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EVALUATION OF THE ACTIVITIES CARRIED OUT IN A FURNITURE FACTORY THROUGH WORK AND TIME STUDY

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ABSTRACT: Efficiency is one of the most important elements of competition. In order for the enterprises to maintain their competitiveness in the market, it is inevitable that they reduce the unit costs of the products they produce and increase the efficiency, depending on the collected study information. At the same time, it is important for businesses to know which product, how and in what time they produce so that they can use their resources in the best way. Work study; It is carried out in order to determine how a job is carried out with low capital, and to increase production profitability by using labor and equipment in the most appropriate way. Especially in the furniture sector, efficiency analysis is gaining importance with the increasing costs. Not enough work has been done in this area. For this reason, in this study, the effect of work and time study on productivity was investigated in a furniture factory. For this aim, a survey study was conducted in the form of face-to-face interviews with 90 people working as workers in the Imaj Furniture Factory operating in the province of Isparta. The survey results were interpreted using the SPSS 17 statistical analysis program. All collected data were evaluated using frequency analysis and Chi-square test. As a result of this research, some statistical results were obtained showing the productivity improvement with the work and time study in the factory.

Keywords: Productivity, Furniture industry, Time study, Work study

1. INTRODUCTION

The increase in competition day by day causes the profits to decrease as new competitors constantly enter the market. At this point, it is of great importance to reduce costs to a minimum. Cost improvement that can be made without allocating additional resources can primarily be achieved by using the workforce more efficiently. At the same time, it is an important requirement for businesses to know which product, how and in what time they produce in order to use their resources in the best way. It is a great need to determine all stages in the production process, together with their times, in detail, costing and controlling the process according to these data, both to keep the costs under control, to identify the problems in the process and to determine the improvement points [1-6]. “Work and time study” has an important place among the methods to be used.

If work study is considered as efforts to improve and facilitate people's working life, the history of work study is as old as humanity. These studies have accelerated due to industrialization. Work study is a technique that investigates all the factors that affect a particular event or activity in terms of economic and efficiency and examines human work in a wide scope in order to create opportunities for improvement [7-10]. The importance of ineffective periods for

businesses is very great. Revealing and eliminating these ineffective times lost in the production process and calculating the standard production times and assigning the labor times accordingly not only increases the efficiency of the production process, but also forms the basis for remuneration [11,12].

In technical terms, productivity is the ratio between the outputs produced by a service or manufacturing sector and the inputs used to create those outputs. Therefore, productivity is defined as the effective use of resources -labor, capital, land, materials, energy, information- in the production of various goods and services [13].

The aim is to obtain high efficiency by using the available resources in the best way. One of the most important problems of the countries of the world is the most appropriate use of raw material resources that are going towards depletion. Work study, which is a technique that investigates the factors affecting production activities in terms of economy and efficiency, and time study, which is a subsection of it, are directly related to productivity [14-17]. Efficiency, simplification of method, optimization by maximizing participation, thereby increasing the value-added content of products, reducing unit production costs or reducing unnecessary work and wasted time It is possible with the balancing of the production line [18,19].

The importance of ineffective periods for businesses is very great. Revealing and eliminating these ineffective times lost in the production process, and calculating standard production times and assigning labor times accordingly, increase the efficiency of the production process. In this study, it has been investigated that productivity can be increased without requiring an additional investment in the furniture industry by using work and time study techniques. In this study, a face-to-face interview was conducted with 90 people working as workers in a furniture factory in order to investigate the effect of work and time studies on productivity, and the survey results were statistically interpreted with the SPSS 17 statistical analysis program.

2. METHOD

A survey study was conducted in order to determine the level of knowledge and raise awareness on work, time study and productivity for the employees in the Özkutlu (Imaj) furniture factory operating in the province of Isparta. A total of 90 surveys were distributed to the workers in the factory, and 90 (100%) returned surveys were evaluated. Survey forms consist of two distinct sections. In the first section, there are demographic (population unit) characteristics of the employees, and in the second section, there are a total of 40 questions to be answered by the employees. In the second section, there are multiple-choice questions consisting of five options. The survey results were statistically evaluated by frequency analysis and Chi-square test using SPSS 17.0 statistical analysis program. In Table 1, the demographic characteristics of the employees who participated in the survey are given.

Table 1. Demographic properties of the employees who participated in the survey

Questions	**Options**	**Frequency (n)**	**%**
Gender	Male	72	80,0
	Female	18	20,0
Age	18-24	15	16,7
	25-34	38	42,2
	35-44	34	37,8

	45 and above	3	3,3
Marital Status	Single	21	23,3
	Married	69	76,7
Educational Status	Primary Education	22	24,4
	High School	58	64,4
	Undergraduate	10	11,1
Mountly Net Income	1600-1750 TL	62	68,9
	1751-2000 TL	18	20,0
	2001 TL and above	10	11,1
Operation Time	0-1 years	10	11,1
	1-2 years	13	14,4
	2-3 years	26	28,9
	3-5 years	24	26,7
	5 years and above	17	18,9

According to Table 1, 80% of the 90 people participating in the survey are men and 20% are women. It is seen that 16.7% of the 90 people participating in the survey are in the 18-24 age range, 42.2% are in the 25-34 age range, 37.8% are in the 35-44 age range and 3.3% are in the 45 and over age range. 23.3% of the respondents are single and 76.7% are married. 24.4% of the respondents are primary school graduates, 64.4% are high school graduates and 11.1% are associate degree-undergraduate graduates. 68.9% of the respondents are working with minimum wage, 20% are slightly above the minimum wage and 11% are workers with better salaries. 11.1% of the respondents are beginners, 14.4% are employees for 1-2 years, 28.9% are employees for 2-3 years, 26.7% are employees for 3-5 years, and 18% 9 of them are workers who have worked for 5 years or more. Accordingly, the majority of the survey consists of employees for more than 2 years.

The five options for the multiple choice questions in the second part of the survey are as follows:

Options:
1- I strongly disagree
2- I disagree
3- I'm undecided
4- I agree
5- I totally agree

3. FINDINGS

The survey results were statistically analyzed using the SPSS 17.0 statistical analysis program. The results obtained by frequency analysis and Chi-square test are given in the tables given between Table 2 and Table 9.

Table 2 shows the result of the Chi-square test evaluation of the relationship between the hypothesis that work study is one of the most effective ways to increase productivity and education status.

Table 2. Chi-square test evaluation result of the relationship between education status and the hypothesis that work study is one of the most effective ways to increase productivity

Work study is one of the most effective ways to increase productivity.									
			1	**2**	**3**	**4**	**5**	**Total**	**p**
Education Status	Primary Education	Number	3_a	9_a	6_a	4_b	0_b	22	0,00
		%	60,0%	64,3%	54,5%	8,5%	0,0%	24,4%	
	High School	Number	2_a	5_a	5_a	38_b	$8_{a,b}$	58	
		%	40,0%	35,7%	45,5%	80,9%	61,5%	64,4%	
	Undergraduate	Number	$0_{a,b}$	0_b	0_b	5_b	5_a	10	
		%	0,0%	0,0%	0,0%	10,6%	38,5%	11,1%	
Total		Number	5	14	11	47	13	90	
		%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	

As can be seen in Table 2, since p <0.05, it was observed that there was a significant difference between the question posed and their education level, those with low education levels did not participate, and as the education level increased, the level of participation in the posed opinion increased.

Table 3 shows the result of the Chi-square test of the hypothesis that the measurement will increase the workload and the relationship between education status.

Table 3. Chi-square test evaluation result of the relationship between the hypothesis that the measurement will increase the workload and the educational status

I think measurement will increase the workload.									
			1	**2**	**3**	**4**	**5**	**Total**	**p**
Educational Status	Primary Education	Number	3_a	3_a	11_b	5_b	0_b	22	0,00
		%	9,4%	8,8%	68,8%	62,5%	0,0%	24,4%	
	High School	Number	$21_{a,b}$	29_b	5_c	$3_{a,c}$	0_b	58	
		%	65,6%	85,3%	31,3%	37,5%	0,0%	64,4%	
	Undergraduate	Number	8_a	2_b	0_b	$0_{a,b}$	0_b	10	
		%	25,0%	5,9%	0,0%	0,0%	0,0%	11,1%	
Total		Number	5	32	34	16	8	90	
		%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	

As it can be seen from Table 3, since p <0.05, it is seen that there is a significant difference between the education level and the question asked. While the answers of those with a low level of education were negative, the answers of those with a higher education level were positive. Table 4 shows the hypothesis that there is a link between work study and productivity, and the result of the evaluation with the Chi-square test of the relationship between genders.

Table 4. Chi-square test evaluation result of the hypothesis that there is a link between work study and productivity and gender status

There is a link between work study and productivity.									
			1	**2**	**3**	**4**	**5**	**Total**	**p**
Gender	Male	Number	10_{a}	$10_{b, c}$	$27_{a, c}$	8_{b}	$17_{a, b, c}$	72	0,031
		%	100,0%	66,7%	90,0%	57,1%	81,0%	80,0%	
	Female	Number	0_{a}	$5_{b, c}$	$3_{a, c}$	6_{b}	$4_{a, b, c}$	18	
		%	0,0%	33,3%	10,0%	42,9%	19,0%	20,0%	
Total		Number	10	15	30	14	21	90	
		%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	

As it can be seen in Table 4, since p <0.05, there is a significant difference between the question asked and the gender status, and the majority of the men who participated in the survey answered that they do not agree with the opinion. It is seen that the majority of women give the answer “I agree”.

In Table 5, the result of the Chi-square test evaluation of the hypothesis that measurement will make the workflow healthier and the relationship between genders can be seen.

Table 5. Chi-square test evaluation result of the hypothesis that the measurement will make the workflow healthier and the gender status relationship

I think measurement will make the workflow more streamlined.									
			1	**2**	**3**	**4**	**5**	**Total**	**p**
Gender	**Male**	**Number**	$7_{a, b, c}$	8_{c}	5_{b}	$21_{a, c}$	$31_{a, c}$	72	0,029
		%	87,5%	100,0%	45,5%	84,0%	81,6%	80,0%	
	Female	**Number**	$1_{a, b, c}$	0_{c}	6_{b}	$4_{a, c}$	$7_{a, c}$	18	
		%	12,5%	0,0%	54,5%	16,0%	18,4%	20,0%	
Total		**Number**	8	8	11	25	38	90	
		%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	

As can be seen in Table 5, since p <0.05, it is seen that there is a important distinction between the question posed and the gender status, and that men and women give different answers.

In Table 6, the Chi-square test evaluation result of the relationship between the hypothesis that work study is one of the most effective ways to increase productivity and age groups can be seen.

Table 6. Chi-square test evaluation result of the relationship between age groups and the hypothesis that work study is one of the most effective ways to increase productivity

Work study is one of the most effective ways to increase productivity.									
			1	**2**	**3**	**4**	**5**	**Total**	**p**
Age	18-24	Number	$0_{a, b}$	0_{b}	0_{b}	9_{b}	6_{a}	15	0,000
		%	0,0%	0,0%	0,0%	19,1%	46,2%	16,7%	
	25-34	Number	1_{a}	3_{a}	5_{a}	24_{a}	5_{a}	38	
		%	20,0%	21,4%	45,5%	51,1%	38,5%	42,2%	
	35-44	Number	$2_{a, b, c}$	10_{c}	$6_{b, c}$	$14_{a, b}$	2_{a}	34	
		%	40,0%	71,4%	54,5%	29,8%	15,4%	37,8%	
	45 ve üzeri	Number	2_{a}	$1_{a, b}$	0_{b}	0_{b}	0_{b}	3	
		%	40,0%	7,1%	0,0%	0,0%	0,0%	3,3%	
Total		Number	5	14	11	47	13	90	
		%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	

As it is seen in Table 6, since p <0.05, it can be said that there is a significant difference between the age groups and the question asked, and those younger in age give positive answers to the posed idea, and negative answers are given as the age range increases.

In Table 7, the Chi-square test evaluation result of the relationship between the hypothesis that I think time is wasted while taking measurements and age groups is seen.

Table 7. Chi-square test evaluation result of the relationship between age groups and the hypothesis that I think time is wasted while taking measurements.

I think time is wasted when taking measurements.									
			1	**2**	**3**	**4**	**5**	**Total**	**p**
Age	18-24	Number	5_{a}	4_{a}	4_{a}	2_{b}	0_{b}	15	0,000
		%	50,0%	26,7%	33,3%	5,4%	0,0%	16,7%	
	25-34	Number	$3_{a, b}$	8_{b}	$4_{a, b}$	20_{b}	3_{a}	38	
		%	30,0%	53,3%	33,3%	54,1%	18,8%	42,2%	
	35-44	Number	2_{a}	3_{a}	$4_{a, b}$	$15_{a, b}$	10_{b}	34	
		%	20,0%	20,0%	33,3%	40,5%	62,5%	37,8%	
	45 ve üzeri	Number	$0_{a, b}$	$0_{a, b}$	$0_{a, b}$	0_{b}	3_{a}	3	
		%	0,0%	0,0%	0,0%	0,0%	18,8%	3,3%	
Total		Number	10	15	12	37	16	90	
		%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	

As it can be seen in Table 7, since p <0.05, it was determined that there was a significant difference between the age groups and the question asked, and the people between the ages of

18-24 did not agree with the idea, while the employees after the age of 25 agreed and said that time was wasted while taking measurements.

In Table 8, the result of the Chi-square test evaluation of the relationship between the hypothesis that work study is a way of increasing the efficiency of a factory by rearranging the work and the working hours is seen.

Table 8. Chi-square test evaluation result of the working time relationship with the hypothesis that work study is a way of increasing the efficiency of a factory by rearranging the work

Work study is a way of increasing the efficiency of a factory by reorganizing work									
			1	**2**	**3**	**4**	**5**	**Total**	**p**
Operation Time	0-1 year	Number	0_a	1_a	1_a	6_a	2_a	10	0,049
		%	0,0%	12,5%	11,1 %	11,1%	12,5%	11,1%	
	1-2 years	Number	0_a	0_a	0_a	9_a	4_a	13	
		%	0,0%	0,0%	0,0%	16,7%	25,0%	14,4%	
	2-3 years	Number	0_a	1_a	1_a	19_a	5_a	26	
		%	0,0%	12,5%	11,1 %	35,2%	31,3%	28,9%	
	3-5 years	Number	2_a	1_a	3_a	13_a	5_a	24	
		%	66,7%	12,5%	33,3 %	24,1%	31,3%	26,7%	
	5 years and above	Number	$1_{a, b}$	5_b	4_b	$7_{a, c}$	0_c	17	
		%	33,3%	62,5%	44,4 %	13,0%	0,0%	18,9%	
Total		Number	3	8	9	54	16	90	
		%	100,0%	100,0%	100,0 %	100,0%	100,0%	100,0%	

As it can be seen in Table 8, since $p < 0.05$, it was observed that there was a significant difference between the question asked and the working time, and that the newcomers agreed with the idea that "work study is a way to increase the efficiency of a factory by rearranging the work", while older employees did not agree with the idea.

In Table 9, the Chi-square test evaluation result of the relationship between the hypothesis that I think time is wasted while taking the measurement and the working time is seen.

Table 9. Chi-square test evaluation result of the relationship between the hypothesis that time is wasted while taking the measurement and the working time

I think time is wasted when taking measurements.									
			1	**2**	**3**	**4**	**5**	**Total**	**p**
Operation Time	0-1 year	Number	2_a	2_a	1_a	3_a	2_a	10	0,131
		%	20,0%	13,3%	8,3%	8,1%	12,5%	11,1%	
	1-2 years	Number	4_a	$3_{a, b}$	$2_{a, b}$	4_b	0_b	13	
		%	40,0%	20,0%	16,7%	10,8%	0,0%	14,4%	
	2-3 years	Number	3_a	6_a	4_a	11_a	2_a	26	

		%	30,0%	40,0%	33,3%	29,7%	12,5%	28,9%
	3-5 years	Number	1_a	4_a	3_a	11_a	5_a	24
		%	10,0%	26,7%	25,0%	29,7%	31,3%	26,7%
	5 years and above	Number	0_a	0_a	$2_{a, b}$	$8_{a, b}$	7_b	17
		%	0,0%	0,0%	16,7%	21,6%	43,8%	18,9%
Total		Number	10	15	12	37	16	90
		%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%

As it can be seen in Table 9, since p >0.05, it was seen that there was no significant difference between the question asked and the duration of the study.

4.RESULTS AND DISCUSSION

The concept of efficiency is an important element in our country, especially for businesses. Efficiency increase in enterprises can be achieved to a large extent by the work study technique and the application of studies based on this technique. The most important thing that businesses should do before starting this application is to provide relevant information from the top-level manager to the lowest-level employee. Otherwise, the desired results may not be obtained from the application. The person who will carry out the study should have sufficient knowledge and skills.
In the application study, work and time studies were carried out in Özkutlu (IMAJ) Furniture operating in Isparta, the answers given to the questions in the survey for workers in the position of workers were handled and the results were analyzed and interpreted by using the SPSS 17.0 statistical analysis program.

According to the data obtained, it is seen that the majority of the workers participating in the survey working at Imaj Furniture are male, between the ages of 25-44, married, primary and high school graduates, experienced workers working with minimum wage.

According to the Chi-square test evaluation result of the relationship between the hypothesis 'Work study is one of the most effective ways to increase productivity' and educational status; It was observed that there was a significant difference between the education level and the given hypothesis, and as the level of education increased, the participation in the thought increased, which is an expected result.

According to the Chi-square test evaluation result of the relationship between the hypothesis 'I think the measurement will increase the workload' and the educational status; It is seen that there is a significant difference between the education level and the hypothesis given with the education level. While the answers of those with a low level of education were negative, the answers of those with a higher education level were positive.

According to the Chi-square test evaluation result of the hypothesis of "There is a link between work study and productivity" and gender status; It is seen that there is a significant difference between the hypothesis given and the gender status, and the majority of the men who participated in the survey gave the answer that I did not agree with the opinion, while the majority of the women gave the answer of I agree.

According to the Chi-square test evaluation result of the relationship between gender status and the hypothesis "I think the measurement will make the workflow healthier"; It is seen that there is a significant difference between the question and the gender status, and that men and women give different answers.

According to the Chi-square test evaluation result of the relationship between the hypothesis 'Work study is one of the most effective ways to increase productivity' and age groups; It is seen that there is a significant difference between the given hypothesis and the age groups, that the younger ones respond positively to the thought, and that the negative answers are given as the age range increases.

According to the Chi-square test evaluation result of the relationship between the hypothesis 'I think time is wasted when taking measurements' and age groups; It has been determined that there is a significant difference between the age groups with the given hypothesis and that people between the ages of 18-24 do not agree with the idea, while employees after the age of 25 agree with the idea and think that time is wasted when taking measurements.

According to the Chi-square test evaluation result of the relationship between the hypothesis "Work study is a way of increasing the efficiency of a factory by rearranging the work" and the working hours; It was observed that there was a significant difference between the given hypothesis and the duration of the study, and that the newcomers agreed with the given idea, while the older employees did not.

According to the Chi-square test evaluation result of the relationship between the hypothesis that I think time is wasted while taking the measurement and the working time; It was found that there was no significant difference between the question asked and the duration of the study.

REFERENCES

[1] Şenyiğit, E., Karakaş, S., Uçar, S., Akbal, S., 2021. Analysis of Work-Study-Productivity Practice for Enterprise Resource Planning in a Furniture Firm: Case Study, *European Journal of Science and Technology,* Special Issue 28, pp. 476-480.

[2] Cengiz, T. G., Orbak, A. Y., (2010). Increasing Efficiency with Work and Time Study in a Milk and Dairy Products Factory, International Journal of Engineering Research and Development, Vol.2, No.2.

[3] Doğruer, İ., (2014). Work study. 2nd Edition, Açılım Bookstore , İstanbul.

[4] Acar, N., (2001). Production Planning Methods and Practices, National Productivity Center Publication No:280, 8th Edition
Ankara.

[5] Baş, İ.M., Artar, A., (1991). Productivity Control in Businesses, National Productivity Center Publications, Ankara.

[6] Ayyıldız, İ., (2001). Work Study Technique and an Application in Increasing Efficiency in Businesses. Master Thesis, Sivas Cumhuriyet University, Institute of Social Sciences.

[7] Bezen, A., (2007). The Relationship between Work Study Techniques and Quality and Customer Satisfaction, An Application in the Packaging Industry. Dumlupınar University, Institute of Science and Technology. Master Thesis, 84s, Kütahya.

[8] Bilen, G., (2007). The Effect of Work Study on Productivity in Textile Business and Applied Study in a Textile Factory, Master Thesis, Bolu Abant İzzet Baysal University, Institute of Social Sciences.

[9] Demir, M., (2003). The Effect of Work Study on Increasing Productivity and Its Application in Textile Industry. Master Thesis, Istanbul Marmara University, Institute of Social Sciences,

[10] Demirbaş, Z., (2010). The Effects of Application of Method Study as an Efficiency Improvement Technique in a Garment Business on Business Performance. Master Thesis, Dokuz Eylul University, Institute of Social Sciences.

[11] Dizdar, E., Özen R., (2001). Work Study Practices for Production Efficiency in the Wood Furniture Industry, Journal Technology, Issue
1-2, 1-9.

[12] Durgun, Y., (2000). Work Study-Work Measurement Techniques and an Application in Textile Industry. Master Thesis, Kocaeli University, Institute of Social Sciences.

[13] Kovancı, Ü., (2018). The effect of occupational health and safety practices on productivity. Master Thesis, Katip Celebi University, Institute of Science.

[14] Öncer, M., Asil N., (1992). Detection and Prevention of Lost Time in Four Modern Furniture Factories by Work Sampling, MPM Publications
: 458, Ankara.

[15] Seri, K., (2010). The Effect of Time Study on Long-Term Efficiency An Empirical Evaluation in a Food Company. Master Thesis, Adnan Menderes University, Institute of Social Sciences.

[16] Sabır, E.C., Dönmez, U., (2013). Application of Work Study Method in Yarn Spinning Mill, Tekstil ve Mühendis, 20: 92, 11-26.

[17] Şahin, E., (2003). Determination of Efficiency by Method and Time Study in a Workplace. Journal of Technology, 3-4, 59-66.

[18] Moktadir, M. A., Ahmed, S., Zohra, F. T., & Sultana, R. (2017). Productivity improvement by work study technique: a case on leather products industry of Bangladesh. Ind. Eng. Manag, 6(1), 1000207.

[19] Kumaş, Z., Sabır, E.C., Duru Baykal, P., (2016). The Using of Work Study Technique for Process Productivity of Apparel Plant. Çukurova University Journal of the Faculty of Engineering and Architecture, 31(1), pp. 175-189.