PRODUCTIVITY MEASUREMENT AND ANALYSIS OF A PUBLIC SECTOR AUTOMOBILE REBUILD ORGANIZATION

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ABSTRACT

Public sector automobile rebuild organizations have comparatively low productivity as compared to private sector organizations especially in developing countries. Despite gigantic budgetary allotments, public sector rebuild organizations remain non-productive, ineffective and inefficient as they are not exposed to aggressive market competition and profitability. These organizations are administered by government rules and procedures unlike private sector organizations which are driven solely on profitability factor. Therefore, conventional productivity improvement models are as such not fully applicable to public sector rebuild organizations. In this context, data of a public sector automobile rebuild organization has been collected. Total and partial productivities of the organization have been measured and analyzed by using Total Productivity Model (TPM). Detailed productivity analysis of the selected organization has been carried out with specific focus on limitations of model when applied to public sector organizations alongside reasons for low productivity. Results indicate that public sector organizations need to focus on cost minimization and resource optimization to enhance productivity and output as compared to private sector organizations which focus on cost minimization and profit maximization.

KEYWORDS: *Productivity measurement, rebuild, automotive, low productivity, cost minimization, resource optimization*

INTRODUCTION

Worldwide industrial revolution has prompted overall acknowledgment and significance of productivity enhancement in public and private organizations at international, national and organizational level. Manufacturing enterprises primarily target maximization of profit and minimization of cost in private sector to remain competitive (Finn, 2011). Private sector organizations have always focused on achieving maximum profitability which has compelled the researchers to work for enhancing productivity in the private sector. On the contrary, manufacturing and services organizations in public sector have not been accorded due importance. Private sector enterprises entail advance management skills, knowledge and techniques as compared to public sector organizations which are incompetent and non-productive (Eugenio Caperchione *et al.,* 2017). Public sector organizations are ineffective and inefficient especially in developing countries (David & Wayne, 2017). Goals and objectives of public and private sector organizations vary and are not interchangeable. Public and Private sector organizations can be differentiated on basis of a number of distinct factors. Salient have been tabulated as under (Mihaiu *et al.,* 2010):-

Table 1: Differences between Public and Private Organizations

Public Organization	Private Organization
Serve the nation (economic and social uplift)	Maximization of profit
Run by public servants / bureaucrats	Run by Board of Governors
Allocate, reallocate and control resources	Generate and allocate resources
Funded as per Government budget	Funds based on investment and productivity
Output based operations	Competitive based operations in market

In developing countries, public sector automobile rebuild industry consumes a major portion of government funds in each fiscal year. Since replacement of equipment / vehicles at the end of useful life is costly option and recurring substitution results in extraordinary drain on economy, therefore, developing countries generally resort to rebuild to ensure sustainability of existing equipment instead of substitution / replacement. Public sector automobile rebuild industry thus holds a major share in national economy of developing countries.

In this backdrop, productivity analysis of one of the largest public sector automobile rebuild organization of a developing country has been carried out in this

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research. The organization selected for the purpose, has more than 2500 employees and is established over an area of 50 acres with a capability of rebuilding 700 vehicles annually. Rebuild organization gets a budget of around Rs 500 Mn on annual basis. Managing Director along with Deputy Managing Director form part of top management, whereas General Managers and Managers form the middle management while Supervisors and Section Incharges are part of lower management. To keep confidentiality / secrecy as promised, selected organization has been referred to as Organization-A. This organization rebuilds vehicles, engines and critical vehicle assemblies. Research scholar is himself employed as a General Manager in the organization.

Measurement and enhancement of productivity in public sector automobile rebuild organizations of developing countries is essentially required due to their low productivity and high consumption of funds. Traditional productivity improvement models are not fully applicable on public sector automobile rebuild industry as these rebuild organizations have unique problems / bottlenecks which result in low productivity. Researcher has therefore endavoured to highlight that conventional productivity enhancement models are designed primarily for private sector organizations and these models when applied to public sector organizations reflect inherent limitations / shortcomings thereby emphasizing need for formulation of a dedicated public sector automobile rebuild productivity enhancement model.

LITERATURE REVIEW

Efficient and effective use of input resources for generating goods or services as outputs is termed as productivity and is defined to be a by-product of effectiveness as well as efficiency. Specific ratio of gross output viz-a-viz single factor input is defined as partial productivity whereas "ratio of net output (excluding material resource from gross output) and sum of labour and capital inputs in deflated monetary units" is named total factor productivity. Total productivity is "ratio of total output to the sum of all input factors". Public sector rebuild organizations are required to gauge performance methodically and consistently to enhance overall productivity of the organization while remaining cognizant to aforementioned definitions (Ingrida Balaboniene and Griede Vecerskiene, 2015). Public sector occupies an important part in national economic landscape (Ana Rita Domingues, 2017). Furthermore, for improving productivity, overt, precise and practicable pre-defined performance goals must be achieved by the public sector rebuild organization employees for the accomplishment of overall organizational objectives (Roland and Frank Verbeeten, 2013). In private organizations, worker behavior and attitude is controlled by monitory means whereas service in public sector is counted as a public good and leads to low motivation (Paulo Aguiar do Monte, 2017). On the contrary, private sector organizations can measure and improve productivity based on market competition and profitability.

Rebuild industry results in generating enhanced revenue besides increase in market share of the organizations especially in Western countries (Jayaraman and Luo, 2007). Rebuild industry facilitates mushrooming of businesses owing to cost saving due to reduction in resource requirements, reusing/recycling of parts, extended useful life cycle of product besides boosting rate of employment (Sarkis *et al.,* 2010). Automotive industry is considered to be leading industry in rebuild as 70% of all rebuild organizations are associated with automotive sector (Steinhilper *et al.,* 2011). Moreover, rebuild of automotive components is the most dominant out of all major products being rebuild (Steinhilper *et al.,* 2011). Rebuilding of vehicles is the practice of disassembly, cleaning, restoration, replacement of parts (condition based) and reassembling a vehicle so that it becomes as good as, or better than new (Hammond *et al.,* 1998). In UK, rebuild consists of adding value to the product in remanufacturing process (Jayaraman *et al.,* 2005). In United States; rebuild vehicle consists of restoring worn out parts of the product to like-new condition. Rebuilding vehicle includes disassembly, cleaning, replacement, reassembly, testing and inspected again so that it complies with or surpasses newly manufactured product standards (Sundin and Bras, 2005).

United States is home to many of the leading global companies dealing with rebuild of automotive parts with an approximate sales of US $ 553 billion in 2011 (USITC, 2012). In this context, it is highlighted that Volkswagen is involved in rebuild since 1947 (Zhang *et al.,* 2011). These facts amply demonstrate economic potential of automobile rebuild sector. Rebuild being a complicated technical process warrants major modifications

to conventional assembling / manufacturing procedures (Guide V.D.R, 2000). Public sector rebuild organizations must be geared up to cope up with wide-ranging issues of variance in condition of worn out returned products and to meticulously articulate activities including segregation, assessment, dis-assembling and re-assembling of rebuild vehicles (Guide V.D.R, 2000). Therefore, planning and processes of public sector rebuild industry are quite different as compared to manufacturing / assembling industry. In rebuild, vehicle has to be dismantled initially followed by the assessment of disassembled parts for reuse, rebuild and replacement and then re-assembly of vehicle whereas in manufacturing, complete new vehicle is manufactured with all brand new parts/assemblies procured from different vendors. Therefore, public sector rebuild and private sector manufacturing organizations despite having some common practices require specific models for measuring and improving productivity. Public sector rebuild organizations have to face more diverse problems and complicated issues as compared to standard manufacturers of new products (Statham, 2006). Thus, public sector rebuild organizations ought to have more organized, strong and dedicated procedures / systems to ensure timely delivery of quality products to the end user. Researchers have always focused on improving productivity in private sector rather than public sector organizations due to profitability factor. Since public sector rebuild enterprises are governed by government rules and procedures, therefore, this paper attempts to highlight that orthodox productivity enhancement models principally designed for private sector manufacturing setups are not fully applicable to public sector automobile rebuild industry and have certain inherent limitations. Moreover, public sector rebuild organizations have low productivity as compared to private manufacturing organizations.

METHODOLOGY

In order to measure and analyze productivity dynamics of a public sector rebuild organization of a developing country, researcher opted for utilizing a productivity measurement model primarily designed for private sector manufacturing industry. Model has a lot of inherent advantages and facilitates productivity measurement, analysis, planning and subsequent improvement in highly scientific approach. Model is equally applicable on manufacturing, production and service organizations. Therefore, it is a more inclusive and reliable problem-solving tool for productivity analysis and improvement of a public sector rebuild organization. Total Productivity Model (TPM) (Khater and Mostafa, 2011) (Sumanth, 1994) was thus selected for measuring productivity of Organization-A. TPM has been employed to measure and evaluate the productivity of the organization by converting all outputs and inputs in uniform units. TPM has also facilitated measurement of standard five partial productivity parameters of the organization. As per TPM, overall total productivity of the organization has been computed by using formula as under:-

$$\text{Total productivity} = \frac{\text{Total tangible output}}{\text{Total tangible input}}$$

Where,

Total tangible output = cost of outputs includes finished and partial products

Total tangible input = cost of inputs includes material, labour, capital, energy, miscellaneous

Tangible output consists of value of directly measureable products and tangible input means consumption of all measurable resources to generate output. Tangible outputs in Organization-A include the value of finished and partial products i.e outputs whereas inputs include cost incurred on human resource (workers, managers, professionals etc), capital cost entails fixed cost (land, plant, buildings, machinery etc) and working cost (inventory, allotment of funds, etc), cost of materials including raw material, energy costs consists of electricity, gas, water, oil bills etc whereas allied expenses include TA/DAs, taxes, R&D, etc. Financial unit in rupees (Mn) has been used for calculating outputs as well as inputs to convert cost of finished products and input resources in equivalent terms. Total productivity underscores the efficiency and effectiveness of the organization. Subsequently, partial productivity for material, capital, labour, energy and miscellaneous expenses has also been computed.

DATA COLLECTION

Organization “A” rebuilds following three main products:-

1. Product 1 - Vehicle

2. Product 2 - Engines

3. Product 3 - Critical Assemblies e.g. fuel pumps, turbochargers, gear box, etc

As per requirement of TPM, data of organization has been collected in two distinct time periods. In order to have a clear picture of productivity trend of the organization, data of the organization spanning over a period of last 5 years has been considered instead of yearly basis. Following 2 x distinct time periods have been selected:-

1. Time period 2011-12 (Period 0) will be termed as base period.

2. Existing period 2016-17 (Period 1) will be termed as current period.

The output data of the organization has been collected by considering the value of the finished products including rebuild cost of vehicles, rebuild cost of engines and the rebuild cost of critical assemblies. Therefore, data for output elements corresponding to each of the above mentioned 3 x products in these two time periods Period 0 (base period 2011-12) and

Period 1(current period 2016-17) has been collected and summarized in Table 2.

Table 2: Output Data for Organization-A in Period 0 and Period 1

	Product 1 (Vehicle)				Product 2 (Engine)				Product 3 (Major Assembly)			
Make & Type	PERIOD 1 (2016/17)		PERIOD 0 (2011/12)		2016/17		2011/12		2016/17		2011/12	
Output	Qty	Total Cost (Mn)	Qty	Total Cost (Mn)	Qty	Total Cost (Mn)	Qty	Total Cost (Mn)	Qty	Total Cost (Mn)	Qty	Total Cost (Mn)
Car	10	10.8	10	8.93	10	0.84	10	0.73	0	0	0	0
Single/ Double Cabin	120	276	120	228.1	80	41.96	80	36.8	34	10.2	34	9.1
Utility Truck	40	289.2	40	239	40	22	40	19.3	2	0.15	2	0.13
Hiace Van	20	104	20	85.9	0	0	0	0	0	0	0	0
Rescue Vehicle	5	49	5	40.5	5	4.5	5	3.9	14	3.5	14	3.1
Bus	15	139.5	15	115.3	0	0	0	0	0	0	0	0
TOTAL	210	868.5	210	717.8	135	69.3	135	60.3	50	13.85	50	12.4

In public sector automotive rebuild organization, the output consists of finished units only against all three above mentioned products. Similarly, cost of input elements in the form of salary for human resource, cost of material and spare parts, cost of fixed and working capital, cost of energy consumption/utility bills and miscellaneous expenses has been collected and summarized in Table 3.

Data for input elements corresponding to each of the above mentioned 3 x products in same two time periods has been collected. The deflation factor varying from 5 to 35% has been applied to represent change in cost of the product in the base period as compared to current period. Total productivity value for product 1 in Period 0 and 1 has been determined by taking output from Table 2 and input from Table 3 as under:-

Total productivity of product 1 in Period 0 = $\frac{717.8}{2948.75}$

= Rs 0.24/Rupee input (1)

Total productivity of product 1 in Period 1= $\frac{868.5}{3397.96}$

= Rs 0.26/Rupee input (2)

Table 3: Input Data for Organization-A in Period 0 and Period 1

	Product 1 (Vehicle)					Product 2 (Engine)					Product 3 (Major Assembly)				
	2016/17		2011/12 (Baseline Period)			2016/17		2011/12 (Baseline Period)			2016/17		2011/12 (Baseline Period)		
Input	Qty	Total Cost (Mn)	Qty	Def	Total Cost (Mn)	Qty	Total Cost (Mn)	Qty	Def	Total Cost (Mn)	Qty	Total Cost (Mn)	Qty	Def	Total Cost (Mn)
Labour															
Top & Middle Management	25	23.55	22	1.35	15.35	2	1.81	2	1.35	1.34	1	0.9	1	1.35	0.66
Lower Management	182	78.4	185	1.35	59.04	4	1.77	4	1.35	1.31	2	0.92	2	1.35	0.68
Employee (Tech)	1631	619.2	1589	1.25	482.6	62	22.53	60	1.25	17.44	18	6.94	19	1.25	5.86
Employee (Non Tech)	591	217.4	595	1.25	175.1	8	2.95	6	1.25	1.76	4	1.45	4	1.25	1.16
Adhoc employees	91	19.66	24	1.1	4.71	2	0.43	1	1.1	0.2	1	0.22	1	1.1	0.19
Total	2520	958.3	2415		736.8	78	29.5	73		22.07	26	10.42	27		8.56
Raw Material															
Car	4	0.02	16		0.11	154	1.26	146		1	0	0	0		0
S / Double Cabin	624	6.3	173		3.2	215	2.67	225		2.33	18	0.32	21		0.31
Utility Truck	30	0.86	51		0.35	118	1.71	120		1.45	57	1.2	53		0.92
Hiace Van	18	0.48	45		0.17	0	0	0		0	0	0	0		0
Rescue Vehicle	383	4.25	400		5.96	129	2.45	132		2.09	41	1.51	40		1.23
Bus	52	3.38	6		0.87	0	0	0		0	0	0	0		0
Total		15.3			10.66		8.1			6.87		3.03			2.48

Capital															
Land		2150		1.1	1955		80		1.1	72.7		16		1.1	14.55
Building		80		1.07	74.77		9.2		1.07	8.6		7.12		1.07	6.65
Machinery		69.16		1.03	67.15		37.6		1.03	36.5		9.3		1.03	9.03
Tools & Equipment		2.72		1.02	2.67		0.52		1.02	0.51		0.25		1.02	0.24
Total Fixed Capital		2302			2099		127.3			118.3		32.66			30.47
Car	10	2.4	10	1.22	1.96	10	0.6	10	1.16	0.51	0	0	0	1.12	0
S/ Double Cabin	120	42	120	1.22	3.44	80	10	80	1.16	8.65	34	3.87	34	1.12	3.46
Utility Truck	40	24.8	40	1.22	2.03	40	7.8	40	1.16	6.72	2	0.102	2	1.12	0.091
Hiace Van	20	9.6	20	1.22	7.86	0	0	0	1.16	0	0	0	0	1.12	0
Rescue Vehicle	5	3.9	5	1.22	3.19	5	1.3	5	1.16	1.11	14	0.63	14	1.12	0.57
Bus	15	18.75	15	1.22	1.53	0	0	0	1.16	0	0	0	0	1.12	0
Total Working Capital (Inventory)	210	101.5	210		83.15	135	19.71	135		17	50	4.62	50		4.12
Total Capital		2403			2182		147			135.3		37.28			34.59
Energy															
Electricity (Summer)		3.19			6.21		0.13			0.11		0.1			0.09
Electricity (Winter)		2.98			5.61		0.12			0.1		0.08			0.07

Sui Gas (Summer)		3.51			0.06		0.02			0.02		0.01			0.01
Sui Gas (Winter)		4.06			0.08		0.02			0.02		0.01			0.01
Water		0			0		0			0		0			0
Oil		5.06			4.95		0.32			0.31		0.11			0.11
Total		18.89			16.92		0.61			0.57		0.32			0.29
Miscellaneous Expenses															
Travel		0.4			0.06		0.02			0.03		0.01			0.01
Taxes		1.75			1.20		0.21			0.17		0.1			0.08
Stationery		0.05			0.80		0.01			0.01		0			0
Total		2.2			2.06		0.24			0.2		0.11			0.1
G. Total		3398			2949		185.5			165		51.16			46.01

From Eq. (1) and Eq. (2), Total productivity index of product 1 can be calculated as under:-

Total productivity index of product 1= $\frac{0.24}{0.24}$ (for Period 0)

Total productivity index of product 1= $\frac{0.26}{0.24}$ = 1.05 (for Period 1)

Similarly, partial productivities for all 3 x products as well as overall partial productivity of the organization in Period 0 and Period 1 have been calculated. As an example, Labour productivity for product 1 has been calculated by taking output of product 1 from Table 2 in time period 0 and taking input from Table 3 against human resource (considering the salary / pay). Details are as under:-

Labour productivity of product 1 in Period 0 = $\frac{717.8}{736.84}$

= Rs 0.97/Rupee input ` (3)

Labour productivity of product 1 in Period 1 = $\frac{868.5}{958.26}$

= Rs 0.91/Rupee input (4)

From Eq. (3) and Eq. (4), labour productivity index of product 1 can be calculated as under:-

Labour Productivity index of product 1= $\frac{0.97}{0.97}$ =1.0 (for Period 0)

Labour Productivity index of product 1= $\frac{0.91}{0.97}$ = 0.93 (for Period 1)

Similarly, other partial productivities of the organization have been calculated.

Based on the data collected and compiled from Table 2 and 3, the total productivity of product 1 for Period 0 has been computed by taking total output of Product 1 from Table 2 and total input of product 1 from Table 3. Details are as under:-

Total productivity of product 1 for Period 0 = 717.8 / 2948.75 = 0.24

Total productivity of product 1 for Period 0 is 0.24 whereas for Period 1 has been computed as 0.26. Similarly, partial productivities for product 1, 2 and 3 have been calculated and summarized in Table 4.

Based on the data collected and compiled from Table 2 and 3, the total productivity of organization for Period

0 and Period 1 has been computed by taking total output of all 3 x products from Table 2 and total input of all 3 x products from Table 3. Details are as under:-

Total productivity of organization for Period 1 = 951.65/ 3634.6 = 0.262 (taken from table 4)

Total productivity of organization for Period 1 is 0.262 whereas for Period 0 has been computed as 0.25. Therefore, overall productivity of organization has increased from 25% to 26.2 %. Total and partial productivities for the complete organization have been computed in the same manner and are shown in Table 5.

Table 4: Total and partial productivities for individual products

Entity		Product 1 (Vehicle)		Product 2 (Engine)		Product 3 (Major Assembly)	
		Period1	Period0	Period1	Period0	Period1	Period0
Total Productivity	Value	0.26	0.24	0.374	0.368	0.271	0.269
Total Productivity Index	Index	1.05	1.00	1.01	1.00	1.007	1.00
Labour Productivity	Value	0.91	0.97	2.35	2.78	1.33	1.44
Labour Productivity Index	Index	0.93	1.00	0.85	1.00	0.92	1.00
Material Productivity	Value	56.82	67.33	8.55	8.85	4.56	4.99
Material Productivity Index	Index	0.84	1.00	0.97	1.00	0.91	1.00
Capital Productivity	Value	0.36	0.33	0.47	0.45	0.37	0.36
Capital Productivity Index	Index	1.10	1.00	1.05	1.00	1.04	1.00
Energy Productivity	Value	45.97	42.43	114.04	107.27	43.52	42.51
Energy Productivity Index	Index	1.08	1.00	1.06	1.00	1.02	1.00
Miscellaneous Productivity	Value	394.9	348.82	289.5	305.16	126.32	133.31
Miscellaneous Productivity Index	Index	1.13	1.00	0.95	1.00	0.95	1.00

Table 5: Total and partial productivities for Organization A as a whole

Entity		PERIOD 1 (2016/17)	PERIOD 0 (2011/12)
Total Productivity of organization	Value	0.262	0.25
	Index	1.046	1
Partial Productivities			
Labour Productivity	Value	0.953	1.031
	Index	0.92	1
Material Productivity	Value	36.014	39.53
	Index	0.91	1
Capital Productivity	Value	0.368	0.336
	Index	1.094	1.00
Energy Productivity	Value	48.014	44.5
	Index	1.08	1
Miscellaneous Productivity	Value	373.43	336.61
	Index	1.11	1

In order to calculate the break-even points for product 1, 2 and 3 and for the whole organization, researcher used formula i.e Break-even Point = 1 - working capital / Total input

For product 1, working capital for period 1 is 101.45 Mn from Table 3 and Total input 3397.96 Mn has again been taken from Table 3. By putting the values,

Break-even Point = 1 - 101.45 / 3397.96 = 0.97

Similarly, break-even point for the individual products as well as for the organization have been calculated and summarized in Table 6

Table 6: Break-even points for individual products and organization

	Entity	Period 1	Period 0
Product 1 (Vehicle)	Working Capital (Mn)	101.45	83.15
	Total Input (Mn)	3397.96	2948.75
	Break-even Point	0.97	0.972
Product 2 (Engine)	Working Capital (Mn)	19.71	17
	Total Input (Mn)	185.48	165.04
	Break-even Point	0.894	0.897
Product 3 (Assembly)	Working Capital (Mn)	4.61	4.12
	Total Input (Mn)	51.16	46.01
	Break-even Point	0.91	0.91
Organization	Working Capital (Mn)	125.78	104.27
	Total Input (Mn)	3634.62	3159.8
	Break-even Point	0.965	0.967

ANALYSIS OF MEASURED PRODUCTIVITY OF ORGANIZATION-A

It is evident from Table 4 that total productivity index increased in Period 1 as compared to Period 0 in case of all three products. The increases are 5%, 1% and 0.7% for product 1, 2 and 3 respectively. Total productivity of the Organization as a whole shows a slight gain in overall productivity with an increase of 4.6% in period 1 as shown in Table 5. Same is depicted graphically in Fig. 1.

able 5 shows an increase of 9.4% in capital productivity, 7.9% in energy productivity and 10.9% in miscellaneous productivity respectively from base period. Scrutiny of table 5 further reveals that labour and material productivity have decreased by 9.2% and 9.1% respectively from Period 0 to Period 1 as shown in Fig. 2.

Target organization has thus achieved an overall increase in total productivity due to marginal increase in capital, energy and miscellaneous expenses productivities despite of decrease in labour and material productivities.

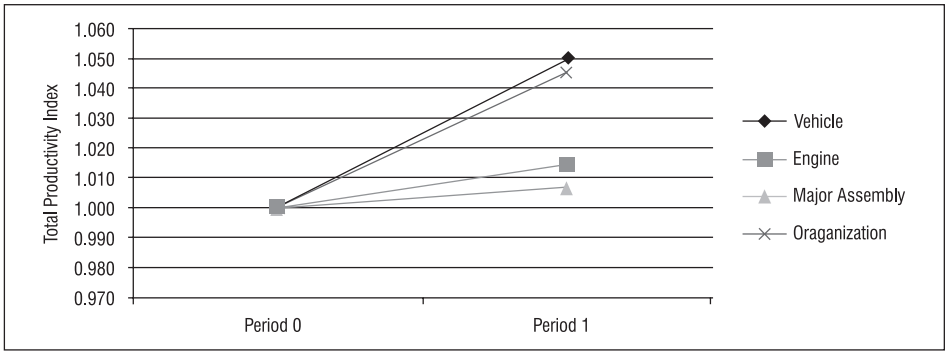

Fig. 1 Total Productivity Index for Product 1, Product 2, Product 3 and Organization.

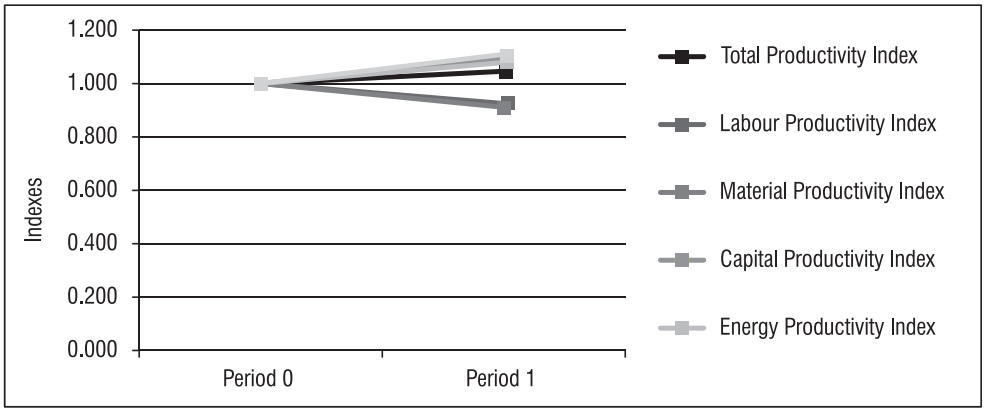

Fig. 2 Total and Partial Productivity Indexes for the Organization.

As per the documentary evidence provided by the target organization, capital productivity has increased between Period 0 and Period 1due to the disposal of dead inventory i.e stores / spares parts worth Rs 10 Mn that had not been used for last 2 x years prior to Period 0. Reduction in inventory has thus resulted in reducing cost of working capital with a corresponding increase in capital productivity. Increase in the energy productivity has been achieved by the organization by introducing concept of utilization of daylight in the organization. Transparent sheets have been installed by the management in the major buildings / sheds thus, leading to a drastic cut in the use of electricity by making optimum use of sunlight. This fact is amply highlighted in table 3 where electricity consumption charges of the organization have been significantly reduced from Rs 6.21 Mn in Period 0 to Rs 3.19 Mn in Period 1. Due to the introduction of computer LAN network within the organization premises, organization has shifted to a paperless environment and accordingly the requirement of stationery for daily correspondence has been drastically reduced leading to a corresponding increase in productivity of miscellaneous expenses. The stationery charges of the organization have also been reduced from Rs 0.8 Mn in Period 0 to Rs 0.05 Mn in Period 1 as reflected in table 3. Therefore, an increase has been observed in the above mentioned 3 x partial productivities, although, organization has applied different productivity improvement techniques during the period under review.

Notwithstanding above, break-even trend of organization is shown in Fig. 3.

Break-even point analysis reveals that total productivity of the organization is far below the break-even point in Period 0 and Period 1(Table 6), thereby indicating that available resources have not been efficiently, effectively and optimally utilized for achieving desired output. In private sector, if the total productivity of the organization remains far below the break-even point for

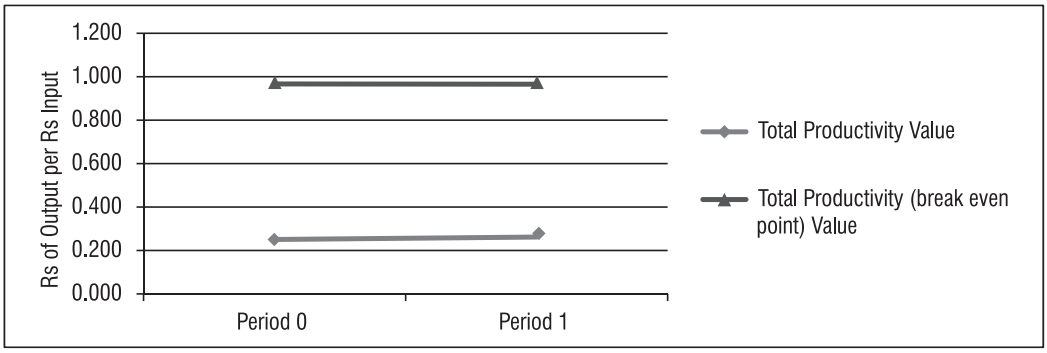

Fig. 3 Value of Total Productivity and corresponding break-even Point for Organization.

a certain time span, that organization will either buckle up / discontinue the production or will bring a radical change in the system to be able to generate sizeable profit to survive and remain competitive in market. Since Organization-A is a public sector enterprise; therefore rebuild of the vehicles / products is being continued despite suffering from evident huge financial loss. In a public sector organization, it is pertinent to highlight that all inputs are Government funded i.e fixed capital cost (land, structure and machinery), working capital (inventory), staff salary, technical and maintenance funds etc. Thus, it is emphasized that in a public sector organization, concept of breakeven point is utilized only to ascertain whether organization is operating in loss or at breakeven point as profitability is not the target. Working in public organizations is totally based on performance / output instead of profit maximization and goal of such organizations is sustainability while ensuring proficient and optimal use of available resources. TPM has been formulated primarily for private organizations to weigh their performance against breakeven point to maximize profit, whereas public sector organizations use breakeven to ascertain whether organization is operating in loss or otherwise and calculate the cost of finished product only instead of profit. Furthermore, productivity of Organization-A has been hovering around 25 – 26.2 % in last 5 years which reveals that awareness about productivity and performance improvement in public sector organization is still not there and no dedicated effort has been made by the top and middle management towards this end due to prevalent bureaucratic culture and lack of accountability in the target organization.

DISCUSSION

Productivity of Organization-A from Period 0 (2011/12) to Period 1 (2016/17) has been analyzed critically especially with respect to partial productivity, productivity of operational units (product wise) and overall productivity of the organization besides working out break-even point. It is highlighted that automobile rebuild process has following specific characteristics as compared to manufacturing (Statham, 2006):-

It is labour intensive as product has to be initially dismantled and then reassembled.

Comparatively higher dependence on diversified machines / test equipment as the dismantled parts are to be cleaned and assessed from point of view of reuse (retested), replace (procurement action) and rebuild (recycled) with simultaneous actions.

Keeping in view the aforementioned aspects, major partial productivities in rebuild sector which contribute significantly to overall organizational productivity are labour and capital (includes machinery / test equipment) productivities. Labour productivity of target organization has shown sharp decline by 9.2 % whereas capital productivity has shown an upward trend by 9.4 %. Decrease in labour productivity implies that the top and middle management have not been able to ensure execution and implementation of basic employee based productivity improvement techniques within the organization. These include financial incentives, fringe benefits, merit based promotions, worker participation, better working environment, accountability & punishment, training & education, recognition, etc. However, capital productivity has increased due to disposal of dead inventory (stores / spares not used and lying dormant since last two years prior to Period 0) by Organization-A in selected timeframe and has thus shown improvement in capital productivity through application of lean and JIT techniques (Asian Productivity Organization, 2015) . Furthermore, as per documentary evidence, organization has made special efforts for upgradation and rebuilding of held machines / test equipment which have also resulted in improvement of capital productivity. It goes without saying that labour and capital productivities primarily reflect technical contours of the organization and constitute the basic pillars for improving overall productivity of the organization. Material productivity of organization has decreased by 9.1% which indicates wastage in procurement and usage of raw material and surplus parts for machines / test equipment. Organization is required to rationalize demand of raw material and plan for procurement of proactive maintenance of machinery.

Organization-A being a public sector entity is not designed to operate for profit generation and is supposed to work at the break-even point to avoid financial loss (Lawrence and Raymond, 2012). On the contrary, performance (output) of the target organization has been around 25% for last 5 years and has been operating continually despite huge financial loss which clearly indicates that increase in output has not been a source of concern or a

matter of survival for relevant stakeholders / management unlike private sector organizations. Since public sector organizations operate under Government rules and regulations, therefore top and middle management are not the direct stakeholders in that classical sense as in case of private sector organizations which operate for profitability (Lawrence and Raymond, 2012). If Organization-A would have been part of private sector, it would have collapsed or may have decided to discontinue rebuild of finished products. Sequel to aforementioned discussion, it is concluded that break-even point can only be utilized by public sector organizations to ascertain whether organization is operating in loss or otherwise and to work out the cost of the finished product instead of profit. These organizations have to exclusively rely / bank upon enhanced output and improvement in performance by ensuring optimal use of input resources. This fact amply emphasizes the importance of accountability in public sector organizations which entails periodic audit of efficiency and effectiveness of these organizations (Anwar Shah, 2007). It is primarily the attitude, dedication, seriousness, professionalism and willingness of top, middle and lower management along with employees to work as a team to generate desired synergy for efficient, effective and optimal utilization of input resources to enhance overall output / performance of public sector organization. Furthermore, public sector rebuild organization has certain specific characteristics and goals which are not interchangeable with private sector; therefore public sector rebuild organizations have unique and distinctive peculiarities (Mihaiu *et al.,* 2010). This fact warrants formulation of a dedicated productivity measurement, evaluation, planning and improvement model for public sector rebuild organizations to continuously monitor productivity and create continuous awareness amongst management and employees regarding importance of productivity.

CONCLUSION

Total productivity model used in this research can facilitate the top management of private sector rebuild organizations to take important strategic decisions based on breakeven analysis with respect to profitability aspect and competition in open market. However, public sector rebuild organizations do not work for profitability or competition in market and concept of breakeven point is applied to these organizations only to ascertain whether organization is operating in loss or otherwise. Therefore, it can be inferred that, goal of private organizations is cost minimization and profit maximization whereas for public sector organizations, it ought to be improvement in performance through cost minimization and resource optimization relative to output achieved (David Fourie & Wayne Poggenpoel, 2017) . The underlying reason for sustained low productivity in public sector organizations lies in the bureaucratic attitude of top and middle management and organizational behavior of employees thereby emphasizing accountability. In case of private sector rebuild organization, management is a direct stakeholder due to personal investment and corresponding profit interest whereas management of public sector rebuild organizations has nothing personal at stake in classical sense and same holds true for employees. Therefore, public sector rebuild organizations have peculiar and distinct characteristics which are not interchangeable with private sector organizations. If top and middle management are made aware of importance of improving productivity in public sector and are held accountable, it can be vehemently said that public sector organizations will start ensuring efficient and effective utilization of available input resources thereby saving millions of rupees to the national exchequer besides bringing a dynamic change in the outlook and performance of these organizations. In nutshell, it can be concluded that public sector rebuild organizations essentially require a dedicated productivity measurement, analysis and improvement model on the same lines as in private sector.

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