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Method of Calculating a Salary Bonus Based on Performance, Quality of Labour, Difficulty of Work, Discipline and Attendance in a Clothing Company

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Abstract
Globally, textile and clothing companies are seeking to increase the export rate by minimising the cost of production. The same goal still applies for Tunisian companies. Nonetheless, production cost is the most but not the only significant factor that increases the competitiveness of a product. Others are important in beating the challenge of global competition. Among these factors are deadlines, economic and social stability, proximity, competence of the workforce and quality. In this study, the SAW method was used to develop a method for the calculation of a salary bonus according to the following criteria: the quality index, performance, difficulty of work, discipline, and attendance. This method improved the skills and wages of the workforce, decreased the absenteeism rate and increased the productivity of the company. The results showed in dependence on the case studied that the quality index varied between -0.053 and 1, performance between 40.5 and 81, the ranking vector between 0.545 and 0.911, and the bonus rate between 0% and 15%. The study reduced the absenteeism rate from 13.25% to 8.3% for direct labour. The quality of production was improved by reducing the defect rate by 8.54% to 4.6%. The efficiency of the chain was also improved by 51% to 67.3%.

Key words: *salary bonus, performance, quality index, discipline, attendance, clothing industry.*

Introduction

Faced with rising production costs in some countries, major clothing brands have recently relocated their production in order to continue mass production at a lower cost. Clothing companies attempt to increase and improve productivity as well as competitiveness in international markets through various strategies that involve different activities to improve efficiency and reduce costs [1]. The competition for export on an international scale since 1985 has forced changes to the internal policy in companies to export at low prices and have great flexibility of the workforce in the industry, especially in order to be competitive in the American and European markets. Similarly, the flexibility of work in the textile clothing sector and the evolution of the organisation of production, such as just-in-time production and production in small batches, are important factors for increasing export competition worldwide [2]. In addition, the involvement not only of work in small subcontracted units but also the large amount of home production carried out by women, allows great flexibility in terms of hiring, dismissal and salary. In fact, contract and casual employment has increased over the years. Contractual wages, unlike permanent wages, are based either on piece wages or on daily wages [1]. Another strategy that companies use to increase their export potential is wage differentials calculated on the basis of gender. In addition, the number of registered unions submitting declarations has steadily decreased [3] and the demand for an increased labour market is also weakening the bargaining power of unions [4]. In September 2019, a survey carried out by Public Eye of 45 international fashion brands revealed that the majority of female supply chain workers do not get a sufficient salary to be able to live [5]. According to the Clean Clothes Campaign, a living wage must cover the needs of a worker and her family while providing her with a discretionary share of income. This problem was approved in all exporting companies and especially garment manufacturing companies. In the case of Tunisian companies, in 2014, the minimum monthly wage in the ITH sector was almost $ 200 (less than TD 300 in 2014), or 50% less than in Morocco and China [6]. Entrepreneurs are always seeking to lower the cost of production in order to increase the rate of global export competitiveness. However, this would lead to the exploitation of workforces who are working at low pay. Moreover, it would worsen the working and living conditions of the millions of workers engaged in the sector. On the other hand, companies seek to increase profits by increasing productivity and efficiency; that is, workers produce more without any bonus on the salary. And this induces operator demotivation. Therefore, the present study aimed to devise a system using Simple Additive Weighting (SAW) which would allow to give a bonus on the salary according to the quality index, performance, discipline, attendance, and level of work difficulty.

Materials and methods

The study was done in a fully exporting company specialising in the manufacturing of knitted articles such as swimwear, panties, boxers, underpants and underclothing. The company contains four production sites in four regions. The study was carried out on a production line specializing in the manufacture of pants. The line contained 20 operators. The chain launched an order for 28,000 pieces for a model of men's boxer shorts containing two half backs and two half fronts, a waistband with elastic, an inside pocket at the waist, a logo on the front and another on the back. Before launching the model, a balancing was done to distribute the operations in a fair way. The assignment of workers in a clothing company is based on the availability of resources and individual performance. However, assignment remains complicated since it is made according to the choices of decision-makers and not by an objective method [7]. In addition, decision-making by managers is not an art for applying mental models since humans cannot distinguish several parameters at the same time [8]. The multicriteria nature of the problem makes a multicriteria decision (MCDM) a kind of resolution, since it takes into account several criteria at the same time, with different weights and thresholds [7]. Using the MCDM method, mathematical models are obtained for decision making in order to find solutions for the problems of organising workshops [9]. The main goal of balancing an assembly line is to increase efficiency by minimising the number of shifts and cycle time [10]. To obtain the best balance, the workers must be allocated according to their skills. The method used is objective, and the level of competence is defined in a skills matrix, which must always be updated following objective assessment based on measurable criteria to judge the skill level of each operator after each training [11]. The four levels used to judge the competence of an operator are as follows: “1” Low level, at which the operator knows the activity but does not have the ability to carry it out, and “2” Intermediate level, where there is no standard activity. The operator reaches the skill level with more training and reaches “3” Competent level, at which the operator becomes autonomous and is able to perform the activity in standard cases, and “4” Expert level, where the operator has better control of the activity and could train another actor. After the assignment of workers on the assembly line and the launch of the order, the study was started, with hourly monitoring of the number of individual defects and of the performance, which is an indicator to measure labour productivity in industrial companies [12]. Performance is calculated by the following formula:

$$\text{Performance} = \frac{\text{Theoretical time}}{\text{Real time}} \quad (1)$$

Where,
Theoretical time = Number of produced parts * Standards time

Real time – time actually spent performing the same operation

Performance is a parameter that is always used to evaluate the operator’s quality from a cost effectiveness point of view. Several studies have been done to assess the competence of a workforce, with activity being one of the evaluation criteria [7]. According to ISO 9001, skills performing activities affecting product conformity must be measured [13]. The quality of the work is a criterion for evaluating the workforce, since the product must comply with the quality criteria required. For this purpose, studies were carried out to measure the individual quality index IQ, which is calculated according to the following formula [14].

$$\text{QI} = 1 - \sum \text{DEC} \times \text{DR} \quad (2)$$

$$-1 \leq \text{QI} \leq 1$$

Where, DR is the rate of defects given by the following formula:

$$\text{DR}(\%) = \frac{\text{Number of defects}}{\text{Number of controlled pieces}} \times 100 \quad (3)$$

DEC is the defect enhancer coefficient. To determine DEC, a defects catalogue was created to simplify the study. For each defect, the method of repair, materials used, the repair and defect control time, the cost of repair equipment, the cost repair time and total cost of the defect of determined [14]. Then, the calculation of DEC is done as follows, ***Equation (4)***.

Other parameters were measured to assess the operator’s competence: discipline, namely, attendance and difficulty of work. Indeed, the decision choice problem arose and MCDM decision criteria methods were used to solve this type of problem [15]. For each attribute a score was calculated and evaluated by

Table 1. *Distribution of operators according to the operations constituting the assembly range of the “boxer shorts” model.*

N° operation	Operation	Time, min	Materials	Number of operators	Operator code
1	Heat transfer front	0.247	Press	1	C01
2	Heat transfer back	0.34	Press		C01
3	Assemble key pocket	0.6	Overlock-514	1	C02
4	Turn inside pocket	0.24	Main	1	C03
5	Tack pocket / waist	0.356	LKT1N_301		C03
6	Assemble crotch back	0.3	Overlock-514	2	C04
7	Assemble cut out back	0.444	Overlock-514		C04+C05
8	Assembler crotch front	0.366	Overlock-514		C05
9	Assemble 2 sides	1.4	Flatlock-607	2	C06 & C07
10	Close inside legs (once)	1.2	Flatlock-607	2	C08 & C09
11	Hem 2 legs	0.6	COV2N4TH_602	1	C10
12	Point x buttons (from buttonhole)	0.2	Manual	1	C11
13	Make buttonhole	0.4	BUTHO_CY_EY_101		C11
14	Attach elastic / belt	0.58	Overlock-514 auto	1	C12
15	Assemble several labels	0.3	LKT1N_301	1	C13
16	Tack labels/belt	0.226	LKT1N_301		C13
17	Fold elasticated belt (round)	0.609	COV2N4THCAN_602	1	C14
18	Measure and cut link at length	0.1	Manual	1	C15
19	Insert link	0.5	Manual		C15
20	Fold + make bartack finish link	0.5	BTK_CY_304	1	C16
21	Make bartacks tack link	0.18	BTK_CY_304		C16
22	Finishing	0.5	Manual	2	C17
23	Final control	0.8	Manual		C18
24	Packaging	0.98	Manual	2	C19 & C20
Total		11.968		20	

$$\text{DEC} = 1 + \frac{\text{Defect cost}}{\text{Article cost price}} \quad (4)$$

$$\text{DEC} = \frac{(\sum \text{material quantities} \times \text{unit price (€)} + \text{Time of repair and recheck (mn)} \times \text{minute's cost(€)})}{\text{Article cost price (€)}}$$

Equation (4)

Table 2. Weighted values for the different criteria W_j.

Criteria	Weigth
Quality Index QI	35%
Performance	35%
Difficulty of the work post	10%
Discipline	10%
Attendance	10%

Table 3. Different attribute values for the attitude and discipline criteria.

1	Very bad
2	Bad
3	Medium
4	Good
5	Very good

Table 4. Different attribute values for the job difficulty criterion.

1	Very simple
2	Simple
3	Medium
4	Difficult
5	Very difficult

multiplying the value of the given scale to the alternative of the same attribute by the relative weight assigned by the decision-makers. The WSM method allows the linear and proportional transformation of the data [16]. The WAM method requires the process of normalising the decision matrix (X) on a scale comparable to all existing alternative assessments [17].

$$r_{ij}\begin{bmatrix} \frac{x_{ij}}{\text{Max } x_{ij}} & \text{if j the attribute benefited} \\ \frac{\text{Min } x_{ij}}{x_{ij}} & \text{if j the attribute not benefited} \end{bmatrix}$$

Where,
r_{ij} – normalised performance rating value
x_{ij} – attribute value belonging to each criterion
Max x_{ij} – the greatest value of each criterion
Min x_{ij} – the smallest value of each criterion

Where, r_{ij} is the normalised performance score of the alternative Ai for the attribute C_j; i = 1, 2, ..., m and j = 1, 2, ..., n. The preference value for each alternative (V_i) is given by the equation below:

$$V_i = \sum_{j=1}^{n} W_j \, r_{ij} \qquad (5)$$

Where,
V_i – ranking for each alternative
W_j – weighted value of each criterion

Results and discussion

The study was initiated with the division of labour among the operators according to ***Table 1***.

The establishment of a bonus system according to the criteria of competence, performance, discipline, attitude and difficulty of the work post requires using the SAW method in order to attribute a value weight to each selected criterion and evaluate the decision to determine the percentage of increase in each salary. For each criterion, a weight was given for the evaluation. ***Table 2*** summarises the different values.

The quality index is calculated from the number of defects. The performance is calculated from the number of parts produced. The different weighting levels of the other criteria relating to discipline, attendance and difficulty of the work post are summarised in ***Tables 3*** and ***4***.

Once all the attributes are calculated, the values of r_{ij} and the ranking vector V_i are calculated, and according to the values obtained (***Table 6***), a salary bonus is given according to the following gap:

- If $V_i < 0.75$: no bonus on the salary
- If $0.75 \geq V_i \geq 0.8$: a bonus of 5% must be attributed to the salary
- If $0.8 > V_i \geq 0.9$: a 10% bonus must be attributed to the salary
- If $V_i > 0.9$: a bonus of 15% must be attributed to the salary

The values of the classification vector V_i are calculated from the ***Equation (5)*** knowing that W_j = {0.35 0.35 0.10 0.10 0.10}.

According to the results in ***Tables 7*** and ***8***, depending on the value of p, which must always be less than the level of precision (in our case 0.05) for the parameters to be statistically significant, a coefficient p less than 0.05 means that the value of this coefficient is statistically significant [18]. The statistic F equals 6.46, which is greater than the critical F (2.46), which corresponds to the law of F or Snedecor, which corresponds to the test report. The law of F gives an idea of the probability of probF rejecting the null hypothesis. Below 5%, we should not reject the value, otherwise we have an probF equal to 0.012%; hence, the values are statistically significant and representative [18]. According to the results found in ***Tables 5*** and ***6***, there are values indicating a consistency between the following two criteria: quality and the performance index. In fact, the operator with the C02 code, occupying the "Assemble pocket" post, has a quality index equal to 0.8 and a performance index of 81. This implies that the work post to be performed is so

Table 5. Calculation of the different attributes for all the criteria for each operator during a month

Operator code	Quality index	Performance	Discipline	Attendance	Difficult of work post
C01	0.599	79.245	5	4	3
C02	0.800	81	4	5	3
C03	1	80.46	5	5	2
C04	0.799	70.47	3	5	2
C05	0.598	79.38	5	4	2
C06	-0.086	47.25	4	5	5
C07	-0.086	47.25	4	5	5
C08	-0.082	40.5	4	4	5
C09	-0.082	40.5	5	4	5
C10	-0.053	81	5	4	4
C11	0.798	81	4	4	3
C12	0.389	78.3	4	5	4
C13	0.799	71.01	4	4	3
C14	0.173	82.215	4	4	5
C15	1	81	4	3	2
C16	0.797	91.8	4	4	3
C17	1	87.75	4	5	3
C18	1	87.75	4	4	3
C19	1	66.15	4	5	2
C20	1	66.15	4	4	2

Table 6. *Calculated values of the normalised performance rating rij and ranking vector V_i with the percentage of bonus.*

Operator code	Value r_{ij}					V_i	Bonus, %
	Quality index	Performance	Discipline	Attendance	Difficult of work post		
C01	0.599	0.863	1	0.8	0.6	0.756	5
C02	0.800	1	0.8	1	0.6	0.840	10
C03	1	0.993	1	1	0.4	0.878	10
C04	0.799	0.870	0.6	1	0.4	0.737	0
C05	0.598	0.980	1	0.8	0.4	0.744	0
C06	-0.086	0.583	0.8	1	1	0.594	0
C07	-0.086	0.583	0.8	1	1	0.594	0
C08	-0.082	0.500	0.8	0.8	1	0.545	0
C09	-0.082	0.500	1	0.8	1	0.575	0
C10	-0.053	1	1	0.8	0.8	0.667	0
C11	0.798	1	0.8	0.8	0.6	0.810	10
C12	0.389	0.967	0.8	1	0.8	0.769	5
C13	0.799	0.877	0.8	0.8	0.6	0.779	5
C14	0.173	1.015	0.8	0.8	1	0.737	0
C15	1	1	0.8	0.6	0.4	0.790	5
C16	0.797	1.133	0.8	0.8	0.6	0.843	10
C17	1	1.083	0.8	1	0.6	0.911	15
C18	1	1.083	0.8	0.8	0.6	0.881	10
C19	1	0.817	0.8	1	0.4	0.804	5
C20	1	0.817	0.8	0.8	0.4	0.774	5

Table 7. *Detailed report of calculated dataset.*

Groups	Number of samples	Sum	Mean	Anova
Quality index	20	11.364	0.568	0.192
Performance	20	17.66	0.883	0.038
Discipline	20	16.8	0.84	0.010
Attendance	20	17.4	0.87	0.013
Difficult of work post	20	13.2	0.66	0.055

Table 8. *Detailed variance analysis.*

Source of variations	Sum of squares	Degree of freedom	Mean of squares	F	Probability P	Critical value for F
Between groups	1.607	4	0.401	6.466	0.00012	2.467
Inside groups	5.903	95	0.062			
Total	7.511	99				

simple that the operator does not find any work difficulty and therefore performs her task with good efficiency and in compliance with the desired quality. The majority of operators with a quality index between 0.8 and 1 have a performance index greater than 1. These occupy workposts that are easy to perform. For operators with successive codes of C06, C07, C08 and C09 and who perform assembly operations on a Flatlock machine, they have the lowest quality index (between -0.085 and -0.082) and performance (between 40 and 47). This is due to the difficulty of the post and the lack of worker versatility in these types of posts. The operator with code C10 has a quality index equal to 0.053 with a good performance index of 81, which indicates that the operator is quick in their work but has a significant rate of retouching. This requires technical intervention to reform the worker in order to improve the level of quality. For operators with codes C19 and C20, they have the best quality index – 1, but the performance is insufficient (equal to 66). This is because the production capacity of both operators is greater than that actually produced by the chain. Technical intervention of the method and quality service is necessary to improve the productivity of the chain. Thus, for workers who do not have enough skills to properly perform assembly operations by means of the flatlock machine, a training plan is needed to improve their level. Indeed, the best training program according to the needs of the following posts to be produced allows to improve the level of versatility and, in turn, productivity and efficiency. On the other hand, the best choices of organisational structure in terms of operator work management and employee responsibility are elements for the success of the program and for improving the personal level. Implementing a bonus system according to the difficulty of the post is a solution to encourage operators to improve the salary level and, at the same time, the versatility rate. Thus, the material level is important enough to reduce defects and improve productivity by reducing the time of machine breakdowns. To remedy maintenance problems, the company is moving towards the application of a TPM (Total Productive Maintenance) plan, the objective of which is to increase efficiency and productivity, and to change staff mentalities [19]. The main objective of TPM methodology is to have zero failures and zero defects. Therefore, the procedure involves having a linear organisational structure with a versatile workforce. Indeed, measurement is the first step to improve. Therefore, the application of a curative maintenance procedure allows to determine the time span of daily failures so as to find an action plan to reduce them.

Following this study, after a meeting with the management to discuss the results found, a decision was taken to raise awareness among the workforce of the importance of the system for calculation of the salary bonus according to the quality index, performance, difficulty of work, discipline and attendance. The bonus calculation method according to the selected criteria was applied to test its effect on the productivity of the chain studied. The results showed that the absenteeism rate was reduced by 13.25% to 8.3%. The quality of production was improved by reducing the defect rate from 8.5% to 3.6%. Moreover, the efficiency of the chain studied was improved by 51% to 67.3%. Following these results, it can be deduced that the salary bonus calculation system has a positive impact on productivity. And we would like to improve the efficiency rate by more than 67.3% by improving the versatility rate by applying a continuous training plan for the workforce. This plan must be updated each in evaluation to measure the rate of improvement in versatility and a new target for each period inserted. To reduce the defect rate and improve productivity, a continuous improvement plan was implemented in the chain to reduce root causes that have a direct impact on productivity reduction. A plan was put in place to reduce machine failure rates by involving the TPM system, which is necessary to reduce the impact of machine failure, which represents a rate of 19% for productivity.

According to this study, the most interesting point is to assess the labour according to work-related criteria, the level of production quality, which is expressed by the quality index, productivity, which is indicated by the performance, and the level of difficulty of the work post, which is a necessary factor in order to improve the rate of individual and overall versatility. Individual assessment is expressed by criteria that are related to the discipline and attitude of the staff. By inserting these criteria, it is possible to increase the rate of responsibility and awareness among operators and decrease the rate of absenteeism, which is a problem affecting the fluidity of production for the clothing company. The application of a bonus system using these five criteria allows to improve workers' salaries on the one hand, and productivity, quality of work, and the versatility rate on the other, as well as reduce the absenteeism rate. The insertion of this system improved the quality of the work by indirectly inserting competition among the operators to improve the rate of versatility, profitability, quality of work and, thus, ultimately their wages. The worker evaluation system affects the future competitiveness and performance of an organisation. In addition, improving personal performance increases the profitability of the company. Therefore, competitiveness increases the rate of competition on a global scale, especially since nowadays, it is necessary to have certification to international standards, such as the 9001 standard, which requires the measurement of skills performing activities affecting product conformity [13].

Conclusions

In this study, we developed a salary bonus system for direct labour in a clothing company by means of the SAW method according to two types of criteria, The first criterion is work related, which assesses the quality and performance of the workers, while the other is the level of difficulty. In addition, we used criteria related to the discipline and attitude of each operator.

The study was carried out on a production line employing 20 operators. According to the results obtained, values of the ranking vector Vi varied between 0.545 and 0.911, which allows to have a salary bonus between 0% (for $V_i < 0.75$) and 15% for ($V_i > 0.9$).

The study reduced the absenteeism rate from 13.25% to 8.3% for direct labour. The quality of production was improved by reducing the defect rate by 8.54% to 4.6%. The efficiency of the chain was improved by 51% to 67.3%.

This system allows to create internal competition among workers in order to improve performance, versatility, quality, and therefore improve wages. Hence, the productivity of the company and the level of personnel improve while reducing absenteeism. All of this helps to increase competition in the market by increasing production capacity.

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