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Development of a Weighted Productivity Model for a Food Processing Industry

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ABSTRACT

In this paper, the data collected from a food processing industry was used to calculate the total productivity. It presents a comprehensive model and methodology for defining and measuring productivity attributes in the food processing industry. The proposed productivity model encompasses seven key factor groups, namely labor, capital, material, energy, machines, facility maintenance, and worker stress levels. Each group is further disaggregated into individual factors, which are assigned specific weights. The mathematical expression of the productivity index model involves summing the weighted individual factors and dividing the result by the total number of group factors. In the case study conducted at a Nigerian food processing company, the developed model was applied to measure the productivity levels. The findings revealed that the current productivity of the company stands at approximately 90%. By utilizing the model, the parameters of productivity were measured, and the results were set as baseline values for future assessments. The study outcomes shed light on the perceived importance and weight values of factors within each group, highlighting their significance in influencing productivity within a technologically advanced food processing corporation. This research contributes valuable insights into the measurement and enhancement of productivity in the food processing industry, offering a structured framework for evaluating process outcomes and optimizing operations to enhance competitiveness. Incorporating the current productivity level of 90% and setting it as the baseline value provides a reference point by allowing comparisons and analysis of productivity improvements over time.

Keywords: Productivity Attributes, Food Processing Industry, Weighted Model, Competitiveness

1 Introduction

Productivity is a fundamental concept used to assess resource utilization in companies. The field of productivity has been predominantly studied in economics, industrial engineering, and administration. Despite the various perspectives, productivity is commonly defined as the ratio of output to input. Enhancing productivity aims to develop a feasible model that improves efficiency and resource utilization. Achieving this requires companies to initiate improvement efforts and effectively utilize production factors to align with their goals. Measuring and analyzing the production system is essential for controlling and making informed decisions. This project focuses on developing a productivity improvement model for a food processing industry, addressing existing production process problems, and proposing solutions.

A manufacturing system involves the combination and transformation of resources, including machines, transportation elements, computers, and people, to produce goods [1]. Productivity, defined as the quantitative relationship between output and input, is crucial for organizational performance and is a major component of competitiveness [2]. Managing productivity plays a vital role in achieving organizational goals and supporting continuous improvement efforts. However, the definition of productivity is complex and varies across disciplines and perspectives. Various approaches, such as total factor productivity (TFP) and partial productivity measures, have been employed for measuring productivity [3].

There is a lack of consensus on the definition of productivity, even within the same discipline. The terms "efficiency" and "effectiveness" are frequently used but often confused with each other [4]. Productivity is perceived differently by different individuals and institutions, ranging from efficiency and output measures to intangible factors like morale and job satisfaction [5]. Despite the disagreements, productivity remains a matter of concern for various stakeholders due to its direct relationship with the standard of living [6].

Productivity measurement aims to assess technology, efficiency, cost savings, benchmarking, and the standard of living [4]. Various definitions of productivity exist, including the technological concept (output-input ratios), the engineering concept (actual vs. potential output), and the economist concept (resource allocation efficiency) [7]. Within the overall performance criteria of a company, productivity is a key success factor [8]. Total productivity, measured as the ratio of total output to all inputs, is ideal but challenging to calculate in practice. Partial productivity measures, such as labor productivity, are commonly used as practical alternatives [9].

The Kendrick and Creamer [10] model focuses on personnel, equipment, material productivity, project scheduling, and cost control to examine and increase productivity in the construction sector. Another model developed is the Craig-Harris approach, which emphasizes customer happiness, employee involvement, service quality, process efficiency, and continuous learning and growth to increase productivity in service-oriented firms [11]. A well-known model is the Taylor-Davis approach, often known as scientific management, which seeks to boost productivity by optimizing work processes via division of labor, standardization, time and motion studies, incentives and rewards, and scientific management concepts [12]. It is important to also recognize the American Productivity

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Center Model, which strives to increase productivity by building a productivity culture, using effective leadership and management techniques, encouraging employee involvement, utilizing technology and innovation, and monitoring performance [13],[14]. Lastly, the Productivity Accounting Model, according to Taylor-Davis [12], is designed to measure and evaluate productivity by measuring inputs and outputs, doing efficiency analysis, benchmarking against industry standards, and analyzing expenses to discover areas for improvement.

There is no current standard or preferred method or model for calculating productivity at the firm or process level. Modern productivity theorists and experts do not agree on how to categorize the types of models and theories or provide recommendations for their uses and applications. The user must select the type of model most appropriate to the inputs and outputs available, objectives, and which model will provide the best results [13]. For this research, a slightly more modern method, the Koss and Lewis model [15] has been selected for its flexibility in accounting for some qualitative inputs and outputs and the ability to weight factors to achieve model balance. Most productivity models measure productivity by using tangible factors. Koss and Lewis show that intangible factors can also affect productivity. Koss and Lewis proposed a productivity index as shown in Eqs. (1) and (2) of these articles. The Koss and Lewis model was re-modified by the addition of some factors found to enhance the efficient measurement and assessment of productivity in a food processing industry as shown in Eqs. (3) to (10).

The food processing business contributes significantly to the world economy, accounting for more than 10% of global GDP. However, the business confronts a variety of issues, including growing costs, increased competition, and worries about sustainability. Improving productivity is critical for the food processing industry's competitiveness and sustainability. Despite the importance of productivity, researches on productivity improvement models for the food processing industry are meager. Existing productivity models are frequently broad and do not sufficiently address the industry's unique difficulties. Existing models, for example, failed to account for the perishable nature of food goods, the complicated manufacturing processes involved and their weighted value, which are categorized as tangible and intangible factors.

This research intends to fill a gap in the literature by establishing a productivity improvement model tailored to the food processing industry. The study will integrate into the model observable (tangible) and hiding (intangible) productivity aspects such as process efficiency, staff engagement, and sustainability practice. The outcomes of the research will provide useful insights into how food processing companies might increase their productivity by considering holistically both tangible and intangible factors of production and their weights simultaneously. The proposed model is a good replacement of the existing productivity improvement models that partially measured productivity mainly based on tangible factors, especially in the food processing industries.

2 Methodology

2.1 Model Development

The complete productivity index model is expressed as follows [15]:

$$PI = \frac{f(X_1) + f(X_2) + f(X_3) + \cdots + f(X_n)}{n} \quad (1)$$

Where each f (Xi) represents an individual or group productivity factor, and n is the total number of group factors.

A group productivity factor $f(X_i)$ is broken down and expressed in the form of:

$$f(X_i) = \frac{W_a X_{ia} + W_b X_{ib} + W_c X_{ic} + \ldots, + W_z X_{iz}}{(W_a + W_b + W_c + W_z)z} \quad (2)$$

Each X_{ij}, j = a . . . y, X is then calculated as X_{ij} (t)/ X_{ij} (t-1) in cases where an increase in the measure indicates a positive effect on productivity, or X_{ij} (t-1)/ X_{ij} (t) where a decrease in the value signifies a positive effect on productivity. X_{ij} (t) would be the measured value of the current period, while X_{ij} (t-1) is the value of the previous period.

W_a, W_b, W_c..., and W_z represent the weights assigned to each productivity factor, indicating their relative importance or contribution to the overall group productivity factor.

z represents the total number of weights assigned to each group productivity factor.

Based on the Koss and Lewis model, a list of quantitative and qualitative parameters that contribute to an organization's productivity and organizational smoothness of production operations was produced. Seven important productivity factor groups are developed for measuring productivity in the food processing industry: L-labor, C-capital, M-material, E-energy, Mc-machines, F-facility maintenance, and S-stress level of workers.

$$f(L) = \frac{W_1L_1 + W_2L_2 + W_3L_3 + W_4L_4 + W_5L_5 + W_6L_6 + W_7L_7 + W_8L_8 + W_9L_9}{(W_1 + W_2 + W_3 + W_4 + W_5 + W_6 + W_7 + W_8 + W_9)9} \quad (3)$$

Eq. (3) represents the labor group productivity factor; the equation calculates the overall productivity factors by considering the individual factors and their respective weights.

L_1, L_2, L_3..., and L_9 represent the values or levels of the individual productivity factors, e.g., level of motivation, work hours, workforce size, skills and knowledge levels of workers, time management, teamwork, workload, health, and job satisfaction.

$$f(C) = \frac{W_1C_1 + W_2C_2 + W_3C_3 + W_4C_4 + W_5C_5 + W_6C_6 + W_7C_7}{(W_1 + W_2 + W_3 + W_4 + W_5 + W_6 + W_7)7} \quad (4)$$

Eq. (4) represents the calculation of the capital group productivity factor by considering various individual productivity factors under capital and their respective weights.

C_1, C_2, C_3..., and C_7 represent the values or levels of the individual productivity factors, e.g., cost of equipment and machinery, cost of labor, cost of technology, cost of managing the facility, cost of supplies and raw materials, cost of transport and logistics, and cost of building and infrastructure.

$$f(M) = \frac{W_1M_1 + W_2M_2 + W_3M_3 + W_4M_4 + W_5M_5}{(W_1 + W_2 + W_3 + W_4 + W_5)5} \quad (5)$$

Eq. (5) represents the material group productivity factor; the equation calculates the overall productivity factors for the material group.

M_1, M_2, M_3..., and M_5 represent the values or levels of the individual productivity factors, e.g., availability of raw materials, quality of raw materials, timely delivery of materials, ease of access to materials, and processing costs of materials.

$$f(E) = \frac{W_1E_1 + W_2E_2 + W_3E_3}{(W_1 + W_2 + W_3)3} \quad (6)$$

Eq. (6) represents the calculation of the energy group productivity factor.

E_1, E_2, and E_3 represent the values or levels of the individual productivity factors, e.g., access to reliable energy sources, quality of energy, and sustainability of energy.

$$f(M_c) = \frac{W_1 M_{C1} + W_2 M_{C2} + W_3 M_{C3} + W_4 M_{C4} + W_5 M_{C5} + W_6 M_{C6} + W_7 M_{C7}}{(W_1 + W_2 + W_3 + W_4 + W_5 + W_6 + W_7)7} \quad (7)$$

Eq. (7) represents the machine group productivity factor; the equation calculates the overall productivity factors for the machine group.

M_{c1}, M_{c2}, M_{c3}..., and M_{c7} represent the values or levels of the individual productivity factors, e.g., machine automation, speed and efficiency of machines, machine error reduction, multi-tasking, reliability of machines, flexibility of machines, and versatility of machines.

$$f(F) = \frac{W_1 F_1 + W_2 F_2 + W_3 F_3 + W_4 F_4}{(W_1 + W_2 + W_3 + W_4)4} \quad (8)$$

Eq. (8) represents the calculation of the facility maintenance group productivity factor.

F_1, F_2, F_3, and F_4 represent the values or levels of the individual productivity factors, e.g., access to proper tools and equipment for carrying out maintenance, effective scheduling of time to carry out maintenance, documentation of maintenance activities, and access to standard spare parts.

$$f(S) = \frac{W_1 S_1 + W_2 S_2 + W_3 S_3}{(W_1 + W_2 + W_3)3} \quad (9)$$

Eq. (9) represents the stress level of the workers group productivity factor; the equation calculates the overall productivity factors for the stress level of the workers group.

S_1, S_2, and S_3 represent the values or levels of the individual productivity factors, e.g., job autonomy, workload, and work flexibility.

The final productivity model is identified by putting the seven group productivity elements identified in Eqs. (3) to (9) into the productivity index expression:

$$PI = \frac{f(L) + f(C) + f(M) + f(E) + f(Mc) + f(F) + f(S)}{7} \quad (10)$$

With these eight equations, productivity can be successfully measured in a food processing industry, using a re-modified Koss-Lewis-based model.

2.2 Model Analysis and Validation

To implement the developed model, a questionnaire was distributed to a sample of 30 personnel, including production supervisors, engineers, and line workers. The questionnaire utilized a rating scale to measure the perceived importance of each productivity factor and assign numerical values to intangible factors. The responses were collected and processed to determine the subjective weightings and numerical values for each identified factor.

The subjective weightings acquired from the questionnaire were used to compute the weighted scores for each identified productivity factor. The weights ensured that no factor had a greater impact on productivity estimation than another. The numerical values for intangible factors were obtained through personal interviews with the production manager. The data generated from the questionnaire provided weights and numerical values for the individual and group productivity components.

To determine the weights of individual productivity factors based on the respondents' ratings, each respondent rated each factor's contribution to its group productivity factor while factors were rated on a scale of 1 to 10, with 10 being the highest importance. The weight indicates the factor's contribution to the overall group's productivity. Weights of energy as a factor, for example, are being analyzed as follows using data obtained from respondents as shown in Table 1.

Table 1 Weights analysis for energy productivity factor

Respondent	**Access to reliable energy source (W_1)**	**Quality of energy (W_2)**	**Energy sustainability (W_3)**
Respondent 1	8	10	6
Respondent 2	7	8	8
...	...	...	...
Respondent 30	10	10	10
Average rating	8.93	9.10	8.77

Total average rating = 8.93 + 9.10 + 8.77 = 26.8
W1 = 8.93 ÷ 26.8 = 0.3333
W2 = 9.10 ÷ 26.8 = 0.3396
W3 = 8.77 ÷ 26.8 = 0.3271

Table 2 showcases the survey data on the level of motivation of workers. The level of motivation of workers was assessed using five survey questions (Q_1-Q_5) as indicated in the table. Each question was rated on a scale from 1 to 5. Respondents (1-30) were asked to rate their motivation level for each question on a scale from 1 to 5, with 1 being the lowest and 5 being the highest.

Table 2 Survey data for rating analysis of the level of motivation of workers

Respondent	**Q_1: Job Motivation**	**Q_2: Accomplishment**	**Q_3: Recognition**	**Q_4: Growth**	**Q_5: Enthusiasm**
Respondent 1	5	5	4	4	5
Respondent 2	3	4	3	4	4
...	...	...	...	...	...
Respondent 30	4	5	4	3	5

A sample of calculation involved is as follows:
From Table 2, respondent 1 rating = 5 + 5 + 4 + 4 + 5 = 23
The individual score is multiplied by 4 to sum it to over 100.
That is, 23 × 4 = 92

The above steps were repeated for every respondent, and the average score of the 30 respondents was considered the level of motivation of the workers.

After obtaining the values of individual factors under Energy group productivity and their respective weights, Eq. (6) was applied to obtain a baseline productivity factor value for Energy as shown:

$$f(\mathrm{L}) = \frac{0.3333\left(\frac{90}{90}\right) + 0.3396\left(\frac{95}{95}\right) + 0.3271\left(\frac{85}{85}\right)}{(0.3333 + 0.3396 + 0.3271)3} = 0.33$$

The same steps were applied to every other individual factor under every productivity group, applying their respective equations. Results are shown in Table 3-Table 16.

To calculate the overall productivity index, Eq. (10) was applied by substituting the baseline productivity factor value for the entire productivity group into the equation as shown:

$$PI = \frac{0.11 + 0.143 + 0.20 + 0.33 + 0.143 + 0.25 + 0.33}{7} = 0.215$$

3 Results and Discussion

Table 3-Table 9 present the individual group productivity factors considered in the evaluation of the developed model. These factors encompass: (key aspects of the workforce, including motivation, working hours, workforce size, skills and knowledge, time management, teamwork, workload volume, health, and job satisfaction for the labor group productivity factor), (key aspects of the capital resources, including equipment and machinery, labor, technology, facility maintenance, raw materials, transportation and logistics, and building and infrastructure for the capital group), (key aspects of material resources, including the availability and quality of raw materials, timely delivery, ease of access, and the processing of materials for the material group productivity factor.), (critical features of energy resources such as access to a reliable energy source, energy quality, and energy sustainability for the energy group productivity factor.), (key aspects of machine functionality, including automation, speed and efficiency, error reduction, multi-tasking capabilities, reliability, flexibility, and versatility for machine group productivity factor.), (key aspects of maintenance management, including access to tools, effective scheduling of time, documentation of maintenance activities, and access to standard spare parts for the facility maintenance group productivity factor.), (key aspects considered in controlling the stress level of workers, including job autonomy, controlled volume of workload, and work flexibility).

Table 3 Perceived importance and weight value for Labor group productivity factors

Individual factors – Labor	Average perceived importance	Weight
Level of motivation of workers	8.83	0.1100
Working hours	8.60	0.1071
Workforce size	8.57	0.1066
Skills and knowledge of workers	9.23	0.1149
Time management	9.23	0.1149
Teamwork	9.07	0.1129
Volume of workload	8.50	0.1058
Health	9.43	0.1174
Job satisfaction	8.87	0.1104

Table 4 Perceived importance and weight value for Capital group productivity factors

Individual factors – Capital	Average perceived importance	Weight
Equipment and machinery	9.23	0.1454
Labor	9.03	0.1423
Technology	8.73	0.1375
Facility maintenance	9.07	0.1428
Raw material	8.83	0.1391
Transportation and logistics	9.23	0.1454
Building and infrastructure	9.37	0.1475

Table 5 Perceived importance and weight value for Material group productivity factors

Individual factors – Material	Average perceived importance	Weight
Availability of raw material	9.20	0.2004
Quality of raw material	9.33	0.2033
Timely delivery of raw material	8.93	0.1946
Ease of access to raw material	8.90	0.1939
Processing of materials	9.53	0.2077

The average perceived importance column indicates the ratings given by the evaluators or respondents regarding the significance of each factor. These ratings reflect the subjective perception of the evaluators and were obtained through a comprehensive assessment process involving discussions and expert opinions. The weight column represents the relative weight assigned to each factor. These weights are derived from the average perceived importance values and provide a quantitative measure of the contribution of each factor in the overall labor assessment. The weights are subjective and subject to variations based on the evaluation criteria and stakeholder opinions.

Table 6 Perceived importance and weight value for Energy group productivity factors

Individual factors – Energy	Average perceived importance	Weight
Access to reliable energy source	8.93	0.3333
Quality of energy	9.10	0.3396
Energy sustainability	8.77	0.3271

Table 7 Perceived importance and weight value for Machines group productivity factors

Individual factors – Machines	Average perceived importance	Weight
Machine automation	8.47	0.1412
Speed and efficiency of machines	9.00	0.1501
Machine error reduction	8.67	0.1445
Multi-tasking	7.90	0.1317
Reliability of machines	8.97	0.1495
Flexibility of machines	8.40	0.1401
Versatility of machines	8.57	0.1429

Table 8 Perceived importance and weight value for Maintenance group productivity factors

Individual factors – Maintenance	Average perceived importance	Weight
Access to tools	9.13	0.2532
Effective scheduling of time	8.90	0.2468
Documentation of maintenance	8.80	0.2440
Access to standard spare part	9.23	0.2560

Table 9 Perceived importance and weight value for stress level of workers group productivity factors

Individual factors – Stress level of workers	Average perceived importance	Weight
Job autonomy	8.73	0.3316
Controlled volume of workload	8.83	0.3354
Work flexibility	8.77	0.3329

Table 10 provides the computed data for each factor under the labor group. Using the expression for the labor group productivity factor (Eq. (3)), and the baseline value, a baseline labor productivity factor value of 0.11 is established. Based on this, a productivity factor value greater than 0.11, denotes an increase in labor factor productivity. On the other hand, a productivity factor value less than 0.11, indicates a declined productivity.

Table 10 Labor group productivity factor values

Individual factors – Labor	Weight	Value
Level of motivation of workers	0.1100	90
Working hours	0.1071	720
Workforce size	0.1066	150
Skills and knowledge of workers	0.1149	92
Time management	0.1149	82
Teamwork	0.1129	91
Volume of workload	0.1058	85
Health	0.1174	95
Job satisfaction	0.1104	90

Table 11 provides the data for each factor under the capital group. Inserting these values into the expression for the capital group productivity factor (Eq. (4)), a baseline capital productivity factor value of 0.143 is established. On this basis, a productivity factor value greater than 0.143 signifies an increase in capital factor productivity. Otherwise, it indicates a decline in productivity.

Table 11 Capital group productivity factor values

Individual factors – Capital	Weight	Value
Equipment and machinery	0.1454	25000
Labor	0.1423	15000
Technology	0.1375	10000
Facility maintenance	0.1428	30000
Raw material	0.1391	2400000
Transportation and logistics	0.1454	27000
Building and infrastructure	0.1475	3000000

Table 12 provides the data for each factor under the material group. Using the material group productivity equation (Eq. (5)), a baseline material productivity factor value of 0.20 is established. Future period values less than 0.20 would indicate a decrease in productivity, while values greater than 0.20 would indicate an increase in productivity.

Table 12 Material group productivity factor values

Individual factors - Material	Weight	Value
Availability of raw material	0.2004	90
Quality of raw material	0.2033	80
Timely delivery of raw material	0.1946	90
Ease of access to raw material	0.1939	88
Processing of materials	0.2077	1000

Table 13 provides the data for each factor under the energy group. Substituting these values into the expression for the energy group productivity factor (Eq. (6)), a baseline capital productivity factor value of 0.33 is established. Future period values less than 0.33 would result in a decrease in productivity, while values greater than 0.33 would bring an increase in productivity.

Table 13 Energy group productivity factor values

Individual factors – Energy	Weight	Value
Access to reliable energy source	0.3333	90
Quality of energy	0.3396	95
Energy sustainability	0.3271	85

The data for each factor under the machines group are presented in Table 14. Using the machines group productivity equation (Eq. (7)), a baseline machines productivity factor value of 0.143 is established. This outcome implies that a productivity factor value greater than 0.143 would witness an increase in machine factor productivity, otherwise, a decrease in productivity would be expected.

Table 14 Machines group productivity factor values

Individual factors – Machines	Weight	Value
Machine automation	0.1412	85
Speed and efficiency of machines	0.1501	98
Machine error reduction	0.1445	97
Multi-tasking	0.1317	1
Reliability of machines	0.1495	0.95
Flexibility of machines	0.1401	85
Versatility of machines	0.1429	30

Table 15 provides the data for each factor under the maintenance group. Substituting these values into the expression for the maintenance group productivity factor (Eq. (8)), a baseline maintenance group productivity factor value of 0.25 is realized, which indicates a baseline value for the facility maintenance group productivity factor. Therefore, the realization of a value greater than this in the future signifies an increase in productivity while lesser value is a sign of a decrease in productivity.

Table 15 Maintenance group productivity factor values

Individual factors – Maintenance	Weight	Value
Access to tools and equipment for carrying out maintenance	0.2532	91
Effective scheduling of time to carry out maintenance	0.2468	95
Documentation of maintenance	0.2440	90
Access to standard spare parts	0.2560	98

Table 16 provides the data for each factor under the stress level of the workers group. Inserting these values into the expression for the stress level of workers group productivity factor (Eq. (9)), a baseline stress level of workers productivity factor value of 0.33 is established. Future period values less than 0.33 would indicate a decrease in productivity, while values greater than 0.33 would indicate an increase in productivity.

Table 16 Stress level of workers group productivity factor values

Individual factors – Stress level of workers	Weight	Value
Job autonomy	0.3316	20
Controlled volume of workload	0.3354	100
Work flexibility	0.3329	90

Given the baseline values known for each group productivity factor, the overall baseline productivity index was calculated as illustrated in section 2.2, and a value of 0.215 was obtained. The baseline productivity index for this analysis is 0.215. Productivity index values for future periods that exceed 0.215 suggest an overall increase in productivity, while values less than 0.215 would reveal a decrease in productivity. Comparing future values to the baseline values will indicate whether productivity has increased or decreased in each respective group.

4 Conclusion

In this study, a total weighted productivity model has been developed with a special focus on the productivity attributes of the food processing industry. This model is unique because, apart from consideration of both tangible (labor, capital, material, energy, machine, maintenance, and worker's stress level) and intangible (ease, flexibility, sustainability, accessibility, motivation, autonomy, etc.) productivity factors, these factors were weighted and integrated based on their levels of importance in establishing total productivity indices for a food processing industry. The future direction (increase or decrease) in the productivity of a company was determined based on the established baseline productivity indices. The following conclusions can be drawn from the results obtained after this model was applied to a food processing industry.

- The current productivity level of the company, 90%, is adequate as a baseline value and reference point to enable comparisons and analysis of productivity improvements over time.
- A baseline labor productivity index of 0.11 was established for the labor group productivity factors with any value higher or lesser than that being an indication of an increase or decrease in labor productivity respectively.

- Under the capital productivity group, a baseline productivity index value of 0.143 was realized in which any productivity value above or below that signified an increase or decrease in the capital productivity of the company.
- Material group productivity index of 0.20 was established as a baseline form in which its increase or decrease indicated improvement or decline of the company's productivity.
- In case of energy group productivity factors, a baseline productivity index of 0.33 was established with an indication that future increase or decrease would result in improving or declining productivity.
- Under machines group productivity index, 0.143 was realized as a baseline from which future increases or decreases in productivity could be determined with reference to this index.
- A baseline facility maintenance productivity index of 0.25 realized, has indicated a value greater or less than this in the future would result in an increase or decrease in productivity, respectively.
- In the case of the stress level of the workers group productivity index of 0.33 is an indication of the future greater or less than 0.33 would indicate an increase or decrease in the productivity of the company, respectively.
- By combining all the factors, the overall baseline productivity index of 0.215 was established which revealed that any productivity index values for future periods which exceed or below 0.215 have indicated an overall increase or decrease in productivity of the food processing company.
- Findings generally showed that the direction of overall productivity (improving or declining) of a company in the future could be determined by the level of increase (decrease) above (below) the currently established baseline overall productivity index for such a company.

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