Improving Productivity In A School Desk Production Factory

Eze Somtochukwu Kingsley, Onyeagba Basil Obinna, Madu Okwuchukwu, Maliki Daniel, Okwuego Emeka Charles.

Abstract: Productivity improvement in a school desk production factory was investigated using work study. The study was limited on four most improved areas: safety standards, working conditions, fatigue and material handling. Data collected were subjected to industrial statistical analysis using activity chart and process chart. Results obtained indicate that the improved method saved a time of 1hr 7mins from the old method, reduces fatigue and increases productivity. The results of this finding will be very useful in small scale industries with regard to improving productivity in Nigeria.

Keyword: Productivity, School desk, Factory, Improvement, Work study, Work space.

1. INTRODUCTION

This is a systematic study and analysis of work methods to ensure the best or economical utilization of human, material resources and time in capping the desk frames with the bushes. The work methods include all the processes that were involved in the operation and procedure. Paul and Rabindra, 2006 used subjective assessment through questionnaire, direct observation method and archival data to improve productivity, quality, increase revenue and reducing rejection cost of manual component. Lim and Hoffman, 1997 found that improved layout of the workplace increased productivity of the workers through more economical use of hand movements by conducting an experiment on hacksaws assembly. Imad Alsyouf, 2007 illustrated how an effective maintenance policy could influence the productivity and profitability of a manufacturing process and showed how changes in the productivity affect profit, separately from the effects of changes in the uncontrollable factors. Krafcik, 1998 describes the Japanese's style manufacturing process pioneered by Toyota which uses a range of techniques including just in time inventory systems, continuous improvement and quality circles. Hemanand *et al*, 2012 in his research on automotive industry found out that waste reduction and unwanted transportation improves productivity The study is a technique to investigate, identify and eliminate non-values in the operation; the only systematic and accurate means of establishing time standard, this makes it the most powerful tool for increasing productivity and profitability.

The objectives of this work includes

- Improving tool utilization, manufacturing processes and procedures thereby conserving material
- Reducing human effort, fatigue and material handling
- Improvement of working conditions and safety standard

2. MATERIAL AND METHOD

Record

All the details about the existing method are recorded. This was done by directly observing the work. Symbols were used to represent the activities like operation, inspection, transport, storage and delay. Equipment type: tools used for the operation are file and improvised mallet (200-300mm length of wooden purline) therefore, no machine activity was recorded.

- *Eze Somtochukwu Kingsley, Onyeagba Basil Obinna, Madu Okwuchukwu, Maliki Daniel, Okwuego Emeka Charles.*
- *Advance Manufacturing Department1,2,3, Metallurgical R&D Department4*
- *Scientific Equipment Development Institute, Enugu (A unit of NASENI) Nigeria.*
- *Manufacturing Services Department, National Engineering Design and Development Institute, Nnewi (A unit of NASENI) Nigeria.5*
- *Email: esomto.eze@gmail.com, obinnaonyeagba@yahoo.com, paskal143@yahoo.com, malikidaniel2003@yahoo.com, charlydon200@gmail.com*

Flow diagram: Path of flow of material in the space was recorded.

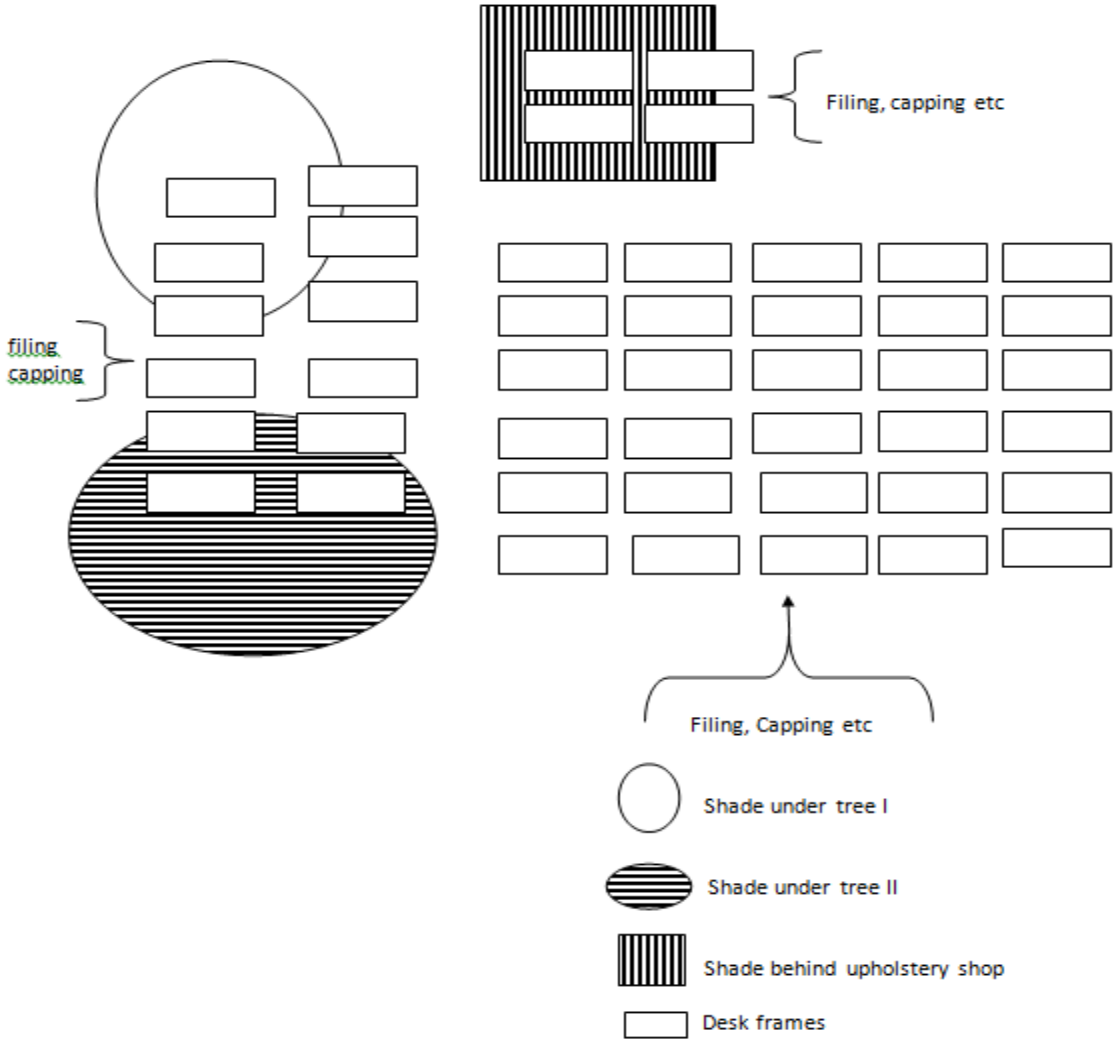

Figure 1*.Initial work space*

Table 1. *ACTIVITY CHART:*

S/N	WORKER	TIME TAKEN TO COMPLETE A FRAME (mins)			
		FILING	TOOL CHANGE	CAPPING	TOOL CHANGE (II)
1	XYV	18	2	11	0.2
2	XYW	22	1	13	0.1
3	XYX	19	2	10	0.3
4	XYY	20	0.5	14	0.2
5	XYZ	20	3	11	0.1

ANALYSIS:

Average filing time = T_f/N
Average time for tool change = T_{tC}/N
Average capping time = T_c/N
Average tool change time (II) = T_{tc2}/N

Where: T_f = total filing time
T_{tp} = total tool change time
T_c = total capping time
T_{tc2} = total tool change time (II)
N = no. of workers

Average filing time = $\frac{18+22+19+20+20}{5}$ = 19.8mins

Average time tool for change = $\frac{2+1+2+0.5+3}{5}$ = 1.7mins

Average capping time = $\frac{11+13+10+14+11}{5}$ = 11.8mins

Average tool change time (II)
= $\frac{0.2+0.1+0.3+0.2+0.1}{5}$ = 0.18mins

33.48mins (29.8 + 1.7 + 21 + 0.18) gives the time to complete the operations on a desk frame Time taken for the 12 frames is therefore given by: 33.48 x 12 = 401.76mins Converting to hour we have the time as 7hrs 9mins.

Table 2. *Process chart:*

S/N	SYMBOL	DESCRIPTION	TIME(mins)
1	○	Selection of caps in the assembling unit	4
2	⇨	Moving the caps to the field	5
3	○	Filing.	19.8 x 12 = 237.6
4	⇨	Tool change. From file to capping mallet. Take note of the delay symbol	1.7 x 12 = 20.4
5	○	Capping	11.8 x 12 = 141.6
6	⇨	Tool change. From capping mallet to file	0.18 x 12 = 2.16
TOTAL			**410.76 = 7hrs 25mins**

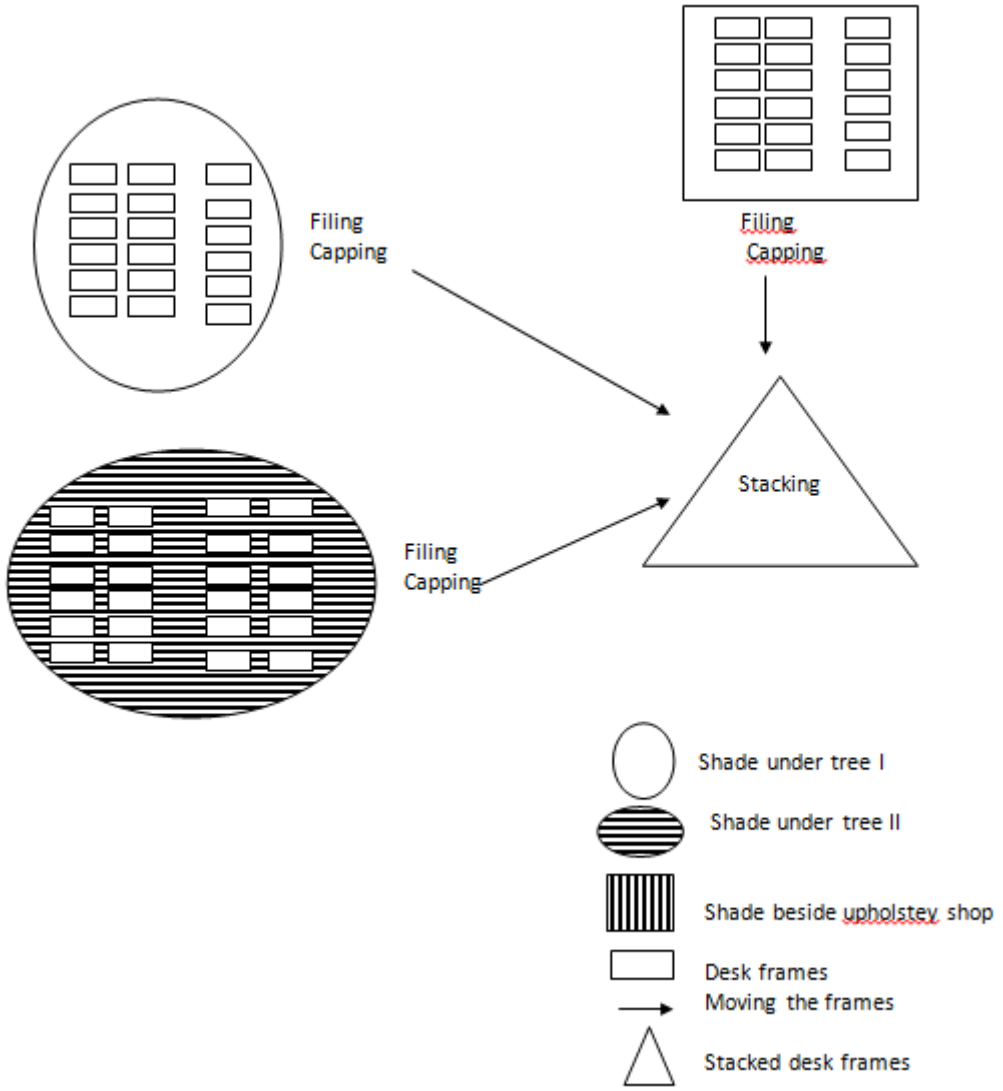

Figure 2. *Improved work space*

Table 3. *ACTIVITY CHART (IMPROVED METHOD)*

S/N	WORKER	TIME TAKEN TO COMPLETE 12 FRAMES (mins)			
		Filing	Tool change	Capping	Moving/stacking
1	XYV	192	2	120	15
2	XYW	216	1	120	14
3	XYX	216	2	132	12

ANALYSIS:

Average filing time = T_f/N
Average time for tool change = T_{tC}/N
Average capping time = T_c/N
Average time for moving/stacking = T_{ms}/N

Where: T_f = total filing time
T_{tp} = total tool change time
T_c = total capping time
T_{ms} = total time for moving/stacking
N = no. of workers

Average filing time = $\frac{192+216+216}{3}$
= 208mins

Average time tool change = $\frac{2+1+2}{3}$
= 1.7mins

Average capping time = $\frac{120+120+132}{3}$
= 124mins

Average time for moving/stacking
= $\frac{15+14+12}{3}$ = 13.6mins

Total time for making the 12 frames; 208 + 1.7 + 124 + 13.6 = 347.3mins Converting to hour, we have 6hrs 18mins

Table 4. *Process chart (Improved method)*

S/N	SYMBOL	DESCRIPTION	TIME(mins)
1	○	Selection of caps in the assembling unit	4
2	⇨	Moving the caps to the field	5
3	○	Filing.	208
4	⇨	Tool change. From file to capping mallet.	1.7
5	○	Capping	124
6	⇨	Moving/stacking the desk frames	13.6
TOTAL			**347.3 = 6hrs 18mins**

3. RESULT AND DISCUSSION

Time Utility:
The difference between the duration of the old method, **7hrs 25mins** and the improved method, **6hrs 18mins** is **1hr 7mins.** This gives us the time we were able to save by using the new method.

Old Method of the Operation:
Desk frames are worked on at the delivery point and left for surface treating and this sometimes makes the working environment an unsuitable one (under the sun), it causes fatigue. The workers have to file a desk frame, fit in the bushes before they proceed to another one; this brings about delays in the operation since the workers keep changing tool and process. It involved a higher degree of human effort, time frame that was expected to be minimized by working where there will be no need to move the desk frames after working is found to have a longer duration due to time waste in blending with the continuous switch of operation and tool change. Workers worked under the sun, this increases fatigue and result to a decline in operation rate.

The Improved Method:
The desk frames are delivered under the available shades in the field. The workers, after operation move the desk frames and stack them off the shades to make space for the next batch of operation, this will reduce fatigue and increase productivity. The workers have to file all the frames in the batch (available target) after which the capping follows, this is more like a batch operation; there is a better process flow which minimizes the time of operation. Tool change will come in only once throughout the operation.

4. CONCLUSION AND RECOMMENDATION:

From the discussion above, it can be concluded that the best method of improving productivity is the method study, improved activity chart and the improved process chart as it improves the current process by reducing workers fatigue,

saves time, creates a better work space and increases productivity.

ACKNOWLEDGEMENT

The authors would like to thank the management and staff of scientific equipment development institute (SEDI) Enugu (A unit of NASENI) for their support in this research.

REFERENCES

[1] Paul H.P. Yeowa, Rabindra Nath Senb (2006), productivity and quality improvements, revenue increment and rejection cost reduction in the manual component insertion lines through the application of ergonomics, international journal of industrial Ergonomics. 36:pp 367- 377.

[2] Lim j and Hoffmann E. (1997), application of the zone of convenient reach by naïve operators performing an assembly task, International journal of industrial Ergonomics. 19: pp 187- 199.

[3] Imad Alsyouf 2007, the role of maintenance in improving companies productivity and profitability, international journal of production Economics. 105: pp 70- 78.

[4] Krafcif J.F. 1998, triumph of the lean production system, sloan management review. 30 (1): pp 41-53.

[5] Hemanand K., Amuthuselvan D., Raja Chidambara S. and Sundararaja G. 2012, improving productivity of manufacturing division using lean concepts and development of material gravity feeder – A case study, international journal of lean thinking. 2 (3): pp 117- 134.