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Operational Correlates of White Collar Productivity

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ABSTRACT

This paper presents an empirical study conducted in a large scale manufacturing industry belonging to automobile sector of India. In the study the thrust was laid upon diagnosing the operational correlates of white collar productivity. In a large number of studies conducted earlier analyzing the factors of productivity, the emphasis was laid upon mainly the psychological factors of productivity related to HR. But, with the technological advancements it was undisputedly accepted that the operational factors too plays a significant role in determining the white collar productivity. The operational factors treated in this study are capacity utilization and inventory management, production management, and process change. Hypotheses related to these factors were constructed and investigated. The population consisted of 130 white collar employees working at various levels of organizational hierarchy. The entire population was divided into 3 strata designated as group-I consisting of departmental heads and senior managers, group-II consisting of managers, and group III consisting of officers. A sample of size 30% equivalent to 39 white collar employees was drawn from the population using stratified random sampling technique. The cell frequency in each stratum was kept uniform to 13 Ss. A 43 item standardized scale was administered upon the selected sample to obtain the response the score of which on each item varied from -2 to +2. The data collected were statistically treated using mean, standard deviation, and Karl Pearson's correlation coefficient. The hypotheses constructed were tested at 5% level of significance using Chi-Square (χ^2) test. The results showed that fall the operational factors considered in this work is interrelated with white collar productivity.

***KEYWORDS:** Capacity utilization, Operational factors, productivity, production management, process change.*

1. INTRODUCTION

The research conducted in productivity domain revealed that the productivity equation of industrial setups depends not only on the psychological factors related to HR but physical/operational factors as well. The recent research studies have revealed to us that "Operational Management" is the hallmark of managing the productivity. Broadly speaking, it is not an independent discipline associated with productivity equation but is an area of specialization whose warp and weft have been woven around HR itself. Thus, as per the emerging trends, productivity management can not be independently thought of only by managing the HR or psychological factors but equal importance needs to be laid upon operation management as well. It is thus intentionally desired in this work to lay major emphasis on these important facets of productivity equation related to physical or operational factors, and thus bridge the gap observed in this field. The study was conducted in one of the flagship industry of Indian automobile sector.

1.1 What is Productivity?

Productivity is an essential part of our urge for self improvement and the achievement of excellence which must be the part of any dynamic society. We must get more out of every acre under the plough. Out of every spindle and machine, out of every technologist, blue collar & white collar personnel, out of every rupee spent. Decision making must be expedited, and there should be greater delegation of financial and administrative powers, simplifications of procedures and improvement in work environment. Better maintenance of plant and equipment for increased capacity utilization."

2. REVIEW OF LITERATURE

A lot of ambiguities have been found associated with defining the realm of white collar productivity. Researchers in the past have put varied opinions on understanding of white collar jobs. Due to this reason, there is dearth of studies focused primarily on evaluating the correlates or the various facets of white collar productivity. Despite the obvious importance of white-collar work to the economy, it is much less understood in an operations sense than is blue-collar work.

A very useful and focused survey/review presented by Wallace J. H., Seyed M. R. I., and Fang L. [1] included an appreciable operations oriented literature survey on managing the white collar work. It meticulously profiled and dealt with the historical pursuits of the white collar productivity domain. The survey revealed that in-spite-of the fact that the white collar work was of vast importance to the economy, the literature has focused largely on traditional blue-collar work. In an effort to stimulate more operations management research into the design, control, and management of white-collar work systems, the survey in [1] provided a systematic review of disparate streams of research relevant to understanding white-collar work from an operations perspective. The review classified research according to its relevance to white-collar work at individual, team, and organizational levels. The survey identified gaps in understanding of white-collar work that suggest promising research directions. Some of the works cited in the survey being very relevant and worth to be included, have been given place in this study also as there is dearth of studies so relevant and pointed.

Well-known principles of bottleneck behavior, task sequencing, line balancing, variability buffering, and many others, Askin and Goldberg [2], Hopp and Spearman [3] pointed to evaluate, improve, and design systems involving blue-collar work. But, in systems where white-collar work predominates, in which tasks are less precisely defined and controlled than in blue-collar systems, principles for guiding operations decisions are yet not known with certainty. The OM field needs to expand its scope and methods to facilitate operations analyses of systems in which white-collar work is an essential component.

Under the definition given by Drucker [4], all workers, whether they are conventionally thought of as white or blue collar, do both white and blue collar work

According to Hopp and Van Oyen [5], the element that describes an individual work system is the set of processes that govern the interactions among the labor, entities, and resources in order to complete Tasks. These could include sequencing/scheduling rules, incentive policies, and a variety of management directives.

Learning is slower and more central in white collar systems than in blue-collar systems Ryu et al. [6]. The complexity of the resources and the novelty of the tasks mean that workers performing white-collar tasks often have more to learn than workers performing blue-collar tasks.

Measurement of output is more difficult in white-collar work systems than in blue-collar systems, Drucker [4], Salemme [7]. In white-collar systems, outputs often have a knowledge component. For example, a consultant writes up an analysis of a management problem for a client. The value of such outputs is more difficult to measure. The intangible knowledge outputs of white-collar work are particularly difficult to value economically until long after the task has been completed. White collar tasks involve a higher degree of creativity. Workers tend to have more discretion over processing times in white-collar systems than in blue-collar systems, Hopp et al. [8]. Because the amount of time spent on a task is discretionary, system utilization is not exogenously determined in white-collar systems as it is in blue-collar systems. Hopp et al. [8] showed that this implies important differences in the operating behavior of blue- and white-collar work systems. One school of thought has argued that work contexts, such as task complexity, deadlines, goal orientations, perceived evaluations, and supervisory styles, affect worker motivation and therefore creative performance, Chesbrough [9]. The prevalence of discretion in white-collar work makes it difficult to apply many results from blue collar research to white collar work systems because most of research on blue collar work systems is built on the assumption that workers are inflexible or have very limited flexibility (Boudreau et al. 2003, Hopp et al. [8].

A key challenge of studying white-collar work systems is due to the difficulty of measuring work performance, Davenport and Prusak [10]. In blue collar work, worker utilization, task completion time, output quality, and quantity can be objectively measured, and thus they can be used to specify a number of quantitative performance measures for evaluating system performance, including utilization, throughput make span, failure rate, etc. However, these metrics often do not translate directly to white-collar work because the inputs are much harder to measure.

Ramirez and Nembhard [11] provided an excellent overview of the literature on productivity measurement in knowledge work. This review reveals that, while researchers have made some progress in approximating or measuring white-collar productivity, thre has been relatively little effort devoted to building general system level models based on specific performance measure. Furthermore, as Ramirez and Nembhard [11] pointed out we still lack methodologies that integrate and cover multiple performance dimensions. Because performance measures are fundamental to OM modeling and analysis, this is a clear research need.

3. METHODOLOGY

For the purpose of data collection for this study, a 43 items standardized scale consisting of various facets of white collar productivity was used. The split half reliability of the scale was 0.89. The responses on the structured questionnaire were collected and analyzed using appropriate techniques as detailed below: -
One hundred and thirty (130) white collar employees working in flagship automobile sector large manufacturing industry, constituted the universe of the present study. From this universe the individual units were selected by dividing the universe into equal weighted strata so that the final sample is representative. If the sample is representative then the outcome of the study is said to be much reliable.

30% of the universe was taken as sampling size, i.e. 39 employees (Ss). The standardized scale was administered to 45 subjects (Ss) so that even after discarding a couple of in-ordered responses the final sample size should not be less than 39 Ss. With this, the cell frequency in each stratum was kept uniform and there were 13 Ss in each stratum which was a good size. Thus the stratified random sampling technique was used for the purpose of this study.

Looking into the requirements of the present study the basic statistical tools mean, standard deviation have been used. Hypotheses have been tested using chi-square test at 5% level of significance.

4. DATA ANALYSIS

The data collected on standardized scale from Ss is presented in tables 4.1 and 4.2. The mean, standard deviation and group wise responses from Ss have been tabulated in table 4.3.

Table -4.1 Productivity Correlates Balance Score Card

Resp. → / Q. No. ↓	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	1	1	1	1	1	2	1	2	1	2	2	1	1	1	1	1	1	2	1
2	2	2	2	2	1	2	2	2	1	2	2	2	2	1	1	1	-1	2	-1
3	1	2	1	1	2	2	2	1	1	2	1	1	2	1	1	1	1	2	1
4	2	1	2	-1	2	2	1	2	1	2	2	1	1	2	-1	2	1	2	2
5	1	1	1	1	1	2	1	2	1	2	1	1	2	-1	-1	1	1	2	-1
6	2	2	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	2	1
7	2	2	1	-1	1	2	1	1	1	2	2	1	1	1	-1	-1	1	2	1
8	2	1	2	1	1	2	2	1	1	2	2	1	1	1	1	1	1	2	-1
9	1	1	1	-1	1	2	2	2	1	2	2	1	1	1	-1	1	1	2	-1
10	1	1	1	-1	1	2	1	1	1	2	2	1	2	1	-1	1	-1	2	-1
11	1	2	-1	1	1	2	2	1	1	2	1	1	1	1	1	1	2	2	-1
12	1	0	1	1	1	-2	-1	-1	-1	1	1	-1	1	1	-1	-1	1	2	1
13	1	2	1	1	1	2	2	1	1	1	2	2	2	1	-1	1	1	2	1
14	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	2	-1
15	1	2	2	1	2	1	2	1	1	1	2	1	2	1	1	1	1	2	1
16	1	2	1	2	2	2	1	1	1	2	1	2	2	1	1	1	1	2	1
17	1	1	-1	1	1	1	1	2	2	2	1	1	-1	-1	1	1	1	2	-1
18	-1	1	1	1	-1	2	-1	-1	1	1	1	1	1	-1	1	1	-1	-2	-2
19	1	1	1	1	1	2	1	1	1	2	2	1	1	1	1	1	1	2	-1
20	1	-2	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	1	-1	-1	1	-1	-2	-1
21	1	1	1	-1	1	1	2	1	-1	1	1	1	1	-2	-1	-1	1	2	-1
22	1	1	1	1	1	2	1	2	1	2	1	1	2	1	1	1	1	2	1
23	2	2	2	1	2	2	2	2	2	2	2	2	2	1	2	1	-1	2	1
24	2	2	2	1	2	1	2	2	1	2	1	1	1	1	1	1	1	2	-1
25	2	1	1	1	1	2	2	1	1	2	1	1	1	1	-1	1	1	2	-1
26	1	1	2	-1	1	2	1	1	1	2	2	1	2	1	1	1	1	2	1
27	1	1	1	-1	1	1	2	1	1	2	2	1	2	1	-1	1	1	2	-1
28	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	-1	1	2	1
29	1	1	2	1	1	1	2	1	1	1	1	1	1	1	2	-2	1	2	-1
30	2	1	2	1	1	2	2	1	1	1	2	1	2	1	2	1	1	2	-1
31	1	1	1	-1	1	1	2	1	1	2	2	1	1	1	2	1	1	2	-1
32	1	1	1	-1	1	2	2	2	1	2	2	1	1	1	2	1	1	2	1
33	1	1	1	-1	1	2	1	2	1	2	1	1	1	1	2	1	1	2	1

34	1	1	2	1	1	2	1	1	1	2	2	1	2	1	2	1	1	2	1
35	1	-1	-1	-2	1	1	2	1	1	2	-1	1	2	1	1	2	-1	2	-1
36	-1	1	1	-1	1	1	1	1	1	2	-1	1	-1	1	1	1	1	2	1
37	-1	1	-1	-1	1	-1	-1	1	1	-1	-1	-1	-1	-1	-1	-1	1	-2	1
38	1	1	1	1	-1	2	1	1	1	1	1	1	2	1	1	-1	1	2	1
39	1	1	1	-1	1	2	-1	1	1	2	1	1	1	-1	-1	-1	-1	-2	-1
40	-2	-1	-1	-1	-1	-1	-1	-1	-1	-1	1	-1	-1	-1	-2	-1	-1	-2	-1
41	-1	1	-1	1	-1	1	-1	-1	1	1	1	-1	1	-1	-1	2	0	-2	-1
42	1	-1	-1	-2	1	1	1	1	1	2	-1	1	1	1	1	-1	0	2	1
43	-1	1	2	-1	1	-1	1	1	1	1	-1	1	-1	1	1	-1	0	2	1
Total	**39**	**43**	**38**	**7**	**39**	**56**	**46**	**44**	**37**	**67**	**50**	**37**	**48**	**25**	**19**	**23**	**25**	**62**	**-1**

Table - 4.2 Productivity Correlates Balance Score Card

Resp. → / Q. No. ↓	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**
1	2	2	2	2	1	2	1	1	1	2	1	1	1	1	1	1	2	1	1	2
2	2	1	2	2	2	1	1	1	-1	2	-1	1	1	-1	1	1	2	1	1	1
3	1	1	-1	1	1	1	2	1	1	1	1	2	-1	1	1	1	2	1	1	2
4	1	1	1	2	2	2	2	1	1	2	1	1	2	1	2	1	2	1	1	2
5	2	1	1	1	2	1	1	1	1	1	1	1	-1	1	2	1	1	1	1	1
6	1	1	1	1	2	1	1	1	1	1	0	1	1	0	1	1	1	1	1	2
7	2	2	1	2	1	-1	1	1	1	1	1	-1	-1	1	1	1	1	1	1	1
8	1	2	-1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	1	1	2
9	1	2	2	1	2	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2
10	1	1	1	2	1	-1	1	1	-1	-1	-1	1	1	-1	1	1	1	1	1	1
11	2	1	1	1	1	1	1	1	2	1	2	1	1	2	1	1	1	1	1	2
12	-1	1	-1	-1	1	-1	1	1	1	1	-1	-1	-1	-1	1	1	1	1	-2	1
13	2	2	1	2	2	-1	2	1	1	1	1	1	-1	1	1	1	1	1	1	1
14	1	1	1	2	1	2	1	1	1	1	1	2	-1	1	1	1	1	1	1	1
15	1	2	1	2	2	1	2	-1	1	1	1	1	1	1	1	1	1	1	1	2
16	2	2	1	2	2	1	2	1	1	2	1	2	1	1	1	1	1	1	1	2
17	1	2	2	1	2	1	1	1	1	-1	1	1	2	1	1	1	1	1	1	1
18	1	-1	-1	1	2	1	1	-1	-1	-1	-1	1	1	-1	1	-1	1	-1	2	1
19	2	1	1	2	1	1	1	2	1	2	1	2	1	1	1	1	-1	1	1	1
20	-1	-2	-2	1	-2	-2	1	-2	-1	-2	-1	-1	-2	-1	-2	-1	-1	-1	1	-1
21	1	1	1	1	1	-2	2	2	1	1	1	1	-1	1	-2	1	2	1	1	1
22	2	1	1	2	2	1	1	1	1	1	-1	1	1	-1	1	1	1	1	1	2
23	2	1	1	2	2	2	2	1	-1	1	1	-1	1	1	2	1	2	1	1	1
24	1	1	1	2	2	1	2	1	1	1	1	-1	-1	1	1	1	1	1	1	2
25	2	1	1	1	2	-1	2	1	1	1	1	1	-1	1	-1	1	1	1	1	1
26	2	2	2	2	2	1	1	1	1	1	1	1	-1	1	1	1	1	1	1	2
27	2	1	2	2	2	-1	1	1	1	2	1	-1	-1	1	-1	1	1	1	1	1
28	2	2	1	2	2	-1	2	1	1	1	1	-1	1	1	1	0	1	1	1	1
29	2	2	1	1	2	1	2	1	1	1	1	-1	1	1	-1	1	1	1	1	2
30	2	2	1	1	1	2	2	1	1	1	1	1	1	1	-1	1	1	1	1	1
31	1	2	1	1	1	1	2	1	1	1	1	1	1	1	-1	1	1	1	1	2
32	2	2	1	1	1	1	2	2	1	1	1	-1	-1	-1	-1	1	1	1	1	1
33	2	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1
34	2	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
35	1	1	-1	2	1	1	1	1	-1	-1	-1	1	1	-1	1	-2	1	-2	1	2
36	1	2	1	2	1	1	2	1	1	1	1	-1	1	1	1	-1	1	-1	1	1
37	-1	1	-2	-2	1	-1	1	-1	1	-1	1	2	1	1	1	1	-1	1	-1	1

38	1	2	1	2	1	1	1	2	1	1	1	1	1	1	1	-2	2	-2	1	1
39	1	1	-1	-1	1	-1	1	-2	-1	2	1	2	1	1	-1	2	1	2	-1	2
40	-2	1	-1	-1	1	-2	-1	-1	-1	1	-1	1	-1	-1	-1	2	1	2	-1	-1
41	1	1	1	-1	-2	-1	1	-1	0	1	-1	-1	1	-1	-1	-2	1	-2	1	-1
42	-1	2	-1	-1	-1	1	1	1	0	-1	1	1	1	1	1	-2	-1	-2	1	1
43	1	1	1	-1	1	1	-1	1	0	1	1	2	-1	1	2	-2	1	-2	1	1
Total	**51**	**55**	**27**	**47**	**53**	**22**	**55**	**31**	**25**	**35**	**25**	**28**	**14**	**23**	**23**	**23**	**44**	**24**	**35**	**53**

Table - 4.3 Mean, Standard Deviation and Group Wise Responses

RESPONDENT NO.	GROUP-I EMPLOYEES	GROUP-II EMPLOYEES	GROUP-III EMPLOYEES
1	39	25	31
2	43	19	25
3	38	23	35
4	7	25	25
5	39	62	28
6	56	-1	14
7	46	51	23
8	44	55	23
9	37	27	23
10	67	47	44
11	50	53	24
12	37	22	35
13	48	55	53
TOTAL	**551**	**463**	**383**
Mean ($\bar{X}$)	**42.385**	**35.615**	**29.462**
Standard Deviation (σ)	**13.690**	**19.099**	**10.268**

4.1 Hypotheses Testing Using Chi Square (χ^2) Test

4.1.1 Null Hypothesis *Ho*: Productivity of White Collar Employees and Capacity Utilization and Inventory Management are independent without any association between them.

Table - 4.4

Groups	Productive Approach	Non-Productive Approach	Neutral Approach	Total
Group-I	4 (A)	17 (B)	70 (C)	91
Group-II	7 (D)	11 (E)	73 (F)	91
Group-III	2 (G)	13 (H)	76 (I)	91
TOTAL	13	41	219	273

Table - 4.5

Cell	Observed Frequency (O)	Expected Frequency (E)	$(O-E)^2$	$(O-E)^2/E$
A	21	4.333	277.778	64.103
B	10	13.667	13.444	0.984
C	60	73.000	169.000	2.315
D	22	4.333	312.111	72.026
E	16	13.667	5.444	0.398
F	53	73.000	400.000	5.479
G	11	4.333	44.444	10.256
H	10	13.667	13.444	0.984
I	70	73.000	9.000	0.123
Tabled Value χ^2 for 4 degrees of freedom = 9.49 Hence, the Null hypothesis is REJECTED			**TOTAL**	**156.668**

4.1.2 Null Hypothesis *Ho*: Productivity of White Collar Employees and Production Management (Scheduling, Lay-outing, and Maintenance etc) are independent without any association between them.

Table - 4.6

Groups	Productive Approach	Non-Productive Approach	Neutral Approach	Total
Group-I	4 (A)	15 (B)	72 (C)	91
Group-II	2 (D)	21 (E)	68 (F)	91
Group-III	9 (G)	14 (H)	68 (I)	91
TOTAL	15	50	208	273

Table - 4.7

Cell	Observed Frequency (O)	Expected Frequency (E)	$(O-E)^2$	$(O-E)^2/E$
A	21	5.000	256.000	51.200
B	10	16.667	44.444	2.667
C	60	69.333	87.111	1.256
D	22	5.000	289.000	57.800
E	16	16.667	0.444	0.027
F	53	69.333	266.778	3.848
G	11	5.000	36.000	7.200
H	10	16.667	44.444	2.667
I	70	69.333	0.444	0.006
Tabled Value χ^2 for 4 degrees of freedom = 9.49 Hence, the Null hypothesis is REJECTED			**TOTAL**	**126.671**

4.1.3 Null Hypothesis *Ho*: Productivity of White Collar Employees and Recognition Of Achievement/Potential are independent without any association between them.

Table - 4.8

Groups	Productive Approach	Non-Productive Approach	Neutral Approach	Total
Group-I	4 (A)	15 (B)	72 (C)	91
Group-II	4 (D)	15 (E)	55 (F)	91
Group-III	2 (G)	15 (H)	70 (I)	91
TOTAL	10	45	197	273

Table - 4.9

Cell	Observed Frequency (O)	Expected Frequency (E)	$(O-E)^2$	$(O-E)^2/E$
A	21	3.333	312.111	93.633
B	10	15.000	25.000	1.667
C	60	65.667	32.111	0.489
D	22	3.333	348.444	104.533
E	16	15.000	1.000	0.067
F	53	65.667	160.444	2.443
G	11	3.333	58.778	17.633
H	10	15.000	25.000	1.667
I	70	65.667	18.778	0.286
Tabled Value χ^2 for 4 degrees of freedom = 9.49 Hence, the Null hypothesis is REJECTED			**TOTAL**	**222.418**

5. CONCLUSIONS

White collar personnel belonging to all the three groups exhibited satisfactory level of general productivity in the industry. They opined that the productivity of white collar is adversely affected due to non-availability of inventory. Process change, more automation, and recycling of waste are the factors which yielded high response from the employees for enhancing the white collar productivity. All of them were found minimally satisfied with the machine capacity utilization. However, greater level of commitment for the productivity was observed in group-I level of employees compared to group-II and group-III white collar employees. Encouragement of white collar employees for doing innovative works has been observed lacking in the system.

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