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The Occupational Health and Safety Performance, of a Multinational Industrial Compagny Located in Casablanca, Kingdom of Morocco

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***Abstract:** The purpose of the research is to present a statistical approach using latent and manifest variables applied to measure the occupational health and safety performance of a worldwide enterprise (energy sector) located in Casablanca, Kingdom of Morocco. The principal idea is to measure the impact of occupational health and safety practices OHS (which are divided into seven segments: Leadership and worker participation, Planning, Support, Operation, Improvement, Performance evaluation and Organizational context) on the OHS performance (which is divided into two perspectives: (Workers Results perspectives and Finance Results perspectives), enabling the company to characterize her performance regarding to the ISO 45001 standard's. To do this, we use the SEM's resolution based on the Partial Least squares (PLS) method via the XL-STAT software on a sample of 139 questionnaires administered face-to-face with managers, technicians, engineers and directors of this company. The obtained results could be examined in order to analyze the occupational health and safety management system performance, in order to reveal the challenges faced by company to maintain the ISO 45001 and to make suggestion to improve operational health and safety process, plan the improvements and develop an action plan.*

***Keywords:** Occupational Health and Safety, Partial Least Squares, Modeling approach, ISO45001, Performance.*

I. INTRODUCTION

The health and safety of employees at work is nowadays a major concern for any company. They are key conditions of efficiency and performance for the employee and for the employer, especially since both are the pillars of sustainable development as well as economic, social and environmental components for any company aspiring to a better performance while ensuring its sustainability.

In this respect, companies, social partners, government authorities and other actors and stakeholders are mobilising to support and promote the principles of health and safety prevention in compliance with local regulations and international conventions.

Given this context, the ISO45001 is the best way to support and promote the principles of health and safety prevention in organization. The goal of this article is to measure the impact of the health and safety performance of this worldwide enterprise (electrical sector) located in Casablanca, Kingdom of Morocco, by using the structural equation method according to PLS approach (Partial Least Square) and via the Xl-stat software. This is an empirical study and it relies on questionnaire based surveys administered via a direct contact with the managers, technicians, engineers and directors of this worldwide enterprise (electrical sector).

II. CONCEPTUAL FRAMEWORK AND RESEARCH METHODOLOGY

As mentioned before, this article deals with a worldwide enterprise based in Casablanca, Kingdom of Morocco. A worldwide enterprise is a large company that operates abroad thanks to its subsidiaries and following a globally scaled strategy and organization. A worldwide enterprise operates in several geographical areas, but with one unique centre or one main decision making centre. The decisions of a worldwide enterprise are mainly based on criteria of economies of scale, tax policies and repatriation of profits.

A. Definition of the structures of the conceptual model

The Structural Equation Modelling (SEM) is a method to define complex interacting systems, **Fernandes, [1]** and it allows studying the causal connections between multiple latent variables. These variables represent a concept but we can only measure them with manifest variables (MV), **Ehlasbi, et. al, [2]** .

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MES is used for the generalization of many classic models such as principal components analysis, factor analysis, and canonical analysis. These statistical models are employed in several research fields, **Roussel, [3], Jacobowicz, [4]** especially in the marketing field to construct satisfaction indicators, **Clémence, [5]**.

This type of modeling is thus important to test the hypotheses of our conceptual model. There are two methods of modeling via (MES) for estimating the existing relationships between the constructs: partial least square (PLS), based on PLS variances, and linear structural relationship (LISREL), based on maximum likelihood the LISREL method and the PLS method, **Lacroux, [6], Benali, et. al, [7], Hadini et.al, [8]** .

B. ISO 45001 Standard: A Quick Survey

Occupational health and safety is one of the constant concerns of managers of a company. The results in this field bear witness to this and allow progress to be made. Today, the case law emphasizes an obligation of security of result of the employer, placing Occupational Health and Safety at the heart of the employer's approach to corporate social responsibility. Occupational health and safety are at the crossroads of multiple requirements to be taken into account:

- Human resources: risk assessment, staff training,
- Organizational: responsibility, delegation of authority,
- Economic: productivity, contribution rates, operating losses,
- Technical: compliance with rules and standards, workplace design and ergonomics.

Occupational health and safety is everyone's responsibility. If the process is to be successfully put into practice, the involvement of employees and their representatives becomes crucial. Their contribution is necessary both for the development of measures and for their effective implementation. Also important is the visible, continuous and proactive involvement of leadership at all management levels vis-à-vis occupational health and safety procedures.

The ISO 45001 guidelines are conceptualized around the following health and safety principles:

- Organizational context: The purpose of this requirement is for the system to focus on the processes and requirements necessary to achieve the objectives of occupational health and safety policy. It is achieved by understanding the organization and the "context" in which it operates.
- Leadership: The success of the occupational health and safety management system depends on the leadership and commitment of the “Senior Management". Directors and Senior Management are expected to become champions of the system and provide the necessary resources to protect workers from harm. The purpose of this section is to set the tone and expectations for senior management to actively participate in the OHS system and to create a positive health and safety culture in the workplace.
- Planning: Planning is one of the most important elements of any management system. ISO 45001 is designed on the basis of the "Plan, do, check, act" cycle, where planning is the means of implementing the actions that will determine how the system will work.
- Support: This part presents the specific requirements that are necessary to support the occupational health and safety management system to ensure its effective performance.
- Operation: After processes in the organization have been determined and planned, the company's operating method, the company must plan and control all OHS management system processes.

Improvement: The organization shall establish, implement and maintain a process[es] for monitoring, measurement, analysis and performance evaluation, ISO 45001, [9]

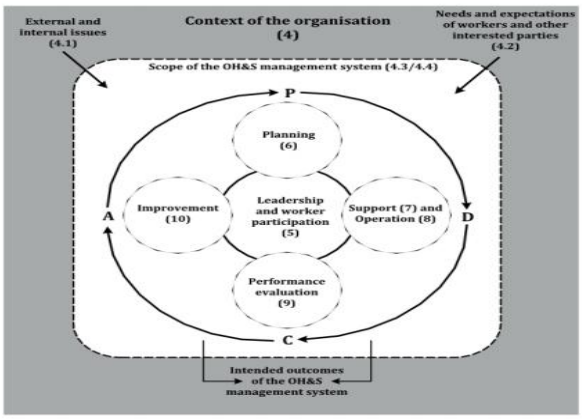

Fig. 1. Relationship between PDCA and the ISO 4500 core subjects (Source: ISO 45001:2018)

III. CONCEPTUAL FRAMEWORK AND RESEARCH METHODOLOGY

A. Choice of criteria of means (occupational health and safety practices)

The preparation and development of our questionnaire was conducted after a theoretical and empirical exploration stage. The empirical exploration consisted in meetings with the managers of this multinational company located in Casablanca, Morocco.

The theoretical exploration was conducted following a review of the literature **Benali, et. al, [7] , ISO 45001, [9] , Benali, et. al, [10] , Fethallah, et. al, [11]** and of the major quality awards (Malcolm Baldrige National Quality Award (MBNQA), Deming, European Foundation for Quality Management (EFQM)). Ultimately, we have selected seven criteria of means (occupational health and safety practices): 1. Leadership and worker participation, 2. Planning, 3. Support, 4. Operation, 5. Improvement, 6. Performance evaluation and 7. Organizational context. To assess the significance of the implementation of and presence of occupational health and safety practices, we used a Likert-type scale of five points. It starts with ‘’Very Low’’ (1) and ends with ‘’Very high’’ (5).

B. Choice of criteria results: occupational health and safety performance perspectives

Our choice of performance perspectives is based on the 2 well known perspectives exactly as mentioned in the ISO 45001: 1.Workers Results perspectives and 2. Finance Results perspectives.

IV. PRESENTATION OF THE RESEARCH MODEL

Our model relies on 9 criteria which are divided into 2 families: (Figure 2).

- Seven criteria refer to the means (Leadership and worker participation, Planning, Support, Operation, Improvement, Performance evaluation and Organizational context
- Two criteria refer to results (Workers Results perspectives and Finance Results perspectives) .

There are causal relations between the criteria of means and the criteria of results. In other words, the means in place are the causes of the given results.

Table- I: Codes used in the causal model

Constructs of the proposed model	Code	Title
Occupational Health and Safety (OHS) practices	LSHP.WP	Leadership and worker participation
	PLANN	Planning
	SUPP	Support
	IMPROV	Improvement
	PERF.EV	Performance evaluation
	OP	Operation
	ORG.C	Organizational context
criteria results	FIN.Rt	Finance Results
	Wkrs.Rt	Workers Results

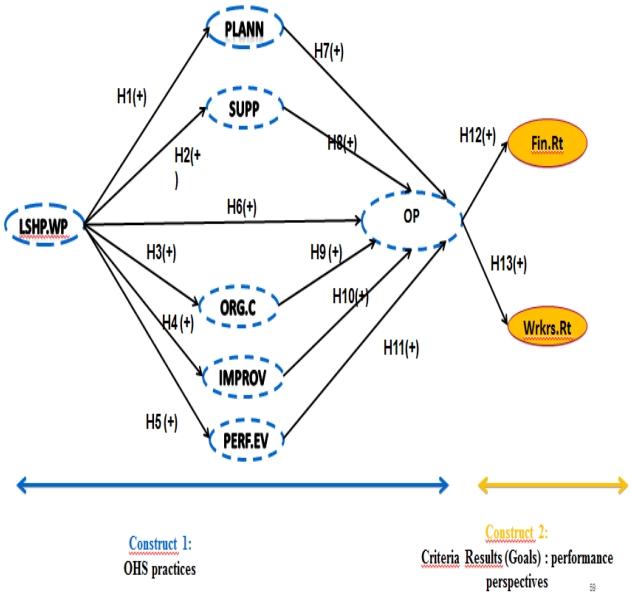

Fig.2. Proposed model

V. RESEARCH METHODOLOGICAL FRAMEWORK

Our study is an empirical type administered via face-to-face questionnaires from managers, technicians, engineers and directors of a worldwide enterprise located in Casablanca, Morocco (the survey response rate reached 94%, out of a total population of 139 employees).

A. Sampling

This research is conducted on a worldwide enterprise that operates in the Electrical sector and which is located in Casablanca, Morocco

B. Evaluation of the proposed model

The variables of the research model are 9 which are divided into 2 families:

- 7 variables that are related to occupational health and safety practices.
- The other 2 variables are related to the occupational health and safety performance.

The latent variables of our model are operationalized via the use of different items. These items are collected and evaluated by means of Likerts scales of five-degree ranging from the Very low to the Very high.

C. Reliability of the measurements and unidimensionality of the blocks

To examine the reliability of measurements we use "Cronbach Alpha" and "Rho D.G." indexes. For each dimension, the value of this internal consistency is greater than 0.8 (Table 2), which shows the good level of reliability, and this, following the instructions of Nunnally and Bernstein (1994) [11] . Similarly, the results in Table 3 also show satisfactory results where Rhô.D.G> 0.8 for all measurement models, and this according to the instructions of Fornell and Larker (1981) [12].

Table- II: Reliability of measures

Latent variable	Items	Cronbach's alpha	Rho D.G.
LSHP.WP	12	0,912	0,921
PLANN	9	0,942	0,954
SUPP	8	0,905	0,913
IMPROV	8	0,909	0,925
PERF.EV	7	0,945	0,950
ORG.C	6	0.875	0,893
OP	11	0,917	0,935
FIN.Rt	4	0.811	0.886
Wkrs.Rt	6	0,862	0,897

Table- III: Eigen values latent variables causal model

LSHP.WP	PLANN	SUPP	IMPROV	PERF.EV	ORG.C	OP	FIN.Rt	Wkrs.Rt
6,126	**3,522**	**5.119**	**4,944**	**7,080**	**3,945**	**5,968**	**4,244**	**2,083**
0,872	0,984	0.823	0,900	0,547	0,880	2,671	0,810	0,412
0,429	0,757	0.578	0,466	0,252	0,446	1,700	0,611	0,464
0,410	0,375	0.505	0,270	0,206	0,250	1,220	0,196	0,407
0,339	0,127	0.426	0,187	0,140	0,002	0,733		0,365
0,270	0,177	0.405	0,176	0,129	0,140	0,301		0,051
0,176	0,166	0.358	0,143	0,100		0,121		
0,139	0,133	0,000	0,012			0,019		
0,095	0000					0,000		
0,000						0,000		
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D. Evaluation of the measurement model

The are three ways of linking the manifest variables to the latent variables whose scheme can be MIMIC, formative, or reflective. The external evaluation of the measurement models depends on the nature of the selected schema or pattern (MIMIC,formative, reflective) [13] [7] .

The same author has confirmed that the reflective type schema (Fig.2) is the most suitable in most structural equation models and that such a choice is mainly based on the subjectivity of the researcher's subjectivity. Each manifest variable is linked to its latent variable by a simple regression:

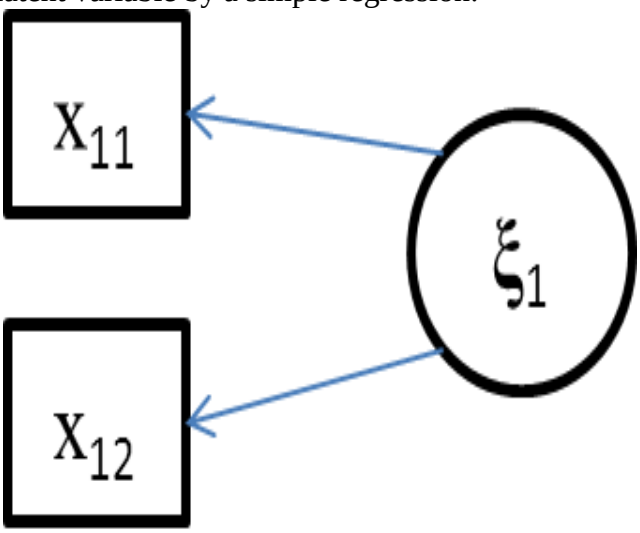

Fig. 3. reflective diagram

The relation between the latent variable and the group of manifest variables related to it is expressed as follows :

$$x_{kj} = \pi_{kj} * \xi_k + \varepsilon_{kj}$$

xkj: Vector related to the Nth manifest variable of the latent variable ξk

ξ : Latent variable

k : Index of latent variables

kj : Index of block manifest variables

π: Loading related to xkj

εkj: Term of errors (measurement errors of latent variables)

E. Convergent validity

We can talk about a good convergent validity if AVE> 0.5 and this following Fornell and Larcker guidelines (1981) [12]. The results in Table.2 clearly confirm the good convergent validity of our measurement model. The rhô.D.G > 0.7 coefficient appears also significant for all the measurement model [11]

Table- IV:Quality index of measurement models

Variable latente	Average Variance Extracted (AVE)	D. G. Rhô
LSHP.WP	0,704	0,921
PLANN	0,892	0,954
SUPP	0,688	0,913
IMPROV	0,697	0,925
PERF.EV	0,800	0,950
ORG.C	0,728	0,893
OP	0,706	0,891
FIN.Rt	0,642	0.886
Wkrs.Rt	0,644	0,897

F. Divergent validity (descriminant)

According to the recommendations of Chin (2010) [14] the divergent validity is retained only if the items belonging to a single construct do not contribute significantly with the others constructs To assess the said validity, the square root of the average extracted variance (AVE) for each factor (Latent Variable) shall be compared with the correlation between the two-by-two factors. The results of Table N° 5 show that the square root of the AVE is greater than the correlations between the different dimensions of our model, the divergent validity is ensured.

This indicator is calculated as follows [12] :

$$AVE = \frac{\sum[\gamma_i^2]\mathrm{var}(VL)}{\sum[\gamma_i^2]\mathrm{var}(VL) + \sum[\mathrm{var}(\varepsilon_i)]}$$

With γ_i : factorial contributions of manifest variables associated with a Latent Variable (VL) ; var : Variance ; ε_i : Terms of errors related to each manifest variable; VL : Latent Variable

Table - V: The discriminating validity

	PLANN	SUPP	IMPROV	PERF.EV	ORG.C	OP	FIN.Rt	Wkrs.Rt	(AVE)
PLANN	**0,921***								0,892
SUPP	0,810	**0,821**							0,788
IMPROV	0,695	0,704	**0,803**						0,717
PERF.EV	0,786	0,669	0,798	**0,914**					0,876
ORG.C	0,590	0,605	0,618	0,720	**0,848**				0,739
OP	0.312	0.265	0.244	0.242	0.475	**0.979***			0.923
FIN.Rt	0,534	0,413	0,593	0,674	0,662	0.475	**0,813**		0,742
Wkrs.Rt	0,410	0,323	0,393	0,498	0,542	0.027	0,601	**0,703**	0,651

* The square root

VI. VALIDATION OF THE STRUCTURAL MODEL

The structural model defines the nature of the relationships existing between its latent variables. To test the validity of adjusting our internal model via the PLS algorithm, we will resort the following:
*

A. Goodness of Fit index (GoF)

This index takes into account both the performance of the structural model and that of the measurement model [15] [7] . It is defined by the geometric mean of the communities mean (or AVE) on the set of latent variables ($\bar{H}^2$) and the mean of the coefficients of determinations (R^2) associated with endogenous latent variables:($\bar{R}^2$) : GoF= ($\sqrt{\bar{H}^2 \times \bar{R}^2}$).

According to Wetzels et al. (2009) [16], the usual values of this index are 0.1, 0.25 and 0.36. They refer respectively to a small, medium and large adequacy of the model. Therefore, and following instructions of Wetzels et al. [16], and according to the obtained results (Table n°6), the search model can be retained based on the threshold (GoF> 0.5) ,and this, according to the instructions of Wetzels et al. (2009) [16]

* This confirms the validity of the structural model.

Table- VI: The discriminating validity

	GOF	GoF (Boot strap)	standard error	Critical Ratio (CR)
Absolute	0.658	0.631	0.038	17.321
Relative	0.852	0.810	0.034	23.653
external model	0.985	0.973	0.021	30.967
internal model	0.836	0.831	0.011	57.814

B. The coefficient of determination (R^2)

On the one hand, the usual values of R^2 are 0.67, 0.33 and 0.19. These are respectively considered as substantial, moderate and low [17]. On the other hand, the structural model is retained when R^2> 0.67 [17]. From what preceded, the results of R^2 and R^2-adjusted (Table N° 7) are substantial to moderate. In order to validate the structural model (internal), we will remove the link relative to the growth factor (EC) (R^2 <<<0.67).

Table- VII: R^2 and R^2 Adjusted Results

	LSHP.WP	PLANN	SUPP	IMPROV	PERF.EV	ORG.C	OP	FIN.Rt	Wkrs.Rt
R^2	-	0,846	0,868	0,883	0,901	0,818	0,875	0,843	0,713
R^2-Ajusted	-	0,846	0,868	0,883	0,901	0,818	0,875	0,843	0,713

C. Effect size f^2

This index allows us to check the validity and magnitude of structural coefficients.

$$f^2 = \frac{R^2\ incl - R^2\ excl}{1 - R^2\ incl}$$

According to (Cohen, 1988) [18] , the usual values of this index are of Effect size f^2 are 0.02, 0.15, and 0.35. They refer respectively to a weak, medium and strong effect . The results of Table 8 our survey clearly show the validity of the measurement model (external) and the validity of the structural model (internal).

D. Structural equations of the conceptual model

Our model holds a single exogenous variable which is the "Leadership" one and it contains eleven endogenous variables. Each endogenous variable is explained by one or more variables in addition to an error term.

The internal model is defined by linear equations connecting the latent variables with each other. For all endogenous ξk, we have $\xi_k = \sum_{i:\xi i \to \xi k} \beta_{kj} + \zeta_k$.

With β_{kj} representing the coefficient associated with the relation between the variables ξk and ξi. ζk is the error term and $\xi_i \to \xi_k$: ξi explains ζk in the model.

Our model is constituted of 8 equations that have been tested based on the PLS approach through the XL-STAT software. The structural equations of the conceptual model are as follows:

1) PLANN = 0.91703*LSHP.WP
2) SUPP = 0.89915*LSHP.WP
3) IMPROV = 0,87123*LSHP.WP
4) PERF.EV = 0,95051*LSHP.WP
5) ORG.C = 0.70807* LSHP.WP

6) OP=0,81110*LSHP.WP+0,67959*PLANN+0, 30811*SUPP+0,41137*IMPROV+ 0,70115* PERF.EV+ 0,21467*ORG.C

7) FIN.Rt =0,15765* OP

8) Wkrs.Rt = 0,57837* OP

VII. HYPOTHESIS TESTING

A global hypothesis will be tested: HG: "occupational health and safety practices positively impact the H&S performance (goals) of this worldwide enterprise". Thus, for each causal relationship, we have formulated a derived hypothesis and since we have 13 causal relationships, we have set up 13 hypotheses derived. These hypotheses will also be subjected to tests of confirmation.

Table - VIII: Research Hypothesis Tests

Causal relationship	Path Coefficient (β)	T* student	Effect size (f^2)	Pr > |t| (P-Value)	Validation the hypothesis
H1:LSHP.WP -> PLANN	0.917	19.598	4.302	0.000	Valid
H3:LSHP.WP -> ORG.C	0.899	14.427	3.972	0.000	Valid
H4:LSHP.WP -> IMPROV	0.708	12.509	0.221	0.000	Valid
H5:LSHP.WP -> PERF.EV	0,871	10,512	3,618	0.000	Valid
	0,950	10,246	4,875	0.000	Valid
H6: LSH ->OP	0,811	9,985	1,392	0.000	Valid
H7:PLANN ->OP	0,679	5,037	0,394	0.000	Valid
H8: SUPP ->OP	0,308	5,186	0,183	0.000	Valid
H9: ORG.C -> OP	0,214	2,056	0,121	0.000	Valid
H10:PERF.EV -> OP	0,701	6,237	0,571	0.000	Valid
H11:IMPROV ->OP	0,411	3,432	0,472	0.000	Valid
H12:OP ->FIN.Rt	0,157	5,302	0,074	0.000	Valid
H13:OP -> Wkrs.Rt	0,578	4,563	0,363	0.000	Valid

According to Table 8, we can confirm the validity of all assumptions about social responsibility practices and total performance (T> 1.96).

The final model can be represented as follows:

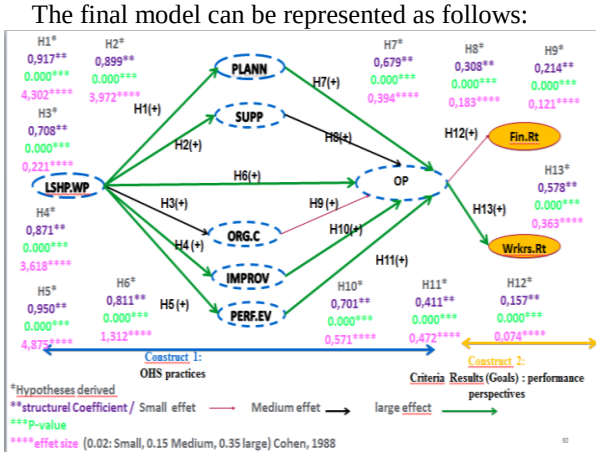

Fig. 4. Final model estimated by the PLS

VIII. RESULTS INTERPRETATION

The main objective of this empirical study is to test , on the one hand, the impact of some practices of the quality on the social responsibility performance factors .The results obtained via the structural equations and the XL-STAT software (Figure N°3 and Tables N°8) presented above, help us come up with the following recommendations:

- Leadership and worker participation, which is an exogenous latent variable, has statistically significant positive influence(s) hence demonstrating a very large impact on the latent variables "Planning", "support", and " Improvement " , and "operation "and "Performance evaluation" : ((β =0.917 t = 19.598, f^2 =4.302, p < 0.01) ; (β =0.899, t = 14.427, f^2 =3.972, p < 0.01) ; (β =0.871, t = 10.512, f^2 =3.618, p < 0.01)). ; (β =0,811, t = 9,985, f^2 =1,392, p < 0.01)). ; (β =0,950, t = 10,246, f^2 =4,875, p < 0.01)). On the other hand, the latent variable " Leadership and worker participation" indicate positive and statistically significant influences, with the presence of midium effects on "Organizational context", (β = 0.708, t = 12.509, f^2 = 0.221, p <0.01).
- The latent variables "Planning" ," support ", " Performance evaluation ", and " Improvement ", demonstrate positive and statistically significant influences, with the presence of a considerable number of good large effects on "Operation " : ((β = 0.679, t = 5.037, f^2 = 0.394, p <0.01), ((β = 0.308, t = 5.186, f^2 = 0.183, p <0.01), (β = 0.701, t = 6.237, f^2 = 0.571, p <0.01), (β = ((β = 0.411, t = 3.432, f^2 = 0.472, p <0.01) . On the other hand, the latent variable " Organizational context" indicate positive and statistically significant influences, with the presence of small effects on "Operation", (β = 0.214, t = 2.056, f^2 = 0.121, p <0.01).
- In the end, we notice that the latent variables "operation" has positive and statistically significant influences on the " Workers Results" and the " Consumer issues" with a large effects importance (β = 0.578, t = 4.563, f^2 = 0.363, p <0.01). and small effects on ' Finance Results", (β = 0.157, t = 5.302, f^2 = 0.074, p <0.01).

IX. DISCUSSION AND CONCLUSION

Our article tackles the issue of measuring the impact of health and safety practices (divided into 7 practices) on the H&S performance (divided into 2 perspectives) of a worldwide Electrical enterprise located in Casablanca, Kingdom of Morocco. The practices that are related to the used means show how the organization works, and whether the means help attain the desired results. We concluded that OHS practices generally have a positive impact on the Workers Results perspectives but an insignificant influence on the Finance Results perspectives. This kind of enterprises should seek to constantly improve, the occupational health and safety practices which exhibit the low and medium direct and indirect influences: "Leadership", "Support", "Operation", and "Organizational context."

Research has shown that excellent results are not achieved by result-based criteria, but by improved performance in criteria of means. This is why organizations are more aware of criteria of means than criteria of results.

Occupational health and safety is everyone's responsibility. If the process is to be successfully put into practice, the involvement of employees and their representatives becomes crucial. Their contribution is necessary both for the development of measures and for their effective implementation. Also important is the visible, continuous and proactive involvement of leadership at all management levels vis-à-vis occupational health and safety procedures.

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