Measure OHS Performance Using Statistical Tools

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Abstract:

Now Quality is being for all firms a new strategic which led to extremely installation of severe control methods; manufacturers are forwarded to increasingly strong and consequently very expensive constraints. The systematic use of Gaussian distribution in random phenomena modeling has been largely contributed to this overflow and can be unsure whether the matter requirements of capability do not show the way to production capability means. In the same way manufacture follow-up by control chart generates lose of time and are not justified (duration, frequency, control quality). When certain conditions are met production monitoring can be brought back to a problem of systematic preventive maintenance. Our research is dealing with resolving matter of capability in the case of nonnormal distribution and to compare index of capability in both situation normal and nonnormal for control chart in production problem.

Keywords: Define, Measure, Analyse, Innovate and control; DMAIC; Control charts; Pareto; Six Sigma.

Jel Classification Codes:XN1, XN2.

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Introduction:

The two categories of first level performance metrics (1a and 1b) are reactive. They concern past results (consequences) on which it is no longer possible to act. The managers who use these measures are primarily concerned with controlling the losses caused by accidental events and occupational injuries. Organizations that do not measure, if only minimally, these indicators are not concerned with health and safety (level 0) and consider that accidents are an inherent and unavoidable part of the job (O'Brien, 2000). Although useful for assessing after-the-fact the impact of actions

taken to improve the SST on large groups of individuals, these measures prove to be ineffective to reflect the improvement of the daily situation of the workplaces.

At the second level, the order of concern changes and focuses on the idea of prevention. Results-based measurement is giving way to performance measurement of processes, equipment, workstations, in short, everything that makes up work organization and its interface with individuals. By verifying whether the workplace meets internal and external regulatory requirements (Level 2a), it is possible to assess its performance against established standards and identify gaps to be filled. At this level, the probability of adopting measures to eliminate risks at the source for workers is higher (Desmarais, 2004).

At Level 2b, the order of concern is no longer about compliance, but rather about the processes and structures and programs that enable the organization to continually improve health and safety. Performance measurement tools and techniques are tailor-made to suit every situation investigated.

At level 3a, performance measures focus on the safety actions of workers and the reasons for failures. We also look at group norms that promote or hinder the adoption of safe behaviors, as well as everyone's perception of management's commitment to OHS and the involvement of staff in it. material. At level 3b, the performance measure reaches its most complex level by allowing the assessment of the integration of all organizational systems in a health and safety perspective.

The choice of health and safety performance measures and their assessment tangibly reflect the values of organizations and their leaders. The higher the order of concern, the more you can expect to increase investment in prevention and reduce repair costs.

Methodology;

1. The self-diagnosis questionnaire and the sensitivity index for OSH interventions

We have developed a self-diagnostic tool based on the classification described above. The tool takes the form of a questionnaire using a Likert scale as a measure. Its administration to all staff allows for a portrait of the situation and to highlight the differences in perception between the hierarchical levels and between the various categories of personnel. The indicators selected in the questionnaire cover the four categories of proactive concerns that we have identified in Table 42 : (2a) environmental conformity, (2b) continuous improvement, (3a) the adoption of values, attitudes and behaviors and (3b) integration of the SST with existing organizational systems.

Table (01) : Dimensions of the CEOT Self-Diagnosis Questionnaire

Size	Number of questions
Health-Work Questionnaire Group Norms and Behavior	7 questions

Engagement and support of senior management	11 questions
Workers' participation	8 questions
SST Responsibilities of Managers and Workers	6 questions
Prevention organization system	18 questions
Assessment of the SST performance of the institution	8 questions

The items in the questionnaire are presented in the form of actions for which the respondents determine the extent to which they are done within their company. This way of presenting the items implies that the respondent must recall facts, observable events or circumstances in which the actions took place or not. The scores obtained for each of the dimensions provide a first assessment of the perception of the actions taken. As part of this paper, which focuses on workers' levels of attention to S & T initiatives, we have set aside the answers provided by managers, S & S managers and those qualified as "others". Our purpose here is to measure the degree of attention given by workers to SST initiatives within the organization.

2. Analysis of groupings

The collected data will be processed and analyzed by the SPSS version 22 software, with a calculation of the staff satisfaction score, a descriptive statistic and a multiple linear regression.

With the help of the appropriate statistical tools, it is possible to form groups of elements or individuals with similar aspects using the Cluster Analysis or Cluster Analysis methods.

The theme of this study focuses on the occurrence of SST practices. In this respect, do all the workers evaluate each of the studied facets of the SST in the same way ? In other words, do they all have the same perception on the subject ? This situation should be technically the case when the company puts efforts in the right places and the communication goes efficiently from the top to the base of the organization. However, human perception is by definition very variable from one individual to another, the averages associated with the dimensions studied rarely represent the situation, in the sense that the dispersion of the data around the averages is often very high, leaving the employer puzzled and unresolved to explain the effect of his SST initiatives.

The first exercise to which the analyst should lend itself is to fix the number of groups to the so-called "similar" answers. To achieve this, a two-steps-cluster strategy was used. The first step is to select a random subsample of thirty or so data and process them using the hierarchical clustering method. This strategy allows the

analyst to determine the number of clusters that best represents the distribution of respondents. Through the so-called agglomeration schedule, it has been found that 2, 3 or 4 clusters would be solutions to explore. The second phase consists of studying these three solutions using a dynamic cloud algorithm or K-Means clusters and comparing them.

3. Metrologicalqualities of the measuring instrument

To check if our scale is sufficiently accurate to be used in a questionnaire, we proceeded to the analysis of the psychometric qualities of this measuring instrument using :

- Item-total correlation indices whose analysis is intended to verify if an item is well constructed and if it demonstrates a high correlation with the corrected total score, without presenting a strong correlation with another item.
- The alpha coefficient of Cronbach. An alpha coefficient of Cronbach greater than 0.70 allowed us to conclude a good internal consistency of the scales (Fayers and Machin, 2000).
- We will relate each item to the total score (overall satisfaction) of the scale to assess the degree of association between each item and the total score (Pearson correlation).

4. Reliability of the questionnaire

The reliability of the questionnaire is evaluated by measuring the internal consistency of the different scales of satisfaction, which reflects how the items of the same scale are interrelated, using Cronbach's alpha coefficient.

a. The first dimension: Senior management commitment and support

Reliabilitystatistics for the first dimension

Table (02): Reliability Statistics for the Second Dimension

Cronbach Alpha	Cronbach Alpha Based on Standardized element	Number of elements
0.504	**0.503**	**11**

The ultimate picture of this analysis is the one that contains the value of Cronbach's alpha. We note here that the value of the coefficient is 0.5 that is excellent, since it exceeds the minimum threshold required of 0.5.

That said, some authors put forward 0.5 as the minimum threshold of acceptability. Be aware that when the alpha value is 0.5, the standard error of

measurement is equal to more than half (0.55) of the standard deviation of the total score distribution.

Frequency table Frequency table of the first dimension

Table (03): Table of frequencies the first dimension

		Frequency	Percentage	Percentagevalid	Cumulative percentage
Valid	Man	41	82,0	82,0	82,0
	woman	9	18,0	18,0	100,0
	Total	50	100,0	100,0	

- **Workforce**

The second column shows the frequency, the number of participants associated with each specific valid (and missing) value of the selected variable In the example, 41 men responded and 9 women responded, for a total of 50 valid observations. In terms of missing values, 0 people have the value "0" in the database.

- **The percentage**

The calculation of the percentage is done by dividing the frequency of a response for a specific value by the total number of observations, then multiplying by 100, In the table, this information is in the third column. Men account for 82% of the sample (41/50 * 100), women represent 18% of the sample (9/50 * 100). For a total proportion of valid observations of 100%, The sum of all the proportions of the answers with the missing always gives 100%.

b. Two-step cluster of the first dimension

The node of the case is in the "Automatic Cluster Creation" table below. We have the BIC for each partition solution. The mechanism concludes with an "optimal" subdivision in K * = 2 classes.

Note : Note that BIC decreases steadily - BIC change is always negative - as one increases K, up to Kmax = 15 in all cases. It is inappropriate on this example to directly designate the right number of classes. SPSS is right not to take it for cash and introduce an additional device.

Automaticcreation of clusters of the first dimension

Table (04) : Automatic creation of clusters of the first dimension

Nombre de clusters	Bayesian Schwartz Criterion (BIC)	Modification BIC[a]	Report modifications BIC[b]	distance[c]measurement report
1	503,747			
2	513,859	10,112	1,000	1,321

3	**544,349**	**30,490**	**3,015**	**1,306**
4	**589,680**	**45,331**	**4,483**	**1,538**
5	**651,987**	**62,308**	**6,162**	**1,143**
6	**718,249**	**66,261**	**6,553**	**1,047**
7	**785,746**	**67,497**	**6,675**	**1,111**
8	**855,886**	**70,140**	**6,936**	**2,037**
9	**938,119**	**82,233**	**8,132**	**1,047**
10	**1020,871**	**82,751**	**8,183**	**1,281**
11	**1106,067**	**85,196**	**8,425**	**1,194**
12	**1192,674**	**86,607**	**8,565**	**1,008**
13	**1279,336**	**86,662**	**8,570**	**1,091**
14	**1366,603**	**87,267**	**8,630**	**1,016**
15	**1453,977**	**87,374**	**8,641**	**1,160**

a. The changes correspond to the previous number of clusters in the table.
b. The change reports are based on the change of the two-cluster solution.
c. Distance measurement reports are based on the current number of clusters, compared to the previous number of clusters.

The Cluster Two-step table summarizes the process by which the number of clusters is chosen.

The grouping criterion (in this case the BIC) is calculated for each potential number of clusters. The small values of the BIC indicate better models, and in this situation, the best cluster solution has the smaller BIC.

A good solution will have a reasonably high ratio of BIC changes and a large ratio of distance measurements.

Analysis of variance of the first dimension

Table (05: Analysis of variance of the first dimension

	Cluster		**Erreur**		**F**	**Sig.**
	Carré moyen	**ddl**	**Carré moyen**	**ddl**		
question n°1	**5,414**	**1**	**,137**	**48**	**39,456**	**,000**
question n°2	**,335**	**1**	**,253**	**48**	**1,324**	**,000**
question n°3	**,856**	**1**	**,228**	**48**	**3,760**	**,000**
question n°4	**5,414**	**1**	**,137**	**48**	**39,456**	**,000**
question n°5	**2,561**	**1**	**,173**	**48**	**14,778**	**,000**
question n°6	**3,016**	**1**	**,194**	**48**	**15,557**	**,000**
question n°7	**4,338**	**1**	**,163**	**48**	**26,551**	**,000**
question n°8	**1,043**	**1**	**,145**	**48**	**7,200**	**,000**
question n°9	**4,529**	**1**	**,166**	**48**	**27,273**	**,000**
question n°10	**,705**	**1**	**,245**	**48**	**2,876**	**,000**

question n°11	,503	1	,250	48	2,013	,000
F tests should be used for descriptive purposes only, since clusters were chosen to maximize the differences between the observations of the different clusters.						

The calculation of the value of F is done automatically and the degree of significance associated is found in the last column In our case, the values of F are significant at p <0.0005, This means that the probability of obtaining an F value of this size by chance is less than 0.05%.

c. The second dimension : worker participation

Reliabilitystatistics for the second dimension

Table (06): Reliability Statistics for the Second Dimension

Cronbach Alpha	Cronbach Alpha Based on Standardized element	Number of elements
0.629	0.628	7

The ultimate picture of this analysis is the one that contains the value of Cronbach's alpha. We note here that the value of the coefficient is 0.6 which is excellent, since it exceeds the required minimum threshold of 0.6.

Frequency table of the second dimension

Table (07): Table of frequencies of the second dimension

		Frequency	Percentage	Percentage valid	Cumulative percentage
Valid	Man	41	82,0	82,0	82,0
	woman	9	18,0	18,0	100,0
	Total	50	100,0	100,0	

- **Workforce**

The second column shows the frequency, the number of participants associated with each specific valid (and missing) value of the selected variable In the example, 41 men responded and 9 women responded, for a total of 50 valid observations. In terms of missing values, 0 people have the value "0" in the database.

The calculation of the percentage is done by dividing the frequency of a response for a specific value by the total number of observations, then multiplying by 100.

In the table, this information is in the third column. Men account for 82% of the sample (41/50 * 100), women represent 18% of the sample (9/50 * 100). For a total

proportion of valid observations of 100%. The sum of all the proportions of the answers with the missing always gives 100%.

d. Two-step cluster of the second dimension

The node of the case is in the "Automatic Cluster Creation" table below. We have the BIC for each partition solution. The mechanism concludes with an "optimal" subdivision in K * = 2 classes.

Note : Note that BIC decreases steadily - BIC change is always negative - as one increases K, up to Kmax = 15 in all cases. It is unsuitable on this example to designate directly the number of classes.

e. Automaticcreation of second dimension clusters

Table (08): Automatic creation of second dimension clusters

Nombre de clusters	Bayesian Schwartz Criterion (BIC)	Modification BIC[a]	Report modifications BIC[b]	distance[c]measurement report
1	408,738			
2	388,970	-19,767	1,000	1,480
3	397,167	8,196	-,415	1,287
4	418,359	21,192	-1,072	1,515
5	454,962	36,603	-1,852	1,138
6	495,188	40,227	-2,035	1,440
7	543,450	48,262	-2,441	1,326
8	596,197	52,746	-2,668	1,279
9	651,942	55,746	-2,820	1,165
10	709,213	57,271	-2,897	1,297
11	768,600	59,387	-3,004	1,180
12	829,072	60,473	-3,059	1,116
13	890,170	61,098	-3,091	1,213
14	952,217	62,047	-3,139	1,173
15	1014,922	62,705	-3,172	1,333

a. The changes correspond to the previous number of clusters in the table.

b. The change reports are based on the change of the two-cluster solution.
c. Distance measurement reports are based on the current number of clusters, compared to the previous number of clusters.

The grouping criterion (in this case the BIC) is calculated for each potential number of clusters. The small values of the BIC indicate better models, and in this situation, the best cluster solution has the smaller BIC.

A good solution will have a reasonably high ratio of BIC changes and a large ratio of distance measurements.

- **Analysis of variance of the second dimension**

Table (09) : Analysis of Variance of the Second Dimension

ANOVA						
	Cluster		Erreur		F	Sig.
	Carré moyen	ddl	Carré moyen	ddl		
sexe	2,391	1	,209	48	11,446	,000
question n°1	,001	1	,190	48	,003	,000
question n°2	,329	1	,183	48	1,794	,000
question n°3	,019	1	,245	48	,077	,000
question n°4	,022	1	,260	48	,086	,000
question n°5	,066	1	,252	48	,261	,000
question n°6	10,550	1	,020	48	522,240	,000
question n°7	5,067	1	,140	48	36,230	,000
question n°8	1,079	1	,234	48	4,609	,000
F tests should be used for descriptive purposes only as clusters have been chosen to maximize differences between observations of different clusters.						

The calculation of the value of F is done automatically and the degree of significance associated is found in the last column In our case, the values of F are significant at p <0.0005, This means that the probability of obtaining an F value of this size by chance is less than 0.05%.

The Third Dimension: OHS Responsibilities of Managers and Workers

- **Reliability statistics for the third dimension**

Table (10) : Reliability statistics of the third dimension

Cronbach Alpha	Cronbach Alpha Based on Standardized element	Number of elements
0.467	0.465	6

The ultimate picture of this analysis is the one that contains the value of Cronbach's alpha. We note here that the value of the coefficient is 0.4 that is excellent, since it exceeds the required minimum threshold of 0.4.

That said, some authors put 0.4 as the minimum threshold of acceptability. Be aware that when the alpha value is 0.4, the standard error of measurement is equal to more than half (0.55) of the standard deviation of the total score distribution.

- **Frequency table of the third dimension**

Table (11) : Table of frequencies of the third dimension

		Frequency	Percentage	Percentagevalid	Cumulative percentage
Valid	Man	41	82,0	82,0	82,0
	Woman	9	18,0	18,0	100,0
	Total	50	100,0	100,0	

- **Workforce**

The second column shows the frequency, the number of participants associated with each specific valid (and missing) value of the selected variable In the example, 41 men responded and 9 women responded, for a total of 50 valid observations. In terms of missing values, 0 people have the value "0" in the database.

In the table, this information is in the third column. Men account for 82% of the sample (41/50 * 100), women represent 18% of the sample (9/50 * 100). The sum of all the proportions of the answers with the missing always gives 100%.

- **The valid percentage**

To decide the question, the "Valid Percentage" column displays relative percentages only for subjects who gave a valid answer, In this case, the table shows that 82% of respondents for men and 18% use it for women.

a. Two-step cluster of the third dimension

The node of the case is in the "Automatic Cluster Creation" table below. We have the BIC for each partition solution. The mechanism concludes with an "optimal" subdivision in K * = 2 classes.

Note : Note that BIC decreases steadily - BIC change is always negative - as one increases K, up to Kmax = 15 in all cases. It is inappropriate on this example to directly designate the right number of classes. SPSS is right not to take it for cash and introduce an additional device.

b. Automaticcreation of third dimension clusters

Table (12) : Automatic Creation of Third Dimension Clusters

Nombre de clusters	Bayesian Schwartz Criterion (BIC)	Modification BIC[a]	Report modifications BIC[b]	distance[c]measurement report
1	302,925			
2	271,479	-31,446	1,000	2,030
3	281,800	10,321	-,328	1,088

4	**295,414**	**13,614**	**-,433**	**1,740**
5	**324,869**	**29,455**	**-,937**	**1,164**
6	**357,344**	**32,475**	**-1,033**	**1,162**
7	**392,386**	**35,041**	**-1,114**	**1,378**
8	**431,769**	**39,384**	**-1,252**	**1,865**
9	**476,473**	**44,704**	**-1,422**	**1,262**
10	**522,455**	**45,982**	**-1,462**	**1,360**
11	**569,727**	**47,272**	**-1,503**	**1,080**
12	**617,264**	**47,537**	**-1,512**	**1,439**
13	**665,814**	**48,550**	**-1,544**	**1,221**
14	**714,782**	**48,968**	**-1,557**	**1,325**
15	**764,212**	**49,430**	**-1,572**	**1,042**

Table 15: Automatic Creation of Third Dimension Clusters

a. The changes correspond to the previous number of clusters in the table.

b. The change reports are based on the change of the two-cluster solution.
c. Distance measurement reports are based on the current number of clusters, compared to the previous number of clusters.

The Cluster Two-step table summarizes the process by which the number of clusters is chosen. The grouping criterion (in this case the BIC) is calculated for each potential number of clusters. The small values of the BIC indicate better models, and in this situation, the best cluster solution has the smaller BIC.

A good solution will have a reasonably high ratio of BIC changes and a large ratio of distance measurements.

- **Variance analysis of the third dimension**

Table (13) : Variance analysis of the third dimension

	Cluster		Erreur		F	Sig.
	Carré moyen	ddl	Carré moyen	ddl		
sexe	**,504**	**1**	**,143**	**48**	**3,517**	**,000**
question n°1	**3,094**	**1**	**,181**	**48**	**17,100**	**,000**
question n°2	**9,147**	**1**	**,019**	**48**	**470,400**	**,000**
question n°3	**,461**	**1**	**,250**	**48**	**1,841**	**,000**
question	**9,334**	**1**	**,039**	**48**	**237,6**	**,000**

n°4					**00**	
question n°5	**2,287**	**1**	**,211**	**48**	**10,832**	**,000**
question n°6	**,461**	**1**	**,250**	**48**	**1,841**	**,000**
F tests should be used for descriptive purposes only, since clusters were chosen to maximize the differences between the observations of the different clusters.						

The calculation of the value of F is done automatically and the degree of significance associated is found in the last column In our case, the values of F are significant at p <0.0005.

This means that the probability of obtaining an F value of this size by chance is less than 0.05%.

c. La quatrième dimension : Système d'organisation de la prévention

- **Reliability statistics for the fourth dimension**

Table (14) : Reliability Statistics for the Fourth Dimension

Cronbach Alpha	Cronbach Alpha Based on Standardized element	Number of elements
0,597	**0.596**	**16**

The ultimate picture of this analysis is the one that contains the value of Cronbach's alpha. We note here that the value of the coefficient is 0.59 which is excellent, since it exceeds the minimum threshold of 0.59.

That said, some authors suggest 0.59 as the minimum threshold of acceptability. Be aware that when the alpha value is 0.59, the standard error of measurement is equal to more than half (0.55) of the standard deviation of the total score distribution.

- **Frequency table of the fourth dimension**

Table (15) : Frequency table of the fourth dimension

		Frequency	Percentage	Percentagevalid	Cumulative percentage
Valid	**Man**	**41**	**82,0**	**82,0**	**82,0**
	Woman	**9**	**18,0**	**18,0**	**100,0**
	Total	**50**	**100,0**	**100,0**	

- **Workforce**

The second column shows the frequency, the number of participants associated with each specific valid (and missing) value of the selected variable In the example, 41 men responded and 9 women responded, for a total of 50 valid observations. In terms of missing values, 0 people have the value "0" in the database.

In the table, this information is in the third column. Men account for 82% of the sample (41/50 * 100), women represent 18% of the sample (9/50 * 100). For a total proportion of valid observations of 100%. The sum of all the proportions of the answers with the missing always gives 100%.

- **The valid percentage**

To decide the question, the "Valid Percentage" column displays relative percentages only for subjects who gave a valid answer.

In this case, the table shows that 82% of respondents for men and 18% use it for women.

D. Two-step cluster of the fourth dimension

The node of the case is in the "Automatic Cluster Creation" table below. We have the BIC for each partition solution. The mechanism concludes with an "optimal" subdivision in K * = 2 classes.

The work on safety behavior is a basic action and is a long-term project. It profoundly changes the culture of your organization. It significantly reduces the frequency of incidents and improves risk prevention.

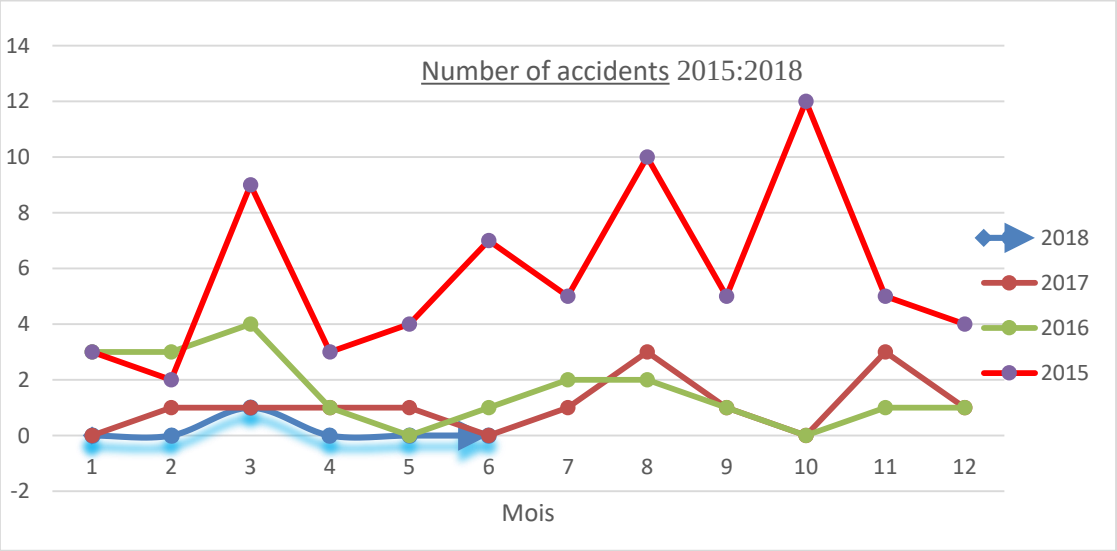
To change a behavior, it must first make sense for us and then change it.

Hence, the importance of observing, in the workplace, the links between the employee's reactions and the risks inherent to his tasks and his work environment, and to act, as an agent of change, to that he adopts a safe behavior.

Finally, think that working on behavior leads to changes, and that staff must be accompanied on these changes to ensure the success of the project and the gradual instillation of values.

d. Number of accidents 2015: 2018

Figure (4) : Number of accidents 2015: 2018



The number of accidents during the year 2018 marks a very small number thanks to the OHS Committee effort through awareness, courage, training, audit, etc. ...

Differences in the assessment of SST items

We propose a diagnostic tool that can be used to plan interventions according to the extent of attention or awareness observed among workers regarding SST initiatives. A high and diffuse percentage of inattentive people within the company will imply a type of generalized intervention as well as a small scale of inattentive, but grouped, will require a targeted intervention. In other words, we can postulate that an acceptable observation would be a small percentage evenly distributed across the organization. Ideally, an organization performing well in sst should approach a 0 score of little attentive and this even in the presence of "zero accidents".

a. Tests of equality of means between groups of dimensions

Table (16) : Equality tests of means between groups of dimensions

	Wilks'Lambda	F	Df1	Df2	Sig
1 / Senior management commitment and support	**0.487**	**50.223**	**2**	**71**	**0.000**
2 / Workers' participation	**0.425**	**42.598**	**2**	**71**	**0.000**
3 / OHS Responsibilities of Managers and Workers	**0.398**	**58.698**	**2**	**71**	**0.000**
4 / Organizational system of prevention	**0.378**	**65.257**	**2**	**71**	**0.000**
5 / Evaluation of the SST performance of the institution	**0.498**	**77.268**	**2**	**71**	**0.000**

6 / Group norms and behavior	**0.678**	**99.258**	**2**	**71**	**0.000**

Table 16 illustrates that at least one of the two groups admits a difference of significant means with respect to the others for each of the SST variables studied. This latest information shows that there is a clear segmentation between the groups. For those familiar with the ANOVA terminology, the Wilks Lambda simply represents the Within / Total ratio, which, when multiplied by 100, is interpreted as the percentage of variance unexplained by the mean difference between groups. When there is a lot of difference between groups, this percentage tends to be small. The "Group Norms and Behavior" is the least discriminating item.

Indeed, 67.8% of its variance is unexplained by the difference between groups. However, on the contrary, it can also be noted that 32.2% of the variance is explained by the presence of the groups, which in the social sciences constitutes a very appreciable result.

b. Average of groups to questions

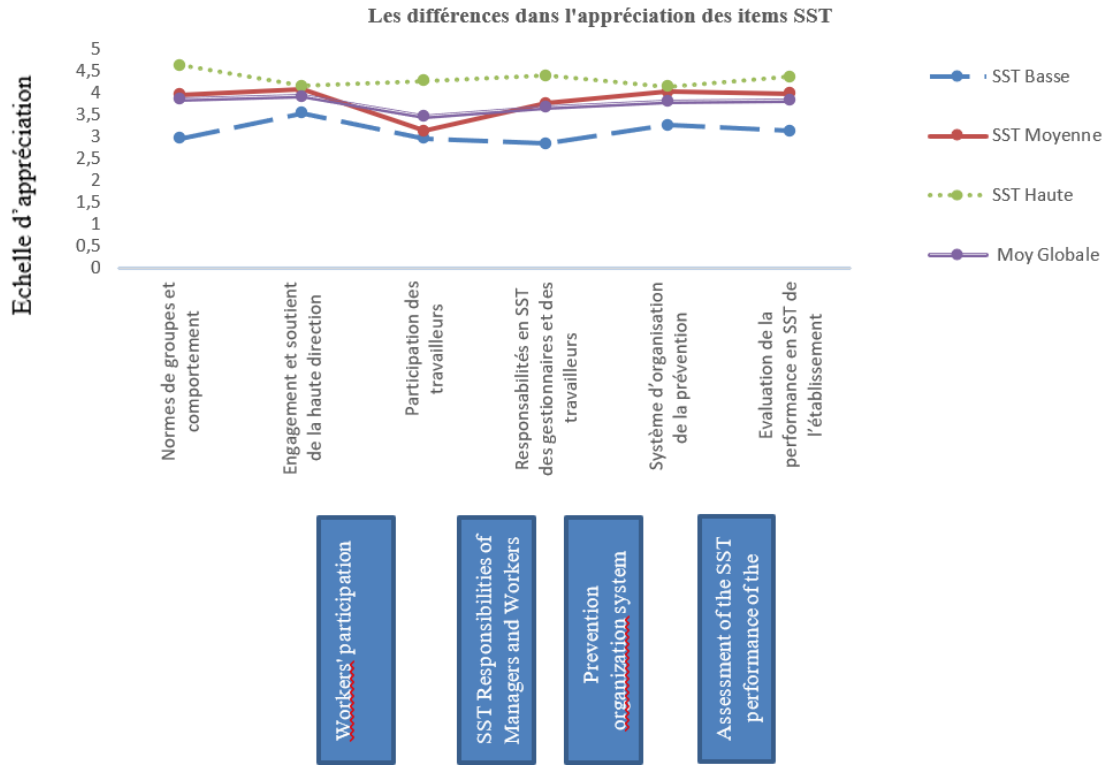
Table (17) : Average of groups to questions

initiatives	-/+	+	++	Globale
Group norms and behavior	**2,96**	**3,96**	**4,63**	**3,85**
Engagement and support of senior management	**3,54**	**4,08**	**4,16**	**3,93**
Workers' participation	**2,96**	**3,14**	**4,27**	**3,46**
OHS Responsibilities of Managers and Workers	**2,85**	**3,76**	**4,39**	**3,67**
Prevention organization system	**3,26**	**4,02**	**4,14**	**3,81**
Assessment of the OHS performance of the institution	**3,14**	**3,98**	**4,37**	**3,83**
Average items	**3,12**	**3,82**	**4,33**	**3,76**

Table 17 presents the averages for the questions for each of the two groups as well as the distribution of individuals in each group. At first, it is very interesting to see that the two-group solution is very well balanced.

c. Differences in the assessment of SST items

Figure (9) : Differences in the assessment of SST items



On the other hand, in this figure, we observe independently of the groups, that the initiatives (items) related to the responsibility of the working groups and the management systems obtain unanimously lower evaluations.

The analysis of the reliability of the scales of the principal components shows that the items of each scale are correlated and coherent with each other with reliability indices varying between 0.77 and 0.89. It is the same for the reliability of the total scale whose Cronbach's alpha is 0.91.

Methodology

a. Design of the questionnaire

This questionnaire was developed in order to assess the level of satisfaction of employees on the one hand and to identify the determinants of this satisfaction while providing a predictive model that explains the variance of satisfaction. Personnel (dependent variable) using a linear combination of explanatory factors (independent variables).

This allowed us to retain 70 items concerning satisfaction and its determinants, after revision, the questionnaire was reduced to 67 items that were selected to assess staff satisfaction. They are divided according to 4 dimensions :

- The first dimension concerns the conditions, the organization and the content of the work, with a score named : 1-score ;

- The second dimension concerns information and communication, with a score named : 2-score ;
- The third dimension concerns training and skills, with a score named : 3-score ;
- The fourth dimension concerns labor relations, with a score named : 4-score ;

A Likert scale of 1 to 5 was chosen as the answer for items assessing staff satisfaction.

❖ **Reliability of the questionnaire**

The reliability of the questionnaire is evaluated by measuring the internal consistency of the different scales of satisfaction, which reflects how the items of the same scale are interrelated, using Cronbach's alpha coefficient.

According to the results obtained from the test, a Cronbach alpha coefficient of 0.85 is synonymous with a good internal consistency of the measurement scales used.

❖ **Cronbach Alpha**

Table (18) : Reliability Statistics

Cronbach of Alpha	Number of elements
0,85	**67**

Gross score calculation, calibration and satisfaction level measurement

Often, the data are "intermediate" measures and are used to calculate a resulting measure. This resulting measure is called the raw score : it is a composite score calculated from elementary scores.

The calculation of the raw scores is done by adding the answers attributed to each item.

For the calibration of this score and the measurement of the level of satisfaction of the staff, we will choose the following method :

Divide the calculated scores into three equal classes, with an extension calculated according to the following criterion : (Higher score-lower score) / 3.

b. Results : analyzes and interpretations

Recall that our objective was on the one hand to evaluate the level of satisfaction of the personnel, on the other hand to identify the determinants of this satisfaction while giving a model of prediction which makes it possible to explain the variance of the satisfaction of the personnel (dependent variable) using a linear combination of explanatory factors (independent variables).

In our survey, we distributed 120 questionnaires and received 112, a 93.33% return rate. Then we canceled the questionnaires with missing data that are 07 in number, which allowed us to run 105 questionnaires, an exploitation rate of 87.5%.

Before determining the overall satisfaction level of the staff which is our primary objective by exploiting the scores of our questionnaire, we will examine the descriptive statistics of this satisfaction (SCORF).

From Table 171 below, the SCORF variable has an average of 98.98 with a variance of 450.040 ; a standard deviation of 22,743 ; a median of 94 and a mode of 92.

The maximum value of the distribution is 211 and the minimum value is 81. In addition :

- 25% of the sample has a SCORF of less than 55.75 ;
- 50% of the sample has a SCORF of less than 73 ;
- 75% of the sample has a SCORF of less than 93.

c. Analysis of variance

Table 19 of ANOVA gives us this information. In our study, we want to know at first if the 1-score better predicts the SCORF than does a model without predictor (with only the average) and in a second time, if the 2-score, the 3-score, the 4-score, better predict the SCORF than a model without predictor.

Table (19) : Analysis of variance of employee satisfaction

Modèle		Somme des carrés	dd1	Moyenne des carrés	F	Sig.
1	Régression	61051,273	1	61051.273	198.631	,000b
	Résidu	52558.589	171	307.360		
	total	113609.861	172			
2	Régression	80239.505	2	40119.753	204.384	,000c
	Résidu	33370.356	170	196.296		
	total	113609.861	172			
3	Régression	98391.304	3	32797.101	364.207	,000 d
	Résidu	15218.557	169	90.051		
	total	113609.861	172			
4	Régression	113609.861	4	18934.977	465.324	,000e
	Résidu	0.000	168	0.000		
	total	113609.861	172			

a. Dependent variable : SCORF
b. Predicted values : (constant), 1-score
c. Predicted values : (constant), 1-score, 2-score

d. Predicted values : (constants), 1-score, 2-score, 3-score
e. Predicted values : (constant), 1-score, 2-score, 3-score, 4-score

Table 19 shows that all the F values obtained for the six models (198,631, 204,384, 364,207 and 465,324) are significant at p <0.001, which indicates that we have less than 0.1% chance of being wrong in asserting that models contribute to better predict SCORF than the simple average.

d. Evaluation of the fit of the regression model to the data

Now that we know that the model is significant, the summary table of the models makes it possible to determine the contribution of each block of variables. This table shows the cumulative R2 at each stage of the model (R-two column) as well as the specific contribution of each block (R-two Variation column).

e. Summary of Employee Satisfaction Models

Table (20) : Summary of Employee Satisfaction Models

Modèle	R	R-deux	R-deux ajusté	Erreur standard de l'estimation	Changement dans les statistiques					Durbin-watson
					Variation de R-deux	Variation de F	Ddl 1	Ddl 2	Sig. Variation de F	
1	.931[a]	.866	.864	9.48950	.160	201.573	1	169	.000	
2	.958[b]	.917	.915	7.48230	.051	103.834	1	168	.000	
3	.965[c]	.932	.930	6.80932	.015	35.849	1	167	.000	
4	1.000[d]	1.00	1.000	.00000	.068	.	1	166	.000	1.578

a. Dependent variable: 1-score
b. Predicted values: (constant), 1-score, 2-score
c. Predicted values: (constants), 1-score, 2-score, 3-score
d. Predicted values: (constant), 1-score, 2-score, 3-score, 4-score
g. Dependent variable: SCORF

The value of the multiple correlation (R) represents the strength of the relationship between the dependent variable SCORF and the combination of the independent variables of each model.

The values obtained from R suggest that the data are satisfactorily adjusted to the model.

The meaning of R2 is evaluated according to the contribution of each step.

The variation of F associated with the first model is significant (p <0.001). This model therefore accounts for a significant proportion of the variance of the SCORF variable. We went from R2 = 0 to R2 = 0.866.

The second model changes the R2 from .917 to 0.932. This variation of 0.051 appears to be significant. Indeed, the value of F is calculated from the variation of R2 between the steps. SPSS therefore determines that the difference (0.051) between R2 of model 2 (0.917) and that of model 1 (0.866) is significant at (p <0.001).

The third model passes the R2 from 0.917 to 0.932. This variation of 0.015 appears to be significant at (p <0.001).

The fourth model moves the R2 from 0.932 to 1.000. This variation of 0.068 appears to be significant at (p <0.001).

Each step thus contributes significantly to improving the explanation of the variability of the SCORF dependent variable.

- **Assessment of the variability explained by the regression model**

The value of R2, when multiplied by 100, indicates the percentage variability of the SCORF dependent variable explained by the model (preachers). The results suggest that :

86.6% of staff satisfaction is explained by the conditions, organization and content of the work.

91.7% of staff satisfaction is explained by the combination of conditions, organization and content of work and remuneration ; career management and regulatory knowledge ; information and communication ;

93.2% of staff satisfaction is explained by the combination of conditions, organization and content of work and remuneration ; career management and regulatory knowledge ; information and communication ; and training and skills.

100% of staff satisfaction is explained by the combination of conditions, organization and content of work and remuneration ; career management and regulatory knowledge; information and communication; training and skills; labor relations; and relations with citizens.

The objective of this article is to propose a tool for measuring employee satisfaction to measure its level of satisfaction and to determine the important dimensions that influence this satisfaction.

The results obtained give us an idea of this level of satisfaction, more than half of the sample (62.2%) have an average level of satisfaction, 19.7% represent a high

level of satisfaction, and 19.1% have a low satisfaction. These results generally suggest that staff are satisfied in their work.

From the results of the linear regression, all the dimensions introduced in the satisfaction questionnaire contribute significantly to explaining the variability of overall satisfaction. We have therefore chosen the factors influencing staff satisfaction.

f. Control

The DMAIC loop is closed by the control phase which has a role to monitor the control of our process Success in the control phase depends on how well the team has done in the previous four phases. The keys are a solid monitoring plan with the appropriate change management methods that identify the key stakeholders. Lessons learned are now being implemented and tools are being put in place to ensure that key variables remain over time in acceptable ranges so that process improvement gains are maintained.

Risk identification tool

This tool presents the activities to be put in place to identify, correct and control risks, It is intended for the main actors involved in the management of OSH in establishments, be it the employer, the workers, their representatives, members of the health and safety committee or any other working group concerned.

Identify

The starting point for any improvement in health and safety actions in your institution is to identify the risks, ie to identify them and then analyze them in order to establish the priorities.

To effectively achieve this step, it is important to plan it well to make sure you do not forget anything, to free the people involved, to be as objective as possible and to record in writing what has been done.

There are several ways to identify risks. For example, we can use :

- Periodic inspections ;
- The accident, incident and first aid register of his establishment ;
- Job analysis ;
- Comments, complaints, suggestions from workers, foremen or the health and safety committee ; the experience of other companies in your sector or that of other members of your prevention mutual ;

- Risk analysis.
- There are many ways to better understand the risks in your workplace. You do not know where to start ? Minimally, the regulations must be respected.
- This tool presents you with two different ways to identify risks :
- Task Analysis : ITEM.

Conclusion

In this article, the aim being the proposal of a methodology for improving the Six Sigma structure optimization process including the design of the service SST. In this perspective, our research focused on the problem of developing an efficiency strategy for improving the behavioral-based security structure and analysis of behavioral systems.

Work on the optimization of the Six Sigma approach including the design of the health and safety service working covering a wide spectrum of problems. However, work covering the analysis of behavioral systems and behavior-based safety is poorly developed in the literature and in particular in the manufacturing industry. This gap is the motivation to focus on this issue through empirical work and an appropriate methodological approach.

In a second part, we carried out the experimentation on the case of the methodology of the Six Sigma approach whose conception of the health and safety service of work and presents the disposition of all the elements necessary for the setting up of a system of management of health and safety at work and to better understand the requirements of OHSAS.

By applying the tools of the Six Sigma method such as histograms, cause-effect diagram, Big Five personality test, SPSS software version 22, Matlab software, - The Bradley curve, the HEXACO model in 25 facets of personality. And on the other hand, is dedicated to this stage, the application of tools as a personality test according to the model HEXACO in 25 facets of personality organized in 6 dimensions, stress test at work. The development of a safe mind and the superimposition of the five types of knowledge on : the Bradley curve, including the integration of safety culture as an integrative project.

As a risk management strategy aims to reduce the number of accidents at work while developing a new structure of systems analysis and a culture of behavior-based safety. In order to achieve how to move this field from health and safety to work from a status of constraint to a status of opportunities, improve the performance of

the company by better respecting the health of employees or how to stop managing the OHS for produce and work in any SST.

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