THE DETERMINATION OF 2ND QUALITY AND EXPORT SURPLUSES EVALUATION EFFICIENCY OF APPAREL COMPANIES WITH THE METHODS OF PERFORMANCE MATRIX AND FUZZY LOGIC

KONFEKSİYON FİRMALARININ 2. KALİTE VE İHRAC FAZLASI ÜRÜNLERİ DEĞERLENDİRME ETKİLİLİKLERİNİN PERFORMANS MATRİSİ VE BULANIK MANTIK YÖNTEMLERİ İLE BELİRLENMESİ

Mehmet KÜÇÜK, Mücella GÜNER

Ege University, Department of Textile Engineering, İzmir, Turkey

ABSTRACT

In the apparel companies, the rate of products as a precaution in place of the second quality ones varies according to the total quantity in the order. A couple of pieces of products left over provide companies the advantages of not shipping the inadequate piece amount to customers and not damaging the image and economy of the company due to long-term business partnerships and perceived image. Therefore, companies prefer to overproduce and overcome the lack production instead of insufficient shipment. This study focuses on the recycling activities of the previously mentioned products that remain unsold and cause a burden to companies as an additional cost in terms of effectiveness that are carried out by the apparel companies. For these purposes, Performance Matrix (OMAX) is used in the research and fuzzy logic method is also utilized to determine the significance levels of the criteria used. Relevant data has been compiled through face to face interviews with the companies mentioned below to allow the evaluation with Performances Matrix methods. In order to adapt the fuzzy logic method to study, company managers were asked to compare the prioritization of the criteria and the evaluations were carried out in the framework of fuzzy logic method. As a result of the study, efficiency values of these companies have been identified, compared and some suggestions are made in order to achieve further increase in these values.

Keywords: Textile and clothing, Apparel industry, Performance matrix (Omax), Objective matrix, Fuzzy logic.

ÖZET

Konfeksiyon firmalarında tedbir amaçlı, 2. kalite ürünlerin yerine gönderilmek üzere üretilen ürün oranı, sipariş edilen ürün miktarına göre değişmektedir. Fazladan bir miktar ürünün elde kalması, müşteriye eksik adetli sipariş göndermekten, firmanın imajı, müşteriler ile uzun süreli iş ilişkisine sahip olması, vb. gibi nedenlerden dolayı firma imajının ve dolayısıyla ekonomisinin daha az zarar görmesini sağlamaktadır. Bu yüzden firmalar, eksik ürün göndermek yerine, fazladan üretim yapmakta ve oluşabilecek eksikliği bu fazla üretim ile gidermektedirler. Bu çalışmada, bahsedilen elde kalmış ve belirli bir maliyeti olan, 2. kalite ve ihraç fazlası ürünlerin firmalar tarafından, etkililik anlamında ne şekilde değerlendirildiği incelenmiştir. Bu incelemelerde Performans Matrisi (OMAX) yöntemi kullanılmış ve bu yöntemde kullanılan kriterlerin önem derecelerinin belirlenmesinde de bulanık mantıktan destek alınmıştır. Performans Matrisi yönteminde değerlendirilmek üzere aşağıda bahsi geçen firmaların tümüyle yüz yüze görüşülerek ilgili veriler derlenmiştir. Bulanık mantık yönteminin çalışmaya adaptasyonunu sağlamak amacıyla da, firma yöneticilerinin kriterlerin öncelik sıralarını karşılaştırılması istenmiş ve değerlendirmeler bulanık mantık yöntemi çerçevesinde gerçekleştirilmiştir. Çalışmanın sonucunda üç firmanın da etkililik değerleri tespit edilmiş, bunlar karşılaştırılmış ve bu değerlerde daha fazla artış sağlanabilmesi amacıyla çeşitli önerilerde bulunulmuştur.

Anahtar Kelimeler: Konfeksiyon sektörü, Performans matrisi (Omax), Objektif matrisi, Bulanık mantık.

Corresponding Author: Mehmet Küçük, mehmet.kucuk@ege.edu.tr

1. INTRODUCTION

The main objective of the economical growth and development to improve organizational performance, makes each organization mandatory to embrace own performance management system. In the understanding of performance management, business performance is the total result of the performance of all components separately. Therefore, in every business that has the understanding of modern management mindset are observed some different models and techniques to evaluate their performance. Performance management system is a dynamic and result-oriented process that allows for making progress constantly in line with pre-defined objectives to employees and managers. This process supports employees and guarantees the ongoing dialogue, increase the work force and productivity, provides a focus on the future than the past (1).

In our country that is in economical and social development efforts, it is impossible that to separate the garment industry from modern management mindset. In order to avoid the problems of management and maintain the activities in a systematic manner, managers should balance between the production factors and end-products owing to the complex and labor-intensive structure of clothing industry. This balance can be achieved through performance evaluation systems.

The production costs of second quality and export surplus products are covered by the manufacturing companies and after the completion of orders, these products remain unsold generally. At that point, the effectiveness of companies while reconverting of these products into money is determined through "Performance (Objective) Matrix-Omax Method". Besides, "Fuzzy Logic" is employed in detecting the significance level of the determined criterion. As a result of this study, the effectiveness levels of three different clothing companies are evaluated in terms of effectiveness percentages.

Performance (Objective) Matrix-Omax Method is employed by James L. Riggs in the early 1980s and the method was put into practice by Oregon Productivity Center (USA) (1). This method enables determining several performance criteria to obtain an overall performance indicator, prioritizing according to their importance levels and evaluating this combination of criterion (2). In this study, Fuzzy Logic Method is used to rank the criterion specified according to their importance. Furthermore, Performance Matrix Method is a method of measuring efficiency on organization basis. During an evaluation period, it provides to calculate a score as the level of effectiveness, if it is needed, also gives opportunity to calculate the total effectiveness and the index of both current and prior periods (3). The purpose of the method is to measure the effectiveness of an organization (5).

Fuzzy logic method was used to determine the relative importance of the pre-defined criterion. According to this method, the importance of each criterion varies between 0 and 1. For each comparison of the paired criterion, Rij (i≠j) is obtained. According to i, formula 1 shows that measurement of the preference level of j (6).

$$R_{ji} = 1 - R_{ij}$$

(1)

The second phase is the creation of the fuzzy logic preference matrix. After data collection and processing of them in accordance with the descriptions above, the fuzzy logic preference matrix (R) can be generated (6).

$$R = \begin{bmatrix} 0 & r_{12} & r_{13} & . & . & . & r_{1j} \\ r_{21} & 0 & r_{23} & . & . & . & r_{2j} \\ r_{31} & r_{32} & . & . & . & . & . \\ . & . & . & . & . & . & . \\ . & . & . & . & . & . & . \\ . & . & . & . & 0 & r_{i-1j} \\ r_{i1} & r_{i2} & . & . & . & r_{ij-1} & 0 \end{bmatrix}$$

(2)

The following equation provides to calculate the importance weight of each criterion. In other words, the formula 3 measures the frequency of preference (6).

$$I_j = 1 - \left(\sum_{i=1}^{n} R_{ij}^2 / (n-1) \right)^{1/2}$$

(3)

The final phase is the alignment of the criterion. The values of Ij change between 0 and 1. The closer the value is to 1, the frequency of preference is the more. Once the Ijs are obtained, the criterions are ranked from the most important to the least (6).

2. MATERIAL AND METHOD

2.1. Material

All companies, in accordance with their principles, do not allow to be mentioned their company names. So, instead of their names, in the study, they were defined that "Company-1, Company-2 and Company-3". Properties of the companies are shown below.

Company-1; There are 36-38 operators in the production department. Cutting, sewing, production, quality-control, ironing and packaging services take place within the company. Printing, embroidery, washing, dyeing operations are provided from third parties.

Company-2; There are 28-30 operators in the production department. Cutting, sewing, production services take place within the company. Quality-control, ironing and packaging, printing, embroidery, washing, dyeing operations are provided from third parties.

Company-3; There are 18-20 operators in the production department. Cutting, sewing, production, quality-control, ironing and packaging services take place within the company. Printing, embroidery, washing, dyeing operations are provided from third parties.

2.2. Method

The calculation of the companies' effectiveness, it was used that the organizational performance assessment method that called the Performance (Objective) Matrix-Omax Method. To help this method and to prove out the

calculations, the fuzzy logic methods are used to determine the significance level of the criterion.

2.2.1. Performance (Objective) Matris - Omax Method

The performance matrix is shown in Table 1 below (8).

Table 1. Performance Matrix (8)

The procedure for filling the performance matrix table out is described in detail below. The table consists of 3 main sections.

Section-1: The first part is concerned with identification and consists of 2 lines. In the first line, the effectiveness criteria take part. The criteria of units that the performance needs to be found are defined then written to the first line (STEP 1) (3). The second line, in the period/season/year/time unit the measured values of the criteria take part (STEP 2) (3).

Section-2: This section consists of 11 lines, in other saying, this section is a type of a scale that consists of 11 different performance levels and indicates the achieving level of the criteria. In this section, all the minimum achievement levels values of the criteria need to be written to the line number 3 and all the best achievement level values need to be written to the line number 10 (3). The values that in the line number 10 are at the same time the target values. The most important activity for this section is setting the target values. The target values are determined for each efficiency criteria. Due to the line number 3 is minimum value, the lines below the line number 3 indicates the minus values.

After determining the values of the lines number 0, 3 and 10, rest of the values that are from 0 to 3 and 3 to 10 are generated by the help of linear interpolation (STEP 3).

Section-3: Effectiveness indicators are calculated in that section and consist of 3 lines. The first line shows the effectiveness scores. Due to the calculation of the effectiveness, it needs to be checked the equivalent value from the performance scale of the actual performance value which is in the first section. After checking the equivalent

value from the performance scale, it is written to the first line of section 3, as the score of each criterion (STEP 4) (3).

The significance levels of each criterion are written to the 2nd line of section 3 (3). In this study, The Fuzzy Logic method was used to determining the significance levels. Each level of the criteria are shown with percentages, so the total of these levels is 100%. Accordingly, the most important criteria get more share which means percentage (STEP 5).

The multiplication of the scores and the significance levels of each criterion are written to third line which is the value line, of section-3. To find out the total point that means the effectiveness of the company, it needs to sum all the values in the third line (STEP 6).

The best score that can be taken from the matrix is 1000. So the desired value to reach is 1000 (4).

2.2.2. Fuzzy Logic (Fuzzy Pair-wise Comparison Method)

Fuzzy Pair-wise Comparison Method was used to get more realistic results about the significance level of the criteria. Responsible people in these 3 companies that were mentioned in the beginning of the study determined the significance level hierarchy between the criteria by themselves with the help of this method.

The responses that received from the companies have been used for the implementation of this method. The significance levels of each criterion have been determined by companies themselves with the help of the tables that were created through this method.

The comparison quantity (K) is to be made for determination of the significance levels of the criteria can be calculated with formula number 4.

$$K = n*(n-1)/2$$

(4)

"n" in the formula number 4, indicates total quantity of the criteria (6). According to the formula, it was calculated that there will be 6 different comparisons. So the comparison table (Table 2) which was obtained by the Fuzzy Logic, shows the comparisons in detail below.

According to this table all criteria are compared with each other and the relative importance of these criteria in accordance with each other are determined by companies with face-to-face interviews. As seen in the table, firstly, criteria-1 is compared with criteria-2, accordingly criteria-3 is compared with criteria-4 and later on all criterions will be compared with each other. For instance, while comparison of criterion 1 and 2, if the decider chooses number "4" where it is placed closer to criteria-1, this means that criteria-1 is of great importance compared to criteria-2.

In this way, through comparisons and analyses of these comparisons, degree of significance of each criterion are determined and saved in the place of significance in Performance Matrix Table (9).

Table 2. Analyzing the significance levels of the criteria [6]

Criterion	Much More	More	Mid	Less	Equal	Less	Mid	More	Much More	Criterion
Criteria-1	5	4	3	2	1	2	3	4	5	Criteria -2
Criteria -1	5	4	3	2	1	2	3	4	5	Criteria -3
Criteria -1	5	4	3	2	1	2	3	4	5	Criteria -4
Criteria -2	5	4	3	2	1	2	3	4	5	Criteria -3
Criteria -2	5	4	3	2	1	2	3	4	5	Criteria -4
Criteria -3	5	4	3	2	1	2	3	4	5	Criteria -4

3. IMPLEMENTATION OF THE STUDY

The more efficient usage of inputs provides companies that have their own production lines the higher quality and the more effectively manufactured outputs. For that reason, this study has been done to check the efficiency of the manufacturer companies. The first step of performance matrix is the determination of the criteria. So in accordance with this purpose, after the meeting with companies, some criteria were determined. The criteria are;

Criterion-1: The percentage between amount of the products that are separated as the second quality products and export surpluses and the total amount that produced. In other words, what is the average percentage of the export surpluses and second quality products in the total production amounts?

$$Criterion\text{-}1 = \frac{(Remained\ quantity)}{(Total\ production\ quantity)} \qquad (5)$$

Formula-5 is used in the calculations for this criterion. This criterion requires no items remain unsold as the best condition. Therefore, the lower the obtained value becomes, the higher the score of Omax table gets. In other words, the aim of this criterion is minimizing the obtained value. Moreover, as stated previously in the literature part, possible minimum and maximum values need to be determined to obtain the values of criteria. According to interviews, the maximum value obtained for the first criteria is 8% (0,08) which means that the companies are allowing up to 8% for overproduction and this corresponds to 3 points in the score table as being the base value. The lowest value obtained is %1 (0,01) which means the overproduction rate of the companies by demonstrating the best condition and this corresponds to 10 points in the score table.

Criterion-2: The ratio of converting second quality and export surplus products into money. In other words, what percentage of these surplus products can be turned into money?

Companies should focus on the ratio of converting the surplus and remained products which require a certain investment into monetary value. For this criterion, the percentage rate of conversion into money is of significance importance and the higher the percentage is; the higher the score can be obtained. What is important for this criterion is to zeroize the surplus and convert all of them into money.

The highest value to recovery of the products that are remained to money is 100% (which means 1). Whilst 100% is equal to 10 point in the performance scale, the lowest value which is 30% (0.3) is equal to 3 point respectively.

Criterion-3: The frequency of converting the 2nd quality or export surpluses products to the money. In other words, do these products are converted into money at specific times or after every production.

$$Criterion\text{-}3 = \frac{(Number\ of\ season\ in\ a\ year)}{(Number\ of\ evaluation\ of\ the\ remained\ product\ in\ a\ year)} \qquad (6)$$

The formula number 6 is used for calculation in this criterion. The point that is important and mentioned in this criterion, the converting time of the products that are produced as a result of some investments like money, effort and so on. So, is this time in the same season with the production of the products in question or in another time? Of course, the concept of effectiveness supports that to convert these products in the same season with the production. Moreover, the decreasing the numerical value that is obtained by using the formula, the score will be increased from the table. That means, it is a minimization criterion. So with the help of the formula, the maximum value of that criterion would be 1 and this corresponds to 10 points in score column. With linear interpolation the lowest value which is 2,4 point is obtained and this corresponds to 3 points.

Criterion-4: The profit rate of 2nd quality or export surplus products that are converted into money to sell. In other words, when dialing back the money, with what percentage profit can be obtained. The purpose of the criterion in question is to determine whether or not profit can be gained from these products. As a result of the interviews which were made with 3 manufacturing companies, for this criterion while the highest profit rate that can be obtained is 8% (0,08), the lowest value which is obtained with the help of linear interpolation is 0,01%.

The determination of criterions' significance levels:

In order to determine the significance levels of the criteria which are stated in section 3, the fuzzy pair-wise comparison method was used. By using this method, all the criterions are compared with each other and the significance levels of each criterion are calculated [9]. To enable each pair-wise comparison, Table-3, Table-4 and Table-5 have been created and sent to the companies to be filled. Fields marked in bold indicate the preferences of these firms.

Company-1;

Table 3. The significance level of the criteria according to company-1

Criterion	Much More	More	Mid	Less	Equal	Less	Mid	More	Much More	Criterion
Criteria-1	5	4	3	2	1	2	3	4	5	Criteria -2
Criteria -1	5	4	3	2	1	2	3	4	5	Criteria -3
Criteria -1	5	4	3	2	1	2	3	4	5	Criteria -4
Criteria -2	5	4	3	2	1	2	3	4	5	Criteria -3
Criteria -2	5	4	3	2	1	2	3	4	5	Criteria -4
Criteria -3	5	4	3	2	1	2	3	4	5	Criteria -4

Company-2;

Table 4. The significance level of the criteria according to company-2

Criterion	Much More	More	Mid	Less	Equal	Less	Mid	More	Much More	Criterion
Criteria-1	5	4	3	2	1	2	3	4	5	Criteria -2
Criteria -1	5	4	3	2	1	2	3	4	5	Criteria -3
Criteria -1	5	4	3	2	1	2	3	4	5	Criteria -4
Criteria -2	5	4	3	2	1	2	3	4	5	Criteria -3
Criteria -2	5	4	3	2	1	2	3	4	5	Criteria -4
Criteria -3	5	4	3	2	1	2	3	4	5	Criteria -4

Company-3;

Table 5. The significance level of the criteria according to company-3

Criterion	Much More	More	Mid	Less	Equal	Less	Mid	More	Much More	Criterion
Criteria-1	5	4	3	2	1	2	3	4	5	Criteria -2
Criteria -1	5	4	3	2	1	2	3	4	5	Criteria -3
Criteria -1	5	4	3	2	1	2	3	4	5	Criteria -4
Criteria -2	5	4	3	2	1	2	3	4	5	Criteria -3
Criteria -2	5	4	3	2	1	2	3	4	5	Criteria -4
Criteria -3	5	4	3	2	1	2	3	4	5	Criteria -4

3.1. Findings

For the implementation part of this study, some questions about the criteria were asked to companies. Table 3, Table-4 and Table-5 were analyzed with the help of Fuzzy Methods and Table-6 is observed accordingly.

The significance levels of the criteria are stated as percentages as follows considering their mean values above (Table 6).

Criterion-1 → %30
Criterion-2 → %21
Criterion-3 → %33
Criterion-4 → %16

Table 6. The resolving table

```
=======================================
Descriptivestatistics  of FuzzyAlternatives
=======================================

            Mean       StDev      Minimum     Maximum     Median
            --------   --------   --------    -------     ------
Altrntve#1  0.5811     0.0715     0.5033      0.6441      0.5033
Altrntve#2  0.3923     0.1048     0.2953      0.5033      0.2953
Altrntve#3  0.6365     0.1086     0.5170      0.7292      0.5170
Altrntve#4  0.3268     0.0594     0.2652      0.3836      0.2652


Kruskal-Wallis Test forFuzzyalternatives
******************************************
Chisquare(0.05,3)=  7.81473
H =8.3974359**   (Alternativesaredifferent  at 0.05)
```

To check the significance levels, Kruskal-Wallis Test which is one of the nonparametric tests (is generally used for if the population does not show normal distribution) was used. The hypothesis for this test; H0: The significance levels of the criteria are the same. H1: At least one of them has different significance level. The value of H=8.3974359 that was obtained from Kruskal-Wallis test, was tested according to Chi-square distribution Chisquare (0.05,3)= 7.81473 and the null hypothesis is rejected. According to the test that was implemented, the significance levels of the criterion are different from each other [7]. The responses that were received from companies about the criterion are described below.

Company-1

Criterion-1: The average percentage of the export surplus and second quality products in the total production amounts: **%5**

In general, this amount is more or less 5% according to this company. Mostly the production is tried to be completed with 5%.

Criterion-2: The ratio of converting second quality and export surplus products into money: **%80**

The response from the company, 80% of the product that are remained in the company as production surpluses are converted into money. The rest which is 20% cannot be converted because of too many defects. So they are utilized within the company.

Criterion-3: The frequency of converting the 2nd quality or export surpluses products to the money: **2** (**_The value obtained as a result of the formula→ 4 seasons / 2 times selling = 2_**)

In this criterion, the season's quantity in a year of the companies is taken into consideration. Number of sell out of the products also evaluated over the year and it was found out that this company works 4 seasons and sells the products that are in their hands as surpluses out just 2 times in a year.

Criterion-4: The profit rate of 2nd quality or export surplus products that are converted into money: **%5**

In accordance with the data that were obtained from the company, the effectiveness value table is shown in Table 7 below.

The total score for company-1 is 625 and it equals to 62,5% effectiveness value for the utilization of the products that were remained.

Company-2

Criterion-1: The average percentage of the export surplus and second quality products in the total production amounts: **%7**

Criterion-2: The ratio of converting second quality and export surplus products into money: **%100**

The response that was received from company-2 indicates that 100% of the surpluses products can be converted into money. Such an effective data like this was achieved by this company by help of an agreement with a recycling company.

Table 7. The Omax table of company-1

Remained product quantity / Total product quantity	The percentage of converting these products into money	The frequency of converting these products to money	The profit rate of these products that are converted to money	Criterion	
0,05	0,8	2	0,05	Performance	
0,01	1	1	0,08	10	
0,02	0,9	1,2	0,07	9	
0,03	0,8	1,4	0,06	8	
0,04	0,7	1,6	0,05	7	
0,05	0,6	1,8	0,04	6	Performance Scale
0,06	0,5	2	0,03	5	
0,07	0,4	2,2	0,02	4	
0,08	0,3	2,4	0,01	3	
0,09	0,2	2,6	0,005	2	
0,1	0,1	2,8	0,0025	1	
0,11	0,05	3	0,0012	0	
6	8	5	7	Score	
30	21	33	16	Significance level	
180	168	165	112	Value	
			625	Total Score	

Criterion-3: The frequency of converting the 2nd quality or export surpluses products to the money: **1,6** (**_8 season/5 times selling = 1,6_**)

Criterion-4: The profit rate of 2nd quality or export surpluses products that are converted to money: **%6**

In accordance with the data that were obtained from this company, the effectiveness value table is shown in Table 8 below.

Table 8. The Omax table of company-2

Remained product quantity / Total product quantity	The percentage of converting these products into money	The frequency of converting these products to money	The profit rate of these products that are converted to	Criterion	
0,07	1	1,6	0,06	Performance	
0,01	1	1	0,08	10	
0,02	0,9	1,2	0,07	9	
0,03	0,8	1,4	0,06	8	
0,04	0,7	1,6	0,05	7	
0,05	0,6	1,8	0,04	6	Performance Scale
0,06	0,5	2	0,03	5	
0,07	0,4	2,2	0,02	4	
0,08	0,3	2,4	0,01	3	
0,09	0,2	2,6	0,005	2	
0,1	0,1	2,8	0,0025	1	
0,11	0,05	3	0,0012	0	
4	10	7	8	Score	
30	21	33	16	Significance level	
120	210	231	128	Value	
			689	Total Score	

The total score for the company-2 is 689 and it equals to 68,9% effectiveness value for the utilization of the products that were remained.

Company-3

Criterion-1: The average percentage of the export surplus and second quality products in the total production amounts: **%4**

Criterion-2: The ratio of converting second quality and export surplus products into money: **%80**

The response from the company, 80% of the surpluses products can be converted into money. The rest 20% is distributed under the title of a social responsibility project.

Criterion-3: The frequency of converting the 2nd quality or export surpluses products to the money: **1,2** *(6 season/5 times selling = 1,2)*

Criterion-4: The profit rate of 2nd quality or export surpluses products that are converted to money: **%6**

In accordance with the data that were obtained from this company, the effectiveness value table is shown in Table 9 below.

Table 9. The Omax table of company-3

	Remained product quantity / Total product quantity	The percentage of converting these products into money	The frequency of converting these products to money	The profit rate of these products that are converted to money	Criterion	
	0,04	0,8	1,2	0,06	Performance	
Scores	0,01	1	1	0,08	10	Performance Scale
	0,02	0,9	1,2	0,07	9	
	0,03	0,8	1,4	0,06	8	
	0,04	0,7	1,6	0,05	7	
	0,05	0,6	1,8	0,04	6	
	0,06	0,5	2	0,03	5	
	0,07	0,4	2,2	0,02	4	
	0,08	0,3	2,4	0,01	3	
	0,09	0,2	2,6	0,005	2	
	0,1	0,1	2,8	0,0025	1	
	0,11	0,05	3	0,0012	0	
	7	8	9	8	Score	
	30	21	33	16	Significance level	
	210	168	297	128	Value	
				803	Total Score	

The total score for the company-3 is 803 and it equals to 80,3% effectiveness value for the utilization of the products that were remained.

3.2. Assessments and Results

As it is seen in table-10, in accordance with the determined criteria and with the help of "Omax-Performance Matrix" and "Fuzzy Logic", the efficiency ratios of the companies were calculated. Therefore, company-1 has 62,5%, company-2 has 68,9% and company-3 has 80,3% efficiency ratios for the utilization of the products that are remained in their hand. With these results, it can be said that company-3 is the most effective with the ratio of 80,3% compared to company-1 and company-2.

On behalf of companies, to have a more effective utilization from the export surpluses and second quality products that are remained in their stocks, the following advices can be given;

- To determine the wastage rate as a lesser percentage,
- To convert all these products into money, either choosing the way of fully recycling, or selling the whole products with lower profit margin within the agreements to the customer not to bazaar stallholders or other domestic customers
- To provide the conversion of these products on time (the same season with their manufacture),
- To keep the profit rates of these products as high as possible,
- To eliminate the factors that cause defective production through production efficiency studies,
- Trying to minimize any possible errors that may occur by adopting the techniques in production such as 5S, Kaizen, Jidoka, Quality Circles, Poka-Yoke.

Tablo 10. The efficiency rate table of companies

Criterion	Company-1	Company-2	Company-3
Remain unsold ratio	5%	7%	4%
The ratio of converting into money	80%	100%	80%
The speed of converting into money	2	1,6	1,2
Profit rate	5%	6%	6%
Efficiency rates	**62,5%**	**68,9%**	**80,3%**

REFERENCES

1. Alptekin C., 2007, *"Performance Management in Health Care Institutions: A Study on the Second Step"*, Dokuz Eylül University Social Sciences Department of Management, Master Thesis, pp. 82-111.

2. Cameron K., 1986, *"A Study of Organizational Effectiveness And Its Predictors"*, Management Science, Vol. 32, pp. 87-112.

3. Özutku H., 2006, "A Case Study Towards Measuring the Effectiveness of Human Resource Management Based on the Purpose Approach", Dokuz Eylül University Institute of Social Sciences Journal, Vol.8, No.3, pp. 262-284.

4. Balkan D., 2010, *"Enterprice Productivity Measurement in Services by OMAX (Objective Matrix), Method and An Application with Turkish Emergency Servise",* Productivity Expert, Department of Research and Productivity Measuring-Monitoring, National Productivity Centre of Turkey Publications, pp. 7-9.

5. Akal Z., 1998, *"Performance Measurement and Control in Enterprises"*, National Productivity Centre of Turkey Publications, pp. 1-14.

6. Günden C. and Miran B., 2007, *"A Research Based on Determining the Objective Hierarchy of Farmers via Fuzzy Pairwise Comparison Method "*, Akdeniz University Journal of Agriculture, Vol.20, No.2, pp.183-191.

7. Miran B., 2012, *"Basic Statistics",* Izmir.

8. Jääskeläinen A., 2008, *"Identifying a Suitable Approach for Measuring and Managing Public Service Productivity"*, The Electronic Journal of Knowledge Management, Vol.7, Issue.4, pp. 271-279.

9. Dervitsiotis K. N., 1995, *"The objectives matrix as a facilitating framework for quality assessment and improvement in education"* Total Quality Management, Vol 6, Nos 5&6, pp. 563-569.