs. Monitoring and learning systems gives employees new and timely feedback. It also helps them to solve problems and improve operations.
Integrated systems are considered as the cost of the systems at the fourth stage. At this stage in the budgeting and planning systems, allows you to make the right decision is the maximum level. Figure 2 also shows the four stages.

Figure 2: Four - Stage Model of Cost System Design

Systems Aspects	**Stage I Systems** Broken	**Stage II Systems** Financial Reporting-Driven	**Stage III Systems** Specialized	**Stage IV Systems** Integrated
Data Quality	*Many errors *Large variances	*No surprises * Meets audit standards	*Shared data - bases * Stand- alone systems *Informal linkages	* Fully linked databases and systems
External Financial	*Inadequate	*Tailored to financial reporting needs	* Stage II System maintained	* Financial reporting systems
Product/ Customer Costs	*Inadequate	* Inaccurate * Hidden costs and profits	* Several stand-alone ABC systems	*Integrated ABM systems
Operational and Strategic Control	*Inadequate	* Limited feedback * Delayed feedback	* Several stand-alone performance measurement systems	*Operational and strategic performance measurement systems

Kaynak: Kaplan ve Cooper (1998: 12)

3. LITERATURE REVIEW

Activity-based costing in the 1990s, had the opportunity to practice and has benefited companies. The studies in the United Kingdom on the adaptation of Activity Based Costing system and the application was made in the 1990s,the rate was at 10%. (Innes and Mitchell, 1991; Nicholls, 1992; Drury et al, 1993). After nearly nine years of their studies, these studies in the UK, Innes et al. (2000:352) stated that 177 large firms, 18% are using FTM Banerjee and Kane, in 1996, 22% in 1996, 21% of Evans and Ashworth, Drury and Tayles made in 2000 that 23% of applications that work reveals. Limerick in 2001, and again in the UK Affleck - Graves's largest 1000 companies have estimated that about 20% of the rate of use of FTM.

Bruggeman et al. (1996: 15) states that the level of 19% of Belgian companies use FTM. In Finland in 1995, 24% (Virtanen et al, 1996) as described. In Europe, the low application rates in Denmark (İsraelsen et al, 1996), Sweden (Love et al. 1996) and Germany (Scherrer, 1996) are reported. Greece (Ballas and Venieris, 1996), in Italy (Barbato et al, 1996) and in Spain (Saez-Torrecilla et al, 1996) did not see their work with activity-based costing system and report adopted. Cohen et al. in 2003 (2005: 988) in their study of Greece's 88th largest firm in the level of production is about 35% of companies use FTM.

In a study of 88 industrial companies in Turkey in 2000 FTM with a company that implements the method is encountered in its entirety (Öker, 2000: 96). Büyükşalvarcı of his study on the bank of the banks in 2004, 26% of 42 FTM refers to implementing the system. Turkey's top 500 industrial companies in 2005 formed the study population Saygıner 112 enterprise research, 51.8% of the cost of traditional methods used for 48.2% of the costs is that they used in determining activity-based costing system (Saygıner, 2007: 75). Karcıoğlu and Öztürk, 87 industrial enterprises in 2011 a study on the 58 companies listed on the ISE method applies the FTM report that (Karcıoğlu and Öztürk, 2012).

2. BACKGROUND From ABC To TDABC

Differences between the activity-based costing systems by conventional methods briefly summarized in figure 3. (Horngren and Foster: 156-157)

Figure 3: Comparison of Conventional Systems and Activity-Based Cost Systems

Typical Systems	**Activity-Based Accounting Systems**
One or a few indirect cost for each department or whole plant	Many Sindirect cost pools because of many activity areas. Operating personnel play a key role in designating the areas
Indirect cost application bases are may be cost drivers.	Indirect cost, application bases are more likely to be cost drivers
Indirect cost application bases are often financial, such as direct labor costs or direct material costs.	Indirect cost, application bases are often nonfinancial variables, such as number of parts in a product or hours of test time

Activity-based costing systems, seeking the answer to the following four. (Kaplan and Cooper, 1998: 79).

- What activities are being performed by the organizational resources?
- How much does it cost to perform organizational activities and business processes?
- Why does the organization need to perform activities and business processes?
- How much of each activity is required for the organizations products, services and customers?

In the initial years of activity-based costing systems are known to provide benefits to companies. Because of improving technologies, changes of production environments, changes in cost factors (directly overhead expenses decreased rapidly increasing labor costs), customer diversity (more than one country, the people of the product sold to international competition), activity-based costing methods, application factories in a complex and intricate structures team leads to

negativity. Problems encountered in implementation of activity-based costing system are summarized briefly as follows (Kaplan and Anderson, 2007: 8).

- The interviewing and surveying process was time-consuming and costly.
- The ata for the ABC model were subjective and diffucult to validate.
- The data were expensiveto store, process, and report.
- Most ABC models were local and did not provide an integrated view of enterprisewide profitability opportunities.
- The ABC model could not be easily updated to accommodate changing circumstances.
- The model was theoretically incorrect when it ignored the potential for unuced capasity.

In Belgium Sanac Firm Activity-based costing Evereart and colleagues also mentioned similar problems. Belgium people speak three languages. (a salesperson, a customer Flamence speaking, French-speaking and German-speaking customer or a customer). For this reason, the time taken to process an order on the phone is important. Customers who purchase customer type, regular or irregular, the number of customers needed to manually calculate the order form filled out by the customer or sales representative or order forms filled out shows that the time spent is crucial. Activity-based costing is the first time in the first half of 2005. Then, in December, operating costs are recalculated. Operating costs are significant differences are observed. This season, due to low explained. It means that in this case, customers are consuming more resources than the busy season. To prevent this and every season to remain the same activity cost driver rates are used in determining the practical capacity should be taken into account. Another issue pointed out that during the application, the demand of each customer order and delivery that does not have separate features. The number of studies is not sufficient as a stand-alone cost of the drive at the same time the

number of orders, number of pallets required to install, the box and the number of containers and packaging should also be considered in the absence of the need arise. Therefore, all these things will be in the quest for an alternative method results in a significant way recently discussed in the literature, without losing the properties of activity-based costing system developed is based on the time the decision to establish the method of activity-based costing.

Since the mid-1980s, activity-based costing in customer profitability analysis is known to provide an overview of the new managers. However, implementation and sustainability problems of the traditional activity-based costing models causes that it will not be a modern management tool. Activity-based costing method that eliminates these problems and the Time-Driven Activity Based Costing system idle capacity into account the advantages are summarized as follows (Kaplan and Anderson, 2007: 18);

- Easier and faster to build an accurate model,
- Integrates well with data now available from ERP and customer relationship management systems (this makes the system more dynamic and less people - intensive),
- Drives costs to transactions and orders using specific characteristics of particular orders, processes, suppliers and customers,
- Can be run monthly to capture the economics of the most recent operations,
- Provides visibility to process efficiencies and capacity utulization,
- Forecasts resource demands, allowing companies to butget for resource capacity on the basis of predicted order quantities and complexity,
- Is easily scalable to enterprisewide models via enterprise-scalable applications software and database technologies,

- Enables fast and inexpensive model maintenance,
- Supplies granular information to assist users with identifying the root cause of problems,
- Can be used in any industry or company with complexity in customers, products, channels, segments and processes and large amounts of people and capital expenditures.

Activity-based costing, activity-based costing systems implementation method based on the time differences are summarized briefly as follows (Evereart at all: 2008).

Panel A: ABC

Step 1: Identify the different overhead activities
Step 2: Assign the overhead costs to different activities using a resource driver
Step 3: Identify the activity driver for each activity
Step 4: Determine the activity driver rate by dividing the total activity costs by the practical volume of the activity driver
Step 5: Multiply the activity driver rate by the activity driver consumption to trace cost to orders, products or customers

Panel B: TDABC

Step 1: Identify the various resource groups (departments)
Step 2: Estimate the total cost of each resource group
Step 3: Estimate the practical capacity of each resource group (e.g. available working hours, excluding vacation, meeting and training hours)
Step 4: Calculate the unit cost of each resource group by dividing the total cost of the resource group by the practical capacity
Step 5: Determine the time estimation for each event, based upon the time equation for the activity and the characteristics of the event
Step 6: Multiply the unit cost of each resource group by the time estimate for the event

4. RESEARCH and CONCLUSION

Application factory is Eryiğit Inc in Ankara Organized Industrial Zone within the boundaries of the application area of 10.000 m^2 with manufacturing operations. All activities are carried out in Ostim factory building. As a leading medical device manufacturer company in Turkey since 1991 serving the health care industry to this day. Company is manufacturing both domestic and abroad. Eryiğit university hospitals in Turkey, training and research hospitals, government health care institutions such as hospitals and military hospitals, central sterilization unit project design, installation and commissioning services are also provided. Eryiğit Inc. operating tables and gynecology, manufactures tables and steam sterilizers. Information about the application is used by the factory in 2012. This information is taken from units interviews with responsible officials, employees, interviews, observations, accounting information system and the computer database. First, by examining the flow chart of the company's business and the company as a result of discussions with resource groups have been identified. 1 Step sections are determined amount of cost drivers and cost allocation are carried out.

After the cost of the distribution of segments theoretical capacity per employee is determined primarily. In 2012, the end of 53 weeks, 15 days official authorization 5 days, excuse, sick leave and 8 days public holiday work is actually removed and 284 work day is determined. This also means that they attempt days 9 hours to 2556 hours. 1 hour lunch break and tea break of 15 minutes twice a day when the time is 7.30 hours of practical work. 2,073 hours a year, which means a worker to work. 2,073 hours a year, which means a worker to work. This information is necessary to determine the rate of movement capacity and cost. Practical capacity of each of these ratios are determined by dividing the total cost of the resource group. Table 1 also shows the values for the purchasing department.

Table 1: Capacity Cost Rates

PRODUCTION DEPARTMENTS	Number of Employees	Daily working time (hours)	Daily working time (minutes)	The annual capacity of the theoretical time (minutes)	Idle capacity (minutes)	Annual Practical Capacity (min)	The total cost of the department	Unit operating costs
Purchasing	1	9	540	153360	28980	124380	54.161,57	0,4354

To create equations in the time of purchase; processes for the production of the necessary operations section, the time required for the realization of activities, drivers, and the amount of time to be determined. Be part of purchase orders, purchase order form preparation activities are carried out orders given minimum stock level determination. The factory in Germany, Denmark, China, France, Italy, from 15 countries, including exports about. In the case of domestic and overseas suppliers of the plant to the distribution of the costs of this situation should be taken into consideration. Phone calls are enough to get goods from a supplier in the country bt mail and correspondence are needed to get goods from overseas suppliers. This is required for domestic and foreign suppliers as a result that differs periods. Activity-based costing system is based on the time it takes into consideration the differences in costs reflect accordingly. Table 2 shows the operations section of the purchase, and the operating time is the time drivers.

Table 2: Activities and Times of Purchase Department

Processes	Operatıons	Unit operates time (minute)	Total time (minutes)	Time Drıvers
Order to obtain	Arrive in-order -Order of approval	10 27	37	Order number
Purchase request form preparation	-Purchase the correct identification of the needs of -Try to get approval	35 20	55	Number of requested materials
To be ordered	-Alternatively, invite proposals from suppliers Evaluation of the tenders -The order granting	10 25 10	45	Given the number of orders
Determination of the minimum stock level	-The quality control of the material -Proper / red Giving	30 26	56	Number of rejected product

37 minutes in order to be taken while domestic orders abroad are required to order additional 75 minutes.

The process of taking these explanations in order equation of motion = 37*X1+75*X2

X1= Order Number, X2= The number of orders abroad

The process of preparing the purchase request form in addition to a total of 55 minutes and 90 minutes are needed overseas suppliers. The process of preparing the purchase request form equation = 55*X1+90*X2

X1= Number of requested materials, X2= Number of foreign demand

The process of your order in addition to a total of 45 minutes, 75 minutes from when the order process should be realized abroad. In this case, the equation should be ordered in the process of = 45*X1+75*X2

X1= The amount of the order, X2= The amount of overseas orders

Determination of the minimum stock level of quality control of the material from the pool and appropriate activity / activities carried out be rejected. 30 minutes of quality control of the material from the appropriate / rejection given 26 minutes to complete. This information of the analysis of Table 1 shows the data needed.

The process of determining the minimum stock level equation = 56*X1

X1 = The amount of rejected product

After set of equations for each product group is required to determine the amount of time necessary driver. This information is generated by the accounting database. Table 3 shows the amount of time the driver portion of the purchase.

Table 3: Part Time Driver Amount of Purchase

Products	Time Drives and Amount						
	Order Number		Number of requested materials		The amount of the order		The amount of rejected product
	Domestic	Abroad	Domestic	Abroad	Domestic	Abroad	
ERS 6613	32	3	154	5	154	5	1
ERS 6610	21	2	96	2	96	2	1
ERS 75	19	3	95	2	95	2	1
ERS 5510	16	6	99	1	99	1	0
ERS 5512	14	6	90	0	90	0	0
ERM 2000	22	6	103	2	103	2	40

ERM 2000F	35	8	155	2	155	2	0
201	1	1	4	3	4	3	0
202	6	6	22	0	22	0	0
203T	6	0	23	0	23	0	0
204	44	0	208	6	208	6	0
200D	4	4	15	1	15	1	0
Toplam	220	45	1064	24	1064	24	43

After determining the necessary drivers when you purchase department substituting equations periods requested by each product is calculated. After determining the cost of the units multiplied by the requested time periods used in the cost of the purchase department is determined.

Table 4: Calculation of the costs assigned to the Department of Purchasing goods

Operations	**Order to Obtain** (a)	**Purchase Request form preparation** (b)	**The order granting** (c)	**Minimum stock level determination** (d)	**Part of the time of purchase request (Minutes)** (x= a+b+c+d)	**The cost of the unit's activity (Minutes)** (y)	**Purchasing section products costs are assigned to** (z=x*y)
Time Equations	(37*X1+75*X2)	(55*X1+90*X2)	(45*X1+75*X2)	(56*X1)			
ERS 6613	1409	8920	7305	56	17690	0,4354	7702
ERS 6610	927	5460	4470	56	10913	0,4354	4752
ERS 75	928	5405	4425	56	10814	0,4354	4708
ERS 5510	1042	5535	4530	0	11107	0,4354	4836
ERS 5512	968	4950	4050	0	9968	0,4354	4340

ERM 2000	1264	5845	4785	2240	14134	0,4354	6154
ERM 2000F	1895	8705	7125	0	17725	0,4354	7717
201	112	490	405	0	1007	0,4354	438
202	672	1210	990	0	2872	0,4354	1250
203T	222	1265	1035	0	2522	0,4354	1098
204	1628	11980	9810	0	23418	0,4354	10196
200D	448	915	750	0	2113	0,4354	920
Total							54113

The results obtained from the application of time driven activity-based costing system can be summarized briefly as follows. Company made the application through different processes and different products are sold to different customers. For this reason, resource consumption levels of the products vary. Be taken into account in determining the cost of time consumed in the product gives more accurate results. Down to the cost of the follow-up activities with the factory TDABC it is possible to do. Just when you need to update the equation will be determined and put in place are sufficient. Times based on the time allocated to the activity-based costing for clients with domestic and overseas customers, taking into account the profitability of the plant for the possibility of comparison arises. Employees to take account of the time spent in vain another advantage of this method is observed. From the results of using this method of time driven activity-based costing is thought to be an accurate method for determining product costs.

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