Coping with Levels of Professional Competences Based on Simple Linear Regression Analysis

Tratamiento del nivel de competencias laborales desde la regresión lineal simple

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ABSTRACT

Aim: The purpose of this research is to explain the existing interrelation between the level of working competences and two main variable indicators of economic performance: salary and gross value added, through analysis of linear regression.
Methods: Simple linear regression was used. This study was conducted at the Bus Strategic Business Group, in TRANSTUR subsidiary, based in Santiago de Cuba, Cuba.
Results: The study examines this process and its repercussions on key indicators that regulate efficiency and efficacy of business management. The theoretical and methodological precepts that demonstrate the integrated, systemic and systematic nature of human talent were presented, according to the level of professional competences, the economic performance observed during the process, and performance within the organization, regardless of the time of analysis.
Conclusions: A new precedent has been established, which favors the implementation of theoretical, methodological, and practical actions that consolidate the efficacy of economic results.
Key words: competences; simple linear regression; salary; gross value added.

RESUMEN

Objetivo: Exponer la interrelación entre el nivel de competencias laborales, con dos indicadores fundamentales de las variables de conducta económica: los niveles de salario y el valor agregado bruto.

Métodos: Se utilizó la regresión lineal simple. Se desarrolló en la Unidad Estratégica de Negocios Grupo Ómnibus, de la Sucursal TRANSTUR S. A., Santiago de Cuba, Cuba.

Resultados: El estudio trata este proceso y su repercusión en indicadores claves que regulan la eficiencia y eficacia de la gestión empresarial. Se muestran los preceptos teóricos y metodológicos que, independientemente del período en que se realice el análisis, permiten demostrar la naturaleza integradora, sistémica y sistemática del talento humano desde su nivel de competencias laborales, la conducta económica lograda en este proceso y su comportamiento en el contexto organizacional.

Conclusiones: Se cuenta con un precedente que en el orden teórico, metodológico y práctico permite emprender acciones que consoliden la efectividad de los resultados económicos.

Palabras clave: competencias; regresión lineal simple; salario; valor agregado bruto.

INTRODUCTION

The transformations that took place in the late TWENTIETH Century, and throughout the Twenty-First, are significant. Nationally and internationally, an interrelation of computer systems, technological advances, and human talent management was produced at a faster pace, including all sorts of organization. The efficiency, efficacy, and effectiveness demanded in the Documents of the Seventh Congress of the Communist Party of Cuba (PCC, 2017, p. 7) are conceptualized as follows:

- Efficiency: The expression that measures the capacity of a system or economic actor to achieve certain objective with minimal resource use. In other words, it is the capacity of reaching a given goal through rational utilization of available resources, either material or not (time), meaning a minimum amount of resources available in the least possible time.

- Efficacy: It is the performance that qualifies the fulfillment of set goals, the capacity to achieve a desired or expected effect. Efficacy means reaching the set goal.

- Effectiveness: The quality of an action that meets the set goals when it is taken. Effectiveness is the combination of efficacy and efficiency; that is, the desired effect is accomplished using the lowest amount of resources, in the least time.

Then, the realization of effectiveness may lead to competitiveness. Following adaptation of Acevedo and Alfonso (2018), the author claims that it is the capacity to achieve and maintain a growing rate of goods with increased productivity, rational utilization of available resources, and the incorporation of novel technological processes with added qualified human talent that provides value to the final product. All this should be in keeping with established total quality standards that ensure satisfactory quality margins, liquidity, investment return, adequate environmental management, and consolidation of the social responsibility of entities. All that must promote the satisfaction of needs and expectations of employees and final customers, according to the demands of the national and international markets, and their survival within an ever-changing scenario, in which dynamism and turbulence are common features.

In both contexts, emphasis is placed on different entities, on the need to use new tools that theoretically and methodologically _in a simple way, though based on scientific research_ allow for a link of process functionality of work, people, resources, and time, which from a generic meaning consists in a transdisciplinary approach (it considers only the qualitative or quantitative analysis of indicators. They are a signal, a meaning or items, as referred to by Cuesta and Valencia (2014), that enable the evaluation of organizational performance, depending on a given level of competences); and

interdisciplinary (quantitative and qualitative), so these indicators are supported, considering that those competences express the economic conduct to follow, and also have a repercussion that ensures expected efficiency and efficacy levels.

"Salary, generally, always has variations. However, in its structure, two integrated elements are distinguished: one relatively stable, and another relatively variable or additional." (González, 1985, p. 25).

This economic behavior is then a referent mainly given by the versatile behavior of the economic indicators of each entity, which in general terms, offer these: income, expenditures, profit, gross value added (GVA), labor productivity, salary, human efficiency coefficient (mean salary-productivity correlation or dynamic of mean-salary-productivity), salary expenditure per GVA peso, and others. It corresponds to the mission, objectives, and strategies oriented to ever-increasing customer satisfaction. Only then, the new challenges posed in this direction will be faced and overcome.

In that sense, having a professionally capable staff; that is, the horizon from which they are identified, developed, standardized, and evaluated in their jobs, is critical to reach satisfactory results in any activity in which entities are involved today, in the short, mid, and long-terms. It makes a broader, flexible, and reliable scope possible to offer arguments about the outcome; such is the case of the current study.

Hence, the rationale of this paper is found in the above-mentioned referents, associated with the process of alignment of work competences to work organization (Bermejo, 2015), in order to explain the existing relation between the level of work competences and two fundamental indicators of economic behavior variables: salary levels and GVA, using simple linear regression. The study took place at the Strategic Business Group of TRANSTUR Ltd. Buses, Santiago de Cuba branch.

DEVELOPMENT

Theoretical and methodological precepts to deal with the level of competence

In this research, the implementation of the simple linear regression technique is explained to address work competences, as a factor that consolidates and grants

scientific foundation to the process of work competence alignment with work organization. Two important indicators are used: salary levels and GVA. Linear regression is a parametric technique used to predict continuous dependent variables, given by a set of independent variables (Alles, 2013).

This technique measures the existing relationships among previous categories in any period of time.

It stems from a theoretical and methodological basis through the following steps:

1. To determine the score of work competences.

- The elements of competences for the job chosen are gathered with the implementation of functional analysis.
- The expert committee sets the specific weight by order of importance of each competence element within a 0-1 range of evaluation, where the sum of specific weights is 1. If 0, it is the lowest value limit of the evaluation range; hence, the closer it is to 0, the lower weight and importance the indicator will have. If the weight is 0, it should be disregarded, because it is unimportant. Therefore, establishing this range to determine the specific weight is something that is generally used, and it creates no controversy with the scale proposed to evaluate the level of each competence element. It will never be given 0 because this value is excluded. From an econometric point of view, the level or work competences (LWC) could assume 0 at the point where the straight line of linear regression intercepts the axis, and for a given salary level and GVA (values assigned to the constant of the model, Bo). Brainstorming is used to create consensus on the scale, so the application of Kendall's non-parametric test is considered unnecessary to seek agreement among experts (Table 1).
- The level of work competences of employees and the organizational unit is evaluated, through a 1-10 scale, as follows:

Scale

[9 - 10]: Complete satisfaction of LWC [7 - 8): Most satisfaction of LWC.

[5 - 6): Partial satisfaction of LWC [3 - 4): Minimal satisfaction of LWC.

[1-2): No satisfaction of LWC.

- The LWC score is recorded monthly for the periods evaluated.
- To measure the LWC, Microsoft EXCEL 16.0 is used.

2. The real monthly behaviors of the salary paid to all the employees or a sample of them, as well as the GVA produced during the period evaluated, and the level of work competences are recorded (Table 2).

3. Simple linear regression is applied for data processing.

4. The levels of LWC-Salary and LWC-GVA relations are defined.

Table 1. Weight determination by the expert committee to evaluate the level of work competences (LWC)

LWC (Elements of work competence).	Specific weight by order of importance.
1. Can drive the bus skillfully and safely.	0.16
2. Sets priorities in task planning.	0.15
3. Checks the technical status of the bus, delivers reliable reports on mechanical issues.	0.13
4. Performs all programed services with efficacy.	0.11
5. Assists customers promptly and ensures safety and integrity.	0.10
6. Takes psychophysiological re-qualifying exams efficiently.	0.09
7. Keeps and protects the hygiene inside and outside the bus systematically.	0.08
8. Maintains proper manners in keeping with the work functions.	0.07
9. Demonstrates proficiency of foreign language when in direct, clear, brief, and concrete communication with customers.	0.06
10. Organizes and updates the required documents without violations.	0.05
Total sum of specific weight.	1.00

Scale: 0-1 (in ascending order, the order of importance of competence elements are assumed; they are used for evaluation of the LWC by driver, and as a whole, for the organizational unit GO, in the period evaluated.

Table 2. Real informative basis of LWC, salary, and gross added value

Season	Month	LWC/2017 Unit	LWC/2018 Unit	Salary/ 2017 MP	Salary/ 2018 MP	GVA/ 2017 MP	GVA/ 2018 MP
High	January	1 008.18	778.43	36.51	36.25	415.78	473.75
High	February	1 114.80	1 119.84	38.20	40.80	708.29	680.49
High	March	939.03	1 003.56	30.79	41.26	602.82	588.33
High	April	1 635.21	1 974.07	40.77	49.96	787.77	661.77

Low	May	1 908.84	2 437.67	43.88	66.59	858.15	782.85
Low	June	1 551.73	1 814.78	39.64	52.75	794.80	613.53
High	July	938.59	1 033.81	33.02	41.99	583.51	593.98
High	August	1 111.88	1 049.95	37.25	46.50	738.15	620.56
Low	September	1 173.06	1 615.96	38.37	55.20	772.41	648.67
Low	October	1 697.73	1 773.62	41.85	72.27	801.36	695.60
High	November	843.85	850.19	30.24	44.28	614.01	389.22
High	December	730.26	921.06	29.85	47.80	553.50	562.75
///////////	//////////	////////////	//////////	440.37	595.65	8 230.55	7 311.50

Simple linear regression

The objective of simple linear regression analysis (Montgomery, 2006) is to estimate the functional relation that exists between an explained variable (dependent) and an explicative variable (independent). This model has four main stages or methodological steps: I) identification; II) primary information; III) verification; and IV) forecast,[1] which extends to the verification of the corresponding assumption of regression.

Stage I. Identification

Building the function of the response is based on a dispersion graph with two linear functions having the following variables:

Independent variable: level of work competences.

Dependent variables: salary and gross value added.

The general econometric statement is the following:

Dependent variable:

Y_i - observation i of the behavior of salary and gross added value, in thousands of pesos, which are determined from historical values of the organizational unit.

Independent variable:

X_{1i} - observation i of the level of competence score, which is within the organizational unit.

Parameters:

β_0 - Function constant representing salary of gross added value when the independent variable is 0.

β_1 - Coefficient associated to salary or gross added value representing independent variable LWC by variation unit of the dependent variable.

ϵ – stochastic disturbance representing a substitutive variable of all the variable omitted which might affect Y_i.

The starting point is given by two response functions or models of simple linear regression, which are shown below:

Linear I: $Y = \beta_0 + \beta_1 X_1 + \epsilon$

Linear II: $Y_2 \beta_0 + \beta_2 X_1 + \epsilon$

Stage II. Primary information and estimation

To determine the parameters or coefficients in the response functions, the ordinary minimal square method is used, which guarantees that the sum of squares of the residues is minimal. This minimum variance method, and the compliance or not of the assumptions, which are stated in the theorem of Gauss-Markov.

It starts from a representative sample of the population, which must comply with the assumptions verified through corresponding hypothesis tests.

To calculate the optimal response function, SPSS, 22.0 was used.

Stage III. Verification of statistical inference

It refers to confirming the estimation made through hypothesis tests, verifying if the sample comes from the population in which the phenomenon is described. In this case, compliance of the assumptions is expressed through classical models.

The following is verified:

- If the R^2 coefficient is within the following interval: $0.6 \leq R^2 \leq 1$
- If the model used corresponds to the phenomenon studied.
- To check if there is a relation between the dependent and independent variables, the F test is performed.
- The T-student test is made to verify the possible relation between the independent variables to the dependent variable.
- Lastly, homoscedasticity, independence, and error normality, are verified.

An action program is designed and implemented.

I. Practical results achieved

Below are the results achieved in the context studied:

a) Ratio between alignment measurement of competences and salary and GVA.

The results and interpretation of how this ratio can be measured in the Bus Group are shown.

To illustrate the previous, one of the best years (2018) in that category was chosen.

Interpretation of results

Between LWC and salary

R^2 (determination coefficient) = 0.634 It is the proportion of explained variability by LWC in terms of salary.

Typical error of estimation = 6.774, in 6.774 thousand pesos, on average, the estimated values of salary are deviated from their real values.

Considering the variance analysis (ANOVA) table, the following set of hypotheses can be stated:

H_0: $B_1 = 0$

H_1: $B_1 \neq 0$

As shown, the sum of regression squares is above the sum of residue squares, which tells of the good fit of the model. Accordingly, the existence of low significance is demonstrated, which in turn, is below the preset alpha level, based on sufficient empirical evidence to refuse the hypothesis of nullity. Hence, LWC contributes with high significance to the model; the model's fit is good.

Formed model (non-standardized coefficients)

$$\hat{Y}_i = 27.802 + 0.016 X_i + e_i$$

β_0=27.802 When the level of work competences is 0, salary has a value of 27.802 thousand pesos in TRANSTUR Ltd., Santiago de Cuba subsidiary.

β_1=0.016 For every additional score of LWC, salary varies accordingly, in 0.016 thousands of pesos.

Individual analysis of non-standardized coefficients

H_0: $\beta_0 = 0$

H_1: $\beta_0 \neq 0$

As the coefficient significance (0.000) is below the preset alpha level (0.05), it indicates that there is enough empirical evidence to refuse the hypothesis of nullity (H_0), and accept the alternative hypothesis (H_1), which indicates that at the population level, β_0, would be significantly different from 0.

Between LWC and GVA

R^2 (determination coefficient) = 0.60 is the variability proportion explained by LWC and GVA.

Typical error of estimation = 68.36: in 68.36 thousands of pesos, on average, the estimated values of GVA are deviated from their real values.

Considering the variance analysis (ANOVA) table, the following set of hypotheses can be stated:

H0: B1 = 0

H1: B1 ≠ 0

As significance is below 0.05, there is sufficient empirical evidence to refuse the hypothesis of nullity (H_0), so independent variable LWC contributes with high significance to the model.

Formed model (non-standardized coefficients)

$$\hat{Y}_i = 406.211 + 0.149X_i + e_i$$

$\hat{\beta}_o = 406.211$: When the level of work competences is 0, the gross added value takes 406.211 thousand pesos.

$\hat{\beta}_1 = 0.149$: For every additional score of LWC, GVA varies in the same sense, in 0.149 thousands of pesos.

Individual analysis of non-standardized coefficients

H0: β_0 = 0

H1: $\beta_0 \neq 0$

As the coefficient significance (0.000) is below the preset alpha level (0.05), it indicates that there is enough empirical evidence to refuse the hypothesis of nullity (H_0), which indicates that at the population level, β_0, would be significantly different from 0.

H0: $\beta_1 = 0$

H1: $\beta_1 \neq 0$

As the coefficient significance (0.000) is below the preset alpha level (0.05), it indicates that there is enough empirical evidence to refuse the hypothesis of nullity (H_0), which indicates that at the population level, β_1, would be significantly different from 0.

This analysis leads to the conclusion that the application of simple linear regression helped identify the direct relation of LWC, salary, and GVA with the model stated.

Use these results as referents to establish a relation between them and the behavior of the human efficiency behavior coefficient, and to verify how the significance of the coefficient (0.000) is below the preset alpha level (0.05), which indicates the existence of sufficient empirical evidence to refuse the hypothesis of nullity (H_0), and accept another alternative. As a result, independent variable LWC contributes significantly to the model. The higher the LWC, the higher the salary increase, and the gross value that each employee adds to the services offered.

CONCLUSIONS

The application of simple linear regression offers a statistical tool that provides a more scientific analysis of the real outcome of variable analysis.

Quantitatively and qualitatively, the existing trans- and inter- disciplinary character between work competences and salary, and between that level of work competences and the gross value added, which leads to an improved process of human talent management in the organizational unit and the jobs chosen for the study in the transportation branch, is demonstrated.

The results demonstrate the establishment of a new theoretical, methodological, and practical precedent that allows for actions that consolidate the efficacy of economic results.

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Conflicts of interest and conflict of ethics statement

The author declares that this is an original article, and it has not been submitted for publication to any journal. It is part of her PhD thesis, and, in that sense, she assumes all responsibilities for the published material whatsoever, so it poses no conflicts between the author and the entity studied.

NOTES

[1]The fourth stage is mentioned, but not explained, because the aims of this study were adjusted up to the third stage. No associate values to the level of competence are reported