TIME DRIVEN ACTIVITY BASED BUDGET IN STRATEGIC DECISIONS; IMPLEMENTATION IN A MANUFACTURING COMPANY

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Abstract

This study was carried out in order to find out the applicability of time-driven activity based butgeting method at manufacturing companies in Turkey. The results obtained from the application of time driven activity based butgeting system can be summarized briefly as follows. Company makes 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 Time Driven Activity Based Costing it is possible to do. Just when you need to update the equation will be determined and put in place are sufficient.

Keywords: Time Driven Activity Based Budget, Costs, Budget

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1 Introduction

It is known that the budget which is not supported by the management, will be unsuccessful. Therefore budget must be supported by the management. Budget should be regulated by responsibility centers. Budget should be prepared in a participatory manner. Budget targets should be realistic. The budget must be approved by senior management. Budget revisions should be made without disturbing the integrity of the budget (H. Kamil, 2010).

There are many benefits expected without budget. Predicting the future is expected to be one of the most important benefits of a budget. Up to even the largest firms, starting from an individual even states are seen as preparing the budget of each institution. A plan prepared by budgeting and are moving within the plan. It was determined that there is a deviation in the plan can easily be corrected through budgeting. To provide communication between departments within the organization thanks are expressed during preparation of budget and expectations of each chapter. During the period thanks to the success of the organization can be measured by budgeting. In measuring the inefficiency occurring in section it is possible to benefit from the budget. Budgeting functions are described briefly as follows: Budgeting is considered as planning, auditing, performance evaluation, coordination, communication and motivation tool (H. Kamil, 2010, Libby et.al., 2009).

Time driven activity based budgeting, is the exact opposite of the time driven activity based costing method. Time driven activity based costing model, based on capacity used; time by means of equations and capacity cost ratio, the order of the resources, products and manage costs up to customers. On the contrary, Time driven activity based budgeting; volume and mix of products, orders, services and start by identifying customers. Then; estimates the amount of capacity that must be provided to meet the demand predetermined cost and authorized to provide the resources needed capacity that finally calculates the budget and the process is repeated. Basically the company through models, created the first Time driven activity based model, until you reach the targeted profitability scenario constantly trying different scenarios, assumptions diversifies (Robert S. And Steven R., 2007).

Expected benefits from Time driven activity based budgeting is the described in the following way. (Robert S. And Steven R., 2007);

- ✓ Estimates the necessary resources to meet the demands of the future and determinen the cost.
- ✓ In items related to the traditional budgeting process eliminates unnecessary work, such as negotiations.
- ✓ Through a transparent analysis gives the spending authority for the staff, determine the work needed to be done to meet the sales and production forecasts and hardware resources in line with the work.

✓ Budgeting, makes the indirect costs more transparent and encourages efficiency. Database technology and enterprise scalable software is integrated into the business model can be easily applied through.

✓ Offers a Quick and easy model solution.

Steps should be performed in time driven activity based budgeting process is described below (Robert S. And Steven R. 2007);

✓ The first step in budgeting based on the time of operation is important to develop activity-based cost model.

✓ Business of the product, the calculation of customer service and profitability.

✓ Business are taken on issues such as process development, pricing, product and customer mix, product design and customer relations.

✓ Entity's future capabilities and the volume of transactions for essential in making production and sales forecasts of the decisions taken to improve profitability.

✓ Calculation of the entity's sales and demand of resource capacity to meet future production estimates.

✓ To determine how to do the expenditure expected to provide resource capacity in the future business.

2 Develop time driven activity based cost model

Since the mid-1980s, the managers on activity-based costing and customer profitability analysis provides a new perspective. Unfortunately traditional Activity Based Cost model implementation and sustainability problems experienced in effectively prevented up to date and modern management tool. Time driven activity based cost method has overcome these challenges. The benefits of the use of time driven activity based cost methods are listed as follows: (Robert S. And Steven R.,2007; Patricia And Werner, 2008).

✓ A an accurate model can be installed easily and quickly.

✓ ERP and information received from the customer relationship management system can be integrated in a good way.

✓ Order of suppliers and customers by using cost drivers and cost by using certain features, such as process can be distributed to transactions and orders.

✓ Monthly basis to measure the efficiency of most current activities, can be used.

✓ Provide the measurement of process efficiency and capacity utilization.

✓ For the budgeted capacity of the resource is to provide opportunities for companies to estimate the demand for resources.

✓ With the help of database technologies and enterprise-wide computer programs, and can be easily implemented.

✓ Model is inexpensive and quickly achieved.

✓ Information to determine the root cause of the problem is provided to the user.

✓ It can be used in the company and capital expenditure which has complicated customers, products, channels, sections and the process resource group

Stages of time driven activity based cost method was performed as follows (Patricia And Werner, 2007).

Step 1: Enterprise resource groups (the department) determination

Step 2: Determination of the total cost of each resource group

Step 3:Determination of the practical capacity of each resource group (vacation, meeting and working hours outside training hours)

Step 4: Determination of the unit cost of the resource group with the practical capacity of the division of the total cost

Step 5: When making the detection time required for each activity and events to create the equation

Step 6: Cost ratio of total time with the capacity required for each resource group to determine the cost of multiplying the.

3 Research methodology

In this study the implementation of the time- driven activity based costing is conducted in the a factory. The factory that is established in 1991 manufactures central sterilization units, sterilizers, wsher disinfectors, tables for operating tables and patient beds. The factory in Germany, Denmark, China, France, Italy, from 15 countries, including exports about. The factory is well-known company as being one of the pioneer medical device manufacturers. To reach the best quality in production, international standards of ISO 13485 in quality management system has been adopted recently.

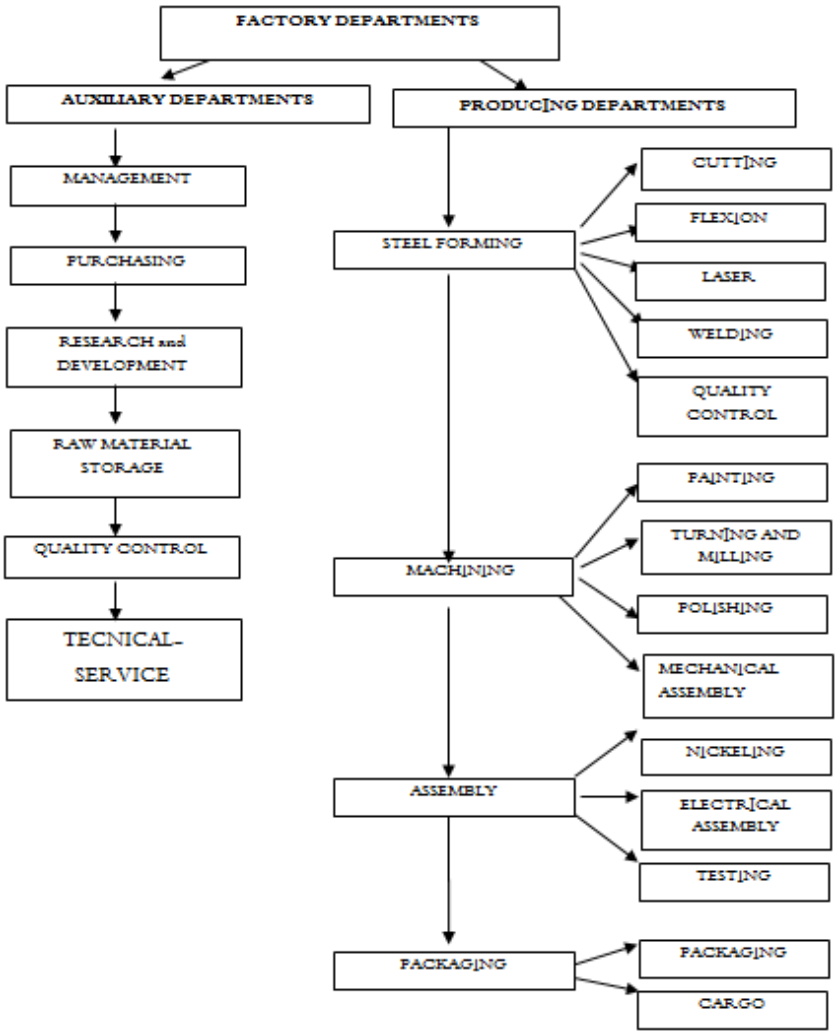
Information about the application is used by the factory in 2012. This information is taken from units interviews with responsible officials, employees, interviews, observations, accounting information system and the computer database.

Factory orders are taken by tendering or private. The company is open production orders from the proper order. Needs to order received is determined. The required materials are required from domestic or foreign suppliers. The production of mechanical and electrical products tested after it is determined if there are any problems. Problem or shipment of products made final checks are carried out.

First time driven activity based budgeting model to create a time driven activity based cost model was developed. The following steps were followed in the creation of time driven activity based costing model.

1 Step: Enterprise resource groups (the department) are determined; In the study departments are classified as the support and manufacturing. Manufacturing departments are organized steel forming, machining, assembly, packaging. The support departments of company are classified management, purchasing, research and development, raw material storage, quality control, tecnical- service. The classifications of the is indicated in Figure 1.

Figure 1. Classification of the departments



2 Step: Enterprise general manufacturing overhead and 1. step cost drivers are determined. Type of general manufacturing overhead for manufacturing departments and cost drivers are illustrated in Table 1.

Table 1. General manufacturing overhead and cost drivers

General manufacturing overheads	Cost drivers
Salary Expenses	Number of Personnel
Auxiliary materials	Number of departments
Electricity Expenses	Kilowatt hour
Water Expenses for produce	Direct
Water Expenses for persons	Number of Personnel
Heating and fuel gas Expenses	m^2
Food Expenses	Number of Personnel
Maintenance and repair expenses for vehicle	Number of vehicle
Maintenance and repair expenses machine	Number of machine
Contract manufacturing expenses	Number of departments
Workers Clothing Expenses	Number of Personnel
Insurance expenses	Direct
Welding Gas	Manufacturing unit
Fuel Expenses	Number of vehicles
Outsourced benefits and services	Number of departments
Depreciation	Direct
Other Expenses	Machine Hours

Table 2. Allocation of manufacturing departments' costs

	DEPARTMENTS														
	STEEL FORMING					MACHİNİNG				ASSEMBLY			PACKAGİNG		
General Manufacturing Overheads	**Cutting (□)**	**Flexion (□)**	**Laser (□)**	**Welding (□)**	**Quality Control (□)**	**Painting (□)**	**Turnİng and milling (□)**	**Polishing (□)**	**Mechanical assembly (□)**	**Electrical assembly (□)**	**Testing (□)**	**Nickeling (□)**	**Packaging (□)**	**Cargo (□)**	**Total (□)**
Salary Expenses	17.160,00	17.160,00	17.160,00	68.640,00	17.160,00	17.160,00	17.160,00	34.320,00	34.320,00	51.480,00	34.320,00	17.160,00	17.160,00	17.160,00	377.520,00
Auxiliary materials	32.089,25	32.089,25	32.089,25	32.089,25	32.089,25	32.089,25	32.089,25	32.089,25	32.089,25	32.089,25	32.089,25	32.089,25	32.089,25	32.089,25	449.249,46
Electricity expenses	2.900,00	3.190,00	-	14.790,00	23.780,00	-	4.060,00	-	5.220,00	5.800,00	8.700,00	-	23.200,00	22.040,00	113.680,00
Water Expenses for produce	-	-	-	-	-	-	8.370,27	-	-	-	-	-	-	-	8.370,27
Water Expenses for persons	27,27	27,27	27,27	109,08	27,27	27,27	27,27	54,54	54,54	81,81	54,54	27,27	27,27	27,27	599,94
Heating and fuel gas Expenses	166,13	182,74	-	847,26	1.362,27	-	232,58	-	299,03	332,26	498,39	-	1.329,04	1.262,59	6.512,30
Food Expenses	1.381,85	1.381,85	1.381,85	5.527,39	1.381,85	1.381,85	1.381,85	2.763,70	2.763,70	4.145,55	2.763,70	1.381,85	1.381,85	1.381,85	30.400,67
Maintenance and repair expenses for vehicle	138,11	138,11	138,11	138,11	138,11	138,11	138,11	138,11	138,11	138,11	138,11	138,11	138,11	138,11	1.933,54
Maintenance and repair expenses machine	15.062,36	7.531,18	-	45.187,08	22.593,54	-	15.062,36	-	-	-	15.062,36	-	-	-	120.498,88
contract manufacturing expenses	-	-	24.319,25	-	-	24.319,25	-	24.319,25	-	-	-	24.319,25	-	-	97.277,00
Workers Clothing Expenses	177,86	177,86	177,86	711,45	177,86	177,86	177,86	355,73	355,73	533,59	355,73	177,86	177,86	177,86	3.913,00
insurance expenses	-	-	-	-	-	-	-	-	-	-	-	-	179,00	-	179,00
Welding Gas	-	-	-	4.724,00	-	-	-	-	-	-	-	-	-	-	4.724,00
Vehicle Fuel Expenses	289,58	289,58	289,58	1.158,32	289,58	289,58	289,58	579,16	579,16	868,74	579,16	289,58	289,58	289,58	6.370,76
Outsourced benefits and services	-	-	45.225,00	-	-	45.225,00	-	45.225,00	-	-	-	45.225,00	-	-	180.900,00
Depreciation	3.222,00	1.611,00	-	9.666,00	4.833,00	-	3.222,00	-	-	-	3.222,00	-	-	-	25.776,00
Other Expenses	-	-	-	-	-	-	-	-	-	-	-	674,00	-	-	674,00
Total Cost	72.614,41	63.778,84	120.808,17	183.587,95	103.832,73	120.808,17	82.211,13	139.844,73	75.819,52	95.469,30	97.783,23	121.482,17	75.971,96	74.566,51	1.428.578,81

3 Step: Then determining the cost driver amounts, the total costs related with the manufacturing and support department are allocated. Allocated of total costs for manufacturing depertmant are illustrated in Table 2.

4 Step: To create time equations each department; processes for he production of the necessary operations section, the time required for realization of activities, time drivers and the amount of time to be determined. For example, to form the time driven activity based costing model for management department, the process that are performed and activities are listed. Process and activities for management department are shown in Table 3.

Table 3. Management department's processes and activities

Management Department	
Processes	Activities
Feasibility study	Participation in fairs Estimated annual production plan preparing Making marketing and sales assessment Evaluation of complaints, satisfactions, demands of customer
Bidding price	Detection of product costs Determination of the product sales price negotiate and correspondence make with buyer companies
Request a quote price	Negotiate and correspondence make with Seller Company Finalization of supplier evaluation
Giving of the material orders	Giving of the decision to purchase needed materials
Staff at reception	Giving job posting interview with the candidates Deciding about the candidates
Auditing	Examining of the audit report and the results Monitoring of the quality objectives Risk management Follow-up of legislative changes national and international Determination of process performance and product suitability Taking the necessary precautions for the alert case Examination of the statistical analysis Determination of document changes Determination of the improvement suggestions

5 Step: After, time drivers of every process and the needed time to performing the process are determined. This information is taken from units interviews with responsible officials, employees, interviews, observations. Process and activities for management department are shown in Table 4.

Table 4. Time drivers and activity times

Time Drivers	Amount of Time Drivers	Time per Step (minutes)
Number of fairs participated	5 (3 abroad)	2400
Number of prepared production plan	12	60
Number of meetings	192	30
Number of customers participating in the survey	50	345
The number of product detected Cost	12	60
Number of interviews conducted with buyers	12	30
Number of products detected sales price	265 (45 abroad)	20
Number of interviews conducted with Seller	1088 (24 abroad)	30 20
The number of ordered materials	1088	45
Number of incoming orders	13 (3 unskilled worker)	10 40
Number of meetings	12 12	30 20
Number of meetings	24	50
Number of transactions	360	40
Number of transactions	1353	45
Number of meetings	12 12 12 12	30 60 40 50

6 Step: After determining the driver and operating time when the equation was established. Management section of participation in trade fairs in the feasibility process, estimate the preparation of annual production plans, making the sales and marketing assessment, evaluation of customer demand satisfaction and complaints activities are carried out.

Participation in trade fairs throughout the year activities are carried out in the feasibility process. Participation in trade fairs in the country provided the time as 5 days (6.5 hours to 32.5 hours per day, 1950 minutes), while adequate, in addition to participation in international fairs is a need for a further 5 days. Another activity is the preparation of the feasibility study estimated the annual production plan. Annual production plan is prepared for all the products at the beginning of each semester. The time required for this activity is 60 minutes. Marketing and sales assessments are among the activities carried out by the management in the meeting. This activity lasts 50 minutes. Recent activities in the feasibility process customer requests, complaints and satisfaction evaluation of the activities. Survey method is used to make the assessment. Preparation 50 minutes printing of questionnaire application lasts 250 minutes and 45 minutes. For a survey of the total (50 + 45 + 250) is required 345 minutes.

$$Time\ Equation\ of\ the\ Feasibility\ Study\ Process = 1950*X_1+1950*X_2+60*X_3+50*X_4+345*X_5 \quad (1)$$

Where X_1: The number of participated that exhibition (domestic)
X_2: The number of participated that exhibition (abroad)
X_3: The number of prepared production plan
X_4: The number of meeting management
X_5: Number of customers surveyed

7 Step: The total amount of time on each resource group instead of putting in the time to drive after determining the amount of time the drive has been the equation of time. The time equation of management department are shown in Table 5.

8 Step: The costs assigned to the product cost ratio by multiplying the capacity of the resource group with the time required for each resource group is calculated. Table 6 in the cost of the resources assigned to the product groups and shows units and the total cost of the product.

Table 5. Management department's time equations and total time per step

Processes	Time Equations (Minutes)	Katsayılar					Total Time per Step (minutes)
		X1	X2	X3	X4	X5	
Feasibility study	1950*X1+1950*X2+60*X3+50*X4+345*X5	5	3	12	192	250	112170
Bidding price	60*X1+30*X2+20*X3+70*X4	12	12	265	45		9530
Request a quote price	30* X1+70*X2+20*X3	1064	24	1088			55360
Giving of the material order	45*X1	1088					48960
Staff at reception	10*X1+40*X2+20*X3	13	13	10			850
Auditing	50*X1+50*X2+40*X3+45*X4+180 (30+60+40+50)*X5	12	24	360	1353	12	79245
Total							306115

3.1 Time driven activity based budget

Time driven activity based budgeting process, the first step was to develop time driven activity based cost model we have developed a business model based on data from the year 2012 in this study. Budgeting is made calculation of operating profitability in the second stage of the product. The product profitability analysis are shown in Table 7.

Table 6. Costs under time driven activity based costing model

PRODUCTS	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	TOTAL
DIRECT MATERIALS	618.639	429.360	101.691	261.580	348.036	180.265	478.789	2.184	13.730	14.480	115.544	12.762	2.577.060
Assigned Overhead Costs From PURCHASING	8.641	5.330	5.282	5.425	4.869	6.904	8.658	492	1.403	1.232	11.438	1.032	60.706
QUALITY CONTROL	5.201	3.869	3.424	2.804	3.241	3.839	7.554	411	1.224	967	4.783	713	38.030
TECNICAL- SERVICE	11.930	11.880	10.089	9.312	9.289	9.449	13.833	6.323	6.439	6.577	11.649	6.284	113.052
RAW MATERIAL STORAGE	6.486	4.634	4.015	3.094	4.014	4.758	12.268	182	1.090	1.090	8.012	726	50.368
RESEARCH and DEVELOPMENT	3.840	2.743	2.377	1.828	2.377	4.023	10.422	183	1.097	1.097	8.045	731	38.764
STEEL FORMING	72.463	50.542	39.582	32.477	42.748	58.183	150.746	1.384	8.302	8.302	60.879	5.534	531.142
MACHINING	64.228	46.155	40.131	31.494	40.028	34.122	88.408	811	4.863	4.863	35.663	3.242	394.008
ASSEMBLY	45.217	31.967	26.682	21.052	27.547	28.970	75.243	916	5.555	5.585	40.956	3.723	313.411
PACKAGİNG	6.531	6.890	5.687	3.270	4.465	8.050	17.816	296	1.779	2.084	13.045	1.797	71.710
Total Overheads	224.536	164.010	137.268	110.756	138.577	158.298	384.948	10.997	31.751	31.797	194.470	23.784	1.611.191
Unit Overheads	10.692	10.934	10.559	11.076	10.660	7.195	6.753	10.997	5.292	5.299	4.420	5.946	
Total (Direct Materials + G.M.O.)	843.175	593.370	238.959	372.336	486.613	338.563	863.736	13.180	45.481	46.276	310.015	36.546	4.188.251
Cost of the Products (unit)	**40.**	**39.558**	**18.381**	**37.234**	**37.432**	**15.389**	**15.153**	**13.180**	**7.580**	**7.713**	**7.046**	**9.136**	

Table 7. Products profitability analysis under time - driven activity based costing

Products	**A1**	**A2**	**A3**	**A4**	**A5**	**A6**	**A7**	**A8**	**A9**	**A10**	**A11**	**A12**	**TOTAL**
Sales Revenue	1.175.139	772.200	180.544	480.000	660.452	614.900	1.554.162	17.000	18.000	36.000	598.400	14.400	6.121.197
Direct Material	618.639	429.360	101.691	261.580	348.036	180.265	478.789	2.184	13.730	14.480	115.544	12.762	2.577.060
General Manufacturing Overheads	224.536	164.010	137.268	110.756	138.577	158.298	384.948	10.997	31.751	31.797	194.470	23.784	1.611.191
Total Expenses	843.175	593.370	238.959	372.336	486.613	338.563	863.736	13.180	45.481	46.276	310.015	36.546	4.188.251
Gross Margin	331.964	178.830	- 58.415	107.664	173.839	276.337	690.426	3.820	- 27.481	- 10.276	288.385	- 22.146	1.932.946
Gross Margin **%**	**28**	**23**	**- 32**	**22**	**26**	**45**	**44**	**22**	**- 153**	**- 29**	**48**	**- 154**	

Table 8. Forecasting of manufacturing and gross margin for next period

Products	**A1**	**A2**	**A3**	**A4**	**A5**	**A6**	**A7**	**A8**	**A9**	**A10**	**A11**	**A12**
Sales Revenue in the period	1.175.139	772.200	180.544	480.000	660.452	614.900	1.554.162	17.000	18.000	36.000	598.400	14.400
Gross Margin in the Period %	28	23	-32	22	26	45	44	22	-153	-29	48	-154
Amount Of Manufacturing for Next Period (Forecasting +%)	4,00%	8,00%	10,00%	8,00%	4,00%	2,00%	3,00%	4,00%	20,00%	13,00%	1,00%	50,00%
Amount Of Manufacturing in the period	21	15	13	10	13	22	57	1	6	6	44	4
Amount of Manufacturing for Next Period (Forecasting)	23	17	13	11	14	25	66	1	6	6	51	4
Sales Revenue for next period (forecasting)	1.222.145	833.976	198.598	518.400	686.870	627.198	1.600.787	17.680	21.600	40.680	604.384	21.600

The third stage in the process of development of business budgeting, pricing, product and customer mix, managerial decisions are taken on issues such as product design and customer relations.

Sales and production estimates have been made by the managers of the company based on market conditions. A3, A9, A10 and A12 products are products sold at a loss. Managers have agreed to continue to produce these products. Why do they accept not to profit from some products to keep customers on bulk purchases. However, the decision to increase the selling price of products at reasonable levels are taken. Managers have decided not to go to any increase in the amount of production for these products and were 10%, 20%, 13%, and they decided to make a 50% price increase. A11, A6 and A7 product managers are more profitable than other products, respectively, for these products, 1%, 2% and 3% of the price change and the amount of production have also decided to increase by 15%.

A1, A2, A4, A5, A8 products are among the profitable product business. Managers to increase their production and 10% of the A1, A5 4% of the price of the product, while the prices of other products have decided to increase by 8%.

Price changes in the next period for all product groups and estimated production quantities in the period are shown in Table 8.

Budgeting the process competences and future business volume in the fourth stage, the basis of the decisions taken in the production and sales forecasts have been made to improve profitability.

Next time next term production quantities increase taking into account the amount of drive time to estimate the demand of resource capacity are revised. New times demand drives supply capacity when placing the estimated equations were determined. In determining the amount of time drivers incomplete (remaining below 0.5) figures are taken into account. Re-designated as the estimated amount of time drivers and placing it into the resource capacity of the equation the result is shown in Table 9 for the estimated amount of the purchase department.

Table 9. Demand forecasting of the future period in purchasing department

Products	Number of Order (X1)	Number of Order (abroad) (X2)	Number of Material Requisition (X1)	Number of Material Requisition (abroad) (X2)	Amount of Orders (X1)	Amount of Orders (abroad) (X2)	Amount of Disapproved Product (X1)
A1	32	3	169	6	169	6	1
A2	23	2	106	2	106	2	1
A3	19	3	95	2	95	2	1
A4	18	7	109	1	109	1	0
A5	15	7	99	0	99	0	0
A6	22	7	118	2	118	2	46
A7	40	9	178	2	178	2	0
A8	1	1	4	3	4	3	0
A9	6	6	22	0	22	0	0
A10	6	0	23	0	23	0	0
A11	51	0	239	6	239	7	0
A12	4	4	15	1	15	1	0
Total	237	49	1178	25	1178	26	49

Budgeting process in the fifth stage of the supply capacity of the period to meet the future demands of the business of sales and production estimates are calculated.

Estimated in future periods (budgeted) calculating unit variable costs and fixed costs per production after determining the amount budgeted manufacturing overhead costs were determined using the following formula. Expenses directly related to the amount of production has been considered as variable expenses and production costs. For example, water used in the production phase of the amount of increase for the company has been recognized as an expense in the variable from now. Expenses not directly related to the amount of production is assumed constant. (food, cargo, depreciation itc.)

$$\text{Total Expenses} = ax + b \quad (2)$$

Where a = Variable Costs by Unit Production Quantity
x = Budgeted Production Quantity
b = Annual Fixed Costs

Determining how to make the spending capacity to provide the expected source of future business in the last stage of the budgeting process has been completed.

4 Conclusion

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.

Through activity-based budgeting based on the time managers can improve their sales and production plans for the future in a much shorter time and more accurate. In this case, provide the strategic decision making of managers. Resources to meet the needs of the future sales and production estimates calculated. How to find this way to ensure the supply capacity of the expenditures will be made in the future. Estimated cost of the necessary resources can be identified. Time driven activity based butgeding model can provide a quick and easy solution for business. The company made the application because of the results and the advantages mentioned above time driven activity based butgeding use is thought to be beneficial.

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