Structural model of university social responsibility

Modelo estructural de responsabilidad social universitaria

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ABSTRACT

The study aims to analyze the University Social Responsibility (USR) policy implemented at the Michoacan State University (*Universidad Michoacana de San Nicolás de Hidalgo - UMSNH*) from the perspective of the university community. For that purpose, a Structural Equations Model in its variant of Partial Least Squares (PLS) was used from a theoretical/empirical construct on the USR. Five variables integrated into 17 indicators were used, obtained by a representative sample. The results are presented in two sections; a) USR performance at the *UMSNH* and; b) the role of each variable in the PLS model. It is concluded that the performance was regular and the Internal Management (IM) had a key impact on the model operation. In the management practice, this might help identify areas to improve the performance of this policy by sector and variables.

Keywords: University Social Responsibility. Sustainable Development. USR Institutional Performance. Partial Least Square.

RESUMEN

El objetivo del estudio fue analizar la política de Responsabilidad Social Universitaria (RSU) implementada en la Universidad Michoacana de San Nicolás de Hidalgo (UMSNH) desde la perspectiva de la comunidad universitaria. Para ello se empleó un Modelo Estructural de Mínimos Cuadrados Parciales (PLS) a partir de un constructo teórico/empírico sobre la RSU. Se emplearon cinco variables integradas en 17 indicadores, obteniendo la información mediante una encuesta a una muestra representativa. Los resultados se presentan en dos apartados: a) descripción sobre el desempeño de la RSU en la UMSNH y; b) rol de cada variable en el modelo PLS. Se concluye que el desempeño de la RSU fue regular y que la Gestión Organizacional (GO) tuvo un impacto clave en el funcionamiento del modelo. En la practica administrativa, esto podría ayudar a identificar áreas de oportunidad para mejorar el desempeño de esta política por sectores y variables.

Palabras clave: Responsabilidad Social Universitaria. Desarrollo Sustentable. Desempeño Institucional. Partial Least Square. Universidad Michoacana de San Nicolás de Hidalgo.

1 INTRODUCTION

The University Social Responsibility (USR) has been established as a comprehensive management policy. It highlights internal processes and promotes good practices to respond to organizational and socio-environmental impacts of the university. It is distinct from the traditional solidarity extension as a unilateral declaratory commitment, compelling each university to put its epistemic assumptions and hidden curriculum under consideration (VALLAEYS, 2007).

Located in Michoacan, Mexico, the *Universidad Michoacana de San Nicolás de Hidalgo* (*UMSNH*) began, in 2007, an environmental management model called Institutional Environmental Plan. In 2014 it formally established the concept of the USR, as a result of a postgraduate course lead by Dr François Vallaeys, in which continuous improvement lines, USR program activities and permanent training plans were established (LÓPEZ, M. T. V.; LÓPEZ, M. V., 2016, p. 3).

It is assumed the possibility USR policy impacts differently on each university actor but might show a general trend. Structural analysis can reveal the impact of variables and by university sectors in the performance of the USR policy. The aims of this study are: 1) quantify the performance of the USR, by sectors and as a whole, and 2) analyze the impact by variables. For this purpose, a Partial Least Squares (PLS) analysis was performed. The proposed variables were: Environmental Resource Management (ERM), Internal Management (IM), Social Responsibility Training (SRT), University Social Projection (USP) and; Knowledge Production and Management (KPM).

To accomplish the objectives, the present article is integrated into five sections. The first one examines the concept of the USR and sustainable development, followed by the USR background in the *UMSNH*. In the third section, the information-gathering techniques and instruments used are explained. Then, in the fourth section, the results were presented, and finally, the conclusions are highlighted.

2 SUSTAINABLE DEVELOPMENT AND THE USR

Sustainable development has been a point of reference for social aspirations and it is generally a fundamental part of development policy discourses. However, the environmental crisis continues to move forward and the strategies to restrain it have been insufficient. The USR proposes to go beyond the attention to the negative environmental impacts and collates with sustainable development. This section presents theoretical literature and case studies. It begins with a description of the socio-environmental crisis and reflects critically on the scope of the USR.

The current socio-environmental crisis has been the result of social, political and economic interactions of capitalism that have accelerated the trends of ecological degradation and social conflicts over natural resources, as well as causing an increase in poverty, ignorance and injustice, which represents a threat to world prosperousness, security and stability, increasing social conflicts in different areas. Public and private actions have been towards disengagement between the practice of ecological policy and socio-environmental accounting (EARTH CHARTER, 2000; FOLADORI; TALKS, 2001; MARTÍNEZ, 2008; MURGA-MENOYO, 2009; QUINCHÉ-MARTÍN; CABRERA-NARVÁEZ, 2020; TOMMASINO, LEFF, 2002).

Some of the approaches to the socio-environmental crisis, propose paradigm shifts towards environmental rationality (LEFF, 2002). Meanwhile, the USR responds to this crisis from universities as active actors with a key role in development due to the presence and impacts on the stakeholders (VALLAEYS; CARRIZO, 2006). Thus, it is proposed that the university should continuously improve the organizational structure, being part of a transparency system, under the scheme that education and public awareness are key to leading society to achieve sustainability (CHIRINOS; PÉREZ, 2016; FUENTES; VALLAEYS; CASTRILLÓN, 2018; MCKEOWN et al., 2002). However, the university organizational structures are mostly too rigid to undertake profound changes both in the short and medium terms.

The criteria used for the USR management has considered three levels: 1) internal, (students, professors, researchers, authorities and administrative staff); 2) external, (employers, graduate students, suppliers and direct strategic partners) and, 3) global environment, (trends and general interactions) (GASCA; OLVERA, 2011). Thus, the USR and sustainable development promote a university projection that considers dissemination criteria, practice, principles and values in management, teaching, research and extension, reexamining its actions in a new social, ethical, democratic, equitable, transparent, helpful and self-organizing project (ESCUTIA; MEJÍA, 2011; NÚÑEZ, 2013; VALLAEYS, 2013; VALLAEYS; CARRIZO, 2005), assumed as Social Responsibility Training.

Hense, the responsible management of environmental resources is key, under the challenge of mainstreaming the curricular content of the courses and the pedagogical guidelines for the university community. Which was demonstrated in academic training, fostering changes in socially responsible behaviour in students being consciously manifested in emotional, cognitive and empathic processes, concerned and capable of taking the perspective of others (ARANGO et al., 2014). In this sense, the University promotes the education of public awareness, and an indisputable moral and existential commitment in the promotion of sustainable development, beginning with the encouragement of justice, freedom and social equality based on its substantive functions.

Some cases stand out such as, the Universidad de Francisco de Vitoria (Spain) which has incorporated a social responsibility subject into the study program since 1993, showing a significant impact from the students, concerning the social commitment towards others, the environment and the professional practice (RAMOS et al., 2016). In Perú, a study among 18 universities shows that the influence of the USR on the organizational culture, at the moment, has had little impact, which may be due to the lack of the USR program's transversality. However, the variables: teaching-learning, research, technological development and innovation, do show incidence (LIMO; PEÑA, 2019). The challenges range from changes in focus towards the learner, (which questions the common practice), to the teaching practice itself and the motivation in training and the transference of values, highly correlated with the motivation and demoralization of professors (IZARRA, 2019; YURÉN; GARCÍA; BRISEÑO, 2019).

At the Universidad de León in Spain, the impacts of university students and their satisfaction regarding the USR were analyzed. Using a Partial Least Squares (PLS) model, with 46 items in four variables, it was found that students can differentiate the facets of the USR, but only the Internal Management (IM) affected the general perception of the USR. Meanwhile, the global perception of the USR was also a determining factor in students' satisfaction (VÁZQUEZ; AZA; LANERO, 2016).

Thus, higher education institutions play a fundamental role in influencing society through their own human resource training strategies. In Brazil, entrepreneurial culture and student satisfaction are related in a positive and highly significant manner to the USR, using 11 indicators for student satisfaction, seven for entrepreneurial culture and 26 for the USR, through PLS analysis (SÁNCHEZ-HERNÁNDEZ; MAINARDES, 2016).

From the overhaul made, some reflections can be extracted:

I. Universities play a prominent role in influencing the solution of the current socio-environmental crisis. However, the scope is still limited related to circles of influence, generally young adults, less in childhood, adolescence and trained professionals. Therefore, the USR should also recommend a greater spectrum of action and social scope.

II. The universities' organizational structures are generally rigid and with little possibility of responding to social changes in the short term. Although the USR has been gradually positioned, it is not the rule but the exception.

III. Under this context, the USR proposes changes in behaviour that range from the continuous questioning of habits in the socio-environmental impact to the capitalist logic of seeking alternatives and new paradigms. However, the universities' own internal socio-political dynamics, make it difficult to internalize the USR and/or different policies that recommend changes, which operate when the external environment and favourable internal circumstances continually excerpt pressure.

IV. It is important to think over the need to overcome committed volunteering towards more mandatory schemes, as is already recommended for Social Responsibility Management. The implementation of legal frameworks and public policies capable of orienting markets towards responsible production and consumption, which do not systematically cause negative impacts, go through the law first before goodwill. Rather than a mandatory scheme, a global economic reorientation should be made, with commitments to sustainability (VALLAEYS, 2020).

Finally, some incidental elements in the USR can be highlighted: 1) Environmental Resource Management (ERM); 2) Internal Management (IM); 3) Social Responsibility Training (SRT); University Social Projection (USP) and Knowledge Production and Management (KPM) for the USR. After five years of having implemented the USR in the *UMSNH*, the proposed hypothesis is that through a PLS structural model, the interaction between variables and actors could be identified, so that the indicators that most influenced the implementation of the *Nicolaita* USR could be known.

3 BACKGROUNDS - THE USR IN THE UMSNH

In the actions taken by the *UMSNH's* environmental management agenda, these stand out: 1) electrical waste management since 2012, (*Recoelectrón*); 2) ecological footprint analysis in the *UMSNH,* as an environmental education mechanism; 3) USR actor training Diploma course is offered, being the professors a key part in all substantive activities (PÉREZ; VALLAEYS, 2016). Additionally, the *UMSNH* has participated with: 1) the Regional Observatory of Social Responsibility in Latin America and the Caribbean (*ORSALC-UNESCO*); 2) the founding of the Mexican Observatory of University Social Responsibility *(OMERSU);* 3) Venue of the First Meeting of Social Responsibility in Mexican Universities (GARCÍA, E. S.; GARCÍA, R. F., 2014); 4) in 2016 it formalized the First Committee for Regional Development and Social Responsibility of the Central West Region of *ANUIES* and; 5) in 2017, the UMSNH hosted the Second USR International Forum (GARCÍA; AGUILAR, 2017).

4 MATERIALS AND METHODS

The population under study was the UMSNH, 2017 from the registration in the official database, a sample of the following 26 university faculties was obtained; School of Medicine, Dentistry, Pharmacology, Psychology, History, Literature, Law, Fine Arts, Economics, Accounting, Veterinary Medicine, Civil Engineering, Philosophy, Mechanical Engineering, Chemical Engineering, Electrical Engineering, Wood Technology Engineering, Architecture, Biology, Physical Mathematics, Nursing; Institutes of Mechanical Engineering, Natural Resources Research and Agricultural and Forestry Research.

The studied sectors were: authorities, academics, administrative staff and students enrolled in 2017. The sample was obtained from the database provided by the UMSNH Human Resources Department and the Student Services Department. The sample size was obtained from the formula, n = (Z ^ 2 pqN) / ((NE) ^ 2 + Z ^ 2 pq) (Table 1), (values for the sample, Z = 1.96; p = 0.5; q = 0.5; E = 0.05). As the effective sample, it consists of the number of interviews obtained, which maintain an acceptable level of significance and representativeness.

Table 1 | Universe, population and study sample

Universes	*Population*	*Minimum sample size*	*Effective simple*	*Value of Z*
Authorities	130	26	16	12% from total*
Professors	2,445	332	226	1.60
Students	36,121	380	383	1.96
Administrative staff	799	259	205	1.65
Total population	39,495	991	705	

**For small populations, a sample slightly greater than 10% of the population was obtained.*
Source: Own elaboration based on the UMSNH Human Resource Department and the Student Services Department, 2017.

4.1 VARIABLES AND SURVEY DESIGN

From the study and the analysis of the USR variables and indicators used in other studies (ARANGO *et al*., 2014; AUSJAL, 2009; CANTÚ, 2013; GASCA; OLVERA, 2011; IESALC, 2008; IZARRA, 2019; LIMO; PEÑA; 2019; RAMOS *et al*., 2016; VALLAEYS; CARRIZO, 2006), the USR at the UMSNH, comprises five areas: environmental, organizational, educational, social and knowledge. The variables used were: Environmental Resource Management (ERM) (four indicators); Internal Management (IM) (four indicators); Knowledge Production and Management (KPM) (three indicators); Social Responsibility Training (SRT) (four indicators) and University Social Projection (USP) (two indicators) (Table 2).

For data collection, a personal interview questionnaire was used and the design established for the final version of the measurement instrument was integrated into three sections: 1) folio number, the universe and the research name; 2) respondents' profile, varying according to the universe and 3) variables, indicators, their respective items and the measuring scale by intervals (Likert-type scale).

To estimate the questionnaire's reliability, Cronbach's alpha coefficient (***α***) was used, showing consistency for the four measurement instruments in the pilot test. The results of ***α*** were: excellent in professors (0.943), administrative staff (0.915) and students (0.927); and acceptable in authorities (0.782) (BOJÓRQUEZ *et al*., 2013; GONZÁLEZ; PAZMIÑO, 2015). Once the instrument was verified, the data was obtained by applying face-to-face interviews by sectors: authorities, professors, administrative staff and students, with a response time between 10 and 15 minutes.

4.2 PARTIAL LEAST SQUARES USE (PLS) TECHNIQUE

The research was supported by the Structural Equation Modeling (SEM) that allows multiple regressions between latent variables (BARROSO; CEPEDA; ROLDÁN, 2005). To develop the methodological process of the tools' conditions and applicability for multivariate analysis (LÉVY; VARELA, 2003), it was decided to use the PLS modelling which is more appropriate for the prediction of the variables, high complexity and theory development (exploratory analysis) (CHIN, 2010). The variance of the dependent variables explained by the independent variables is maximized, instead of reproducing the empirical covariance matrix (HAENLEIN; KAPLAN, 2004). Furthermore, since the focus estimates the latent variables as linear combinations of the measurements.

These models identify how internal and external factors affect the analyzed variables, considering the way these variables could be interrelated. The PLS assumes that each construct plays the role of a theoretical concept represented by indicators, and the relationships between constructs must be established taking into account the prior knowledge (theory) of the phenomenon under analysis (LOEHLIN, 1987). The PLS is based on an iterative algorithm and the parameters are calculated by Least Squares regressions. The term Partial is due to the iterative procedure that involves separating the parameters instead of estimating them simultaneously (BATISTA-FOGUET; COENDERS, 2000; HAENLEIN; KAPLAN, 2004; ROLDÁN; SÁNCHEZ-FRANCO, 2012).

With the obtained results, a model is built that allows us to see the interrelationships between the USR variable, focusing on maximizing the variance. The results identify the factors that most impact each of the indices, thereby supporting the decision taken by knowing the impact by variable.

4.3 LATENT AND OBSERVED VARIABLES

One of the most relevant concepts for SEM is latent variables. These are not directly observable or measured by a generally accepted instrument (SCHUMACKER; LOMAX, 2004). Latent variables are constituted of manifest variables, observed variables or indicators. In the PLS Path Modeling, the latent variables will be obtained as a linear combination of the observed group variables (indicators) (LOEHLIN, 1987). It is assumed that any measurement will be imperfect, as shown (HAENLEIN; KAPLAN, 2004), each observation in the real world comes with a measurement error compound by two parts: (a) random error (caused by the order of the items in a survey or by the respondent bias); and (b) systematic error, due to the variance. Therefore, the observed value of an item is constituted by: 1) the variable's true value; 2) the random error and, 3) the systematic error.

The PLS provides a framework for analyzing multiple relationships between constructs. It is assumed that each construct plays the role of a theoretical concept represented by its indicators, and the relationships between constructs must be established taking into account the prior knowledge (theory) of the phenomenon under analysis. In summary, the PLS can be a powerful tool due to the minimum demands of measurement scales, sample size, and residual distributions (CHIN, 2010). To develop the methodological process, the following survey was developed based on the variables, see Table 2.

The results obtained from the indicators were incorporated by dimension in the PLS smart 3.0 software, grouping by dimensions and variables. Then, a form of relationship between variables is suggested, generating the latent variables based on the expected relationship between them. The following step is to run the interaction in the proposed relationship, the application makes the calculations until it reaches the variable convergence or stability. After several tests, the statistical consistency indicates the model reliability and the interpretation capacity in the integrated variables modelling by the groups of indicators.

Table 2 | Variables Operationalization

Variables	*Dimensions*	*Indicators*	*Clave*
Environmental Resource Management (ERM)	Ecosystem Protection	Institutional Environmental Plan (EPI) Knowledge	PE
		Green areas sufficiency	PE2
		Green areas protection and carefulness	PE3
	Waste Management	Recycling bin for solid waste separation	MRA1
		Solid waste sorting knowledge	MRA2
		Solid waste correct disposal	MRA3
	Energy Use	Efficient use of energy	UE1
		Energy generation	UE2
	Water Treatment and Care	Efficiency in the water use	TCA1
		Water care	TCA2
	Influence in Ecological Behaviors	Paper sheets reuse	ICE1
		Ecological footprint knowledge	ICE2
		Low impact mobility promotion	ICE3
		Disposable reduction	ICE4
		Influence of the EPI on ecological habits	ICE5
		Efficient use of water	ICE6
Internal Management (IM)	Nicolaita Identity	Attention to vulnerable population	IN1
		The practice of the principle of humanism	IN2
	Work Environment	Study environment	AL1
		Regarding diversity	AL2
	Remuneration and Training	Perception of equity	RC1
		Perception regarding salary/remuneration	RC2
		USR training	RC3
	Participation and Democracy	Democratic values perception	PD1
		Gender equality	PD2
Social Responsibility Training (SRT)	USR Training	Environmental content	CRS1
		Contingency strategies training	CRS2
	Multidisciplinary Training	Social project training	FM1
	Interinstitutional Training	Inclusion in university projects	FI1
		Project participation with other universities	FI2
	Critical Reflection Training	Social problems awareness	FR1
		Profession role in society	FR2
		Perception of accomplishment	FR3
University Social Projections (USP)	Extension	Link with environmental causes	EX1
		Participation in environmental causes	EX2
	Academic Linkage	Links with deprived sectors of society	VN1
		University job bank	VN2
Knowledge Production and Management (KPM)	Socially Useful and Relevant Research	The research applied to vulnerable social groups	IP1
		General research linkage	IP2
	Multidisciplinary Knowledge	Development projects with other sectors	CM1
		Student/professors participation in research	CM2
	Sustainability Knowledge	Self-knowledge promotion	CS1
		The research applied to improve USR	CS2

Source: Information obtained from the theoretical framework.

5 RESULTS

5.1 NICOLAITA USR PERFORMANCE

The USR performance in the *UMSNH*, on a scale with a maximum of 5.0, for authorities was 3.57, for professors 3.25 and very close to 3.0 for both administrative staff and students. The average indicates regular performance. The IM shows the best performance (3.6) and the lowest variance (0.022), while the lowest performance was for SRT and USP, both with a value of 3.0. (Table 3). Table 4 shows the global performance by sectors of the parametric statistics where the central tendency and distribution measures can be observed, finding the highest performance for AUT and the lowest for AS, very close to ST, as well as the highest variance among the professors' sector (PF).

Table 3 | USR-UMSNH Average Performance

	Administrative Staff (AS)	*Professors (PF)*	*Authorities (AUT)*	*Students (ST)*	*Average***	*Variance*
ERM	2.99	3.02	3.35	3.08	3.111	0.027
IM	3.54	3.66	3.84	3.52	3.641	0.022
SRT	2.78	3.07	3.14	3.05	3.012	0.026
USP	2.90	3.20	3.63	2.59	3.077	0.197
KPM	3.14	3.30	3.89	2.99	3.328	0.154
*Average**	3.07	3.25	3.57	3.04		
Variance	0.088	0.064	0.102	0.110		

** Average by sectors (groups) from the averages per variable.*
***Average per variable based on averages by sector.*
Source: Own elaboration with field data.

Table 4 | Descriptive statistics for the global average performance of USR

	AS	*AUT*	*PF*	*ST*
*Media**	3.089	3.545	3.225	3.128
Typical error	0.042	0.094	0.044	0.032
Median	3.073	3.586	3.214	3.150
Mode	2.805	3.857	3.238	3.125
Standard deviation	0.605	0.374	0.656	0.624
Sample variance	0.366	0.140	0.430	0.390
Kurtosis	-0.367	1.802	-0.665	-0.153
Asymmetry coefficient	0.179	-1.254	0.090	-0.156
Range	2.951	1.429	2.857	3.625
Minimum	1.83	2.57	1.86	1.30
Maximum	4.78	4.00	4.71	4.93
Sum	633.27	56.71	728.93	1198.18
Observation (n)	205	16	226	383

** Average from the concentrated information*
Source: Own elaboration with field data.

5.2 PLS-SEM MODEL FOR THE NICOLAITA USR PERFORMANCE

A three-step process was followed for the PLS use: 1) the weights of the relationships, which link the indicators to their respective latent variables and are estimated; 2) the case values are calculated for each latent variable based on the indicators weighted average; 3) these case values are used in a group of regression equations to determine the parameters of the path or structural coefficients (HAENLEIN; KAPLAN, 2004). The algorithm returns to the relations of the measurement model where new weights (outer weights) are calculated and the process continues iteratively until the convergence of the weights is reached. See Figure 1.

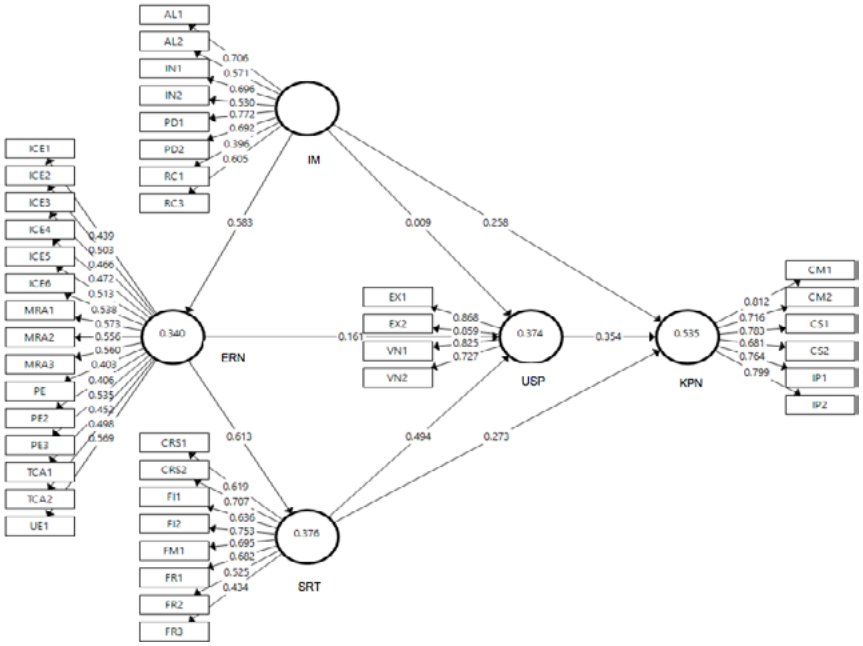

Figure 1 | UMSNH University Social Responsibility Structural Model

Source: Personal elaboration in Smart PLS, V. 3.0, based on field information.

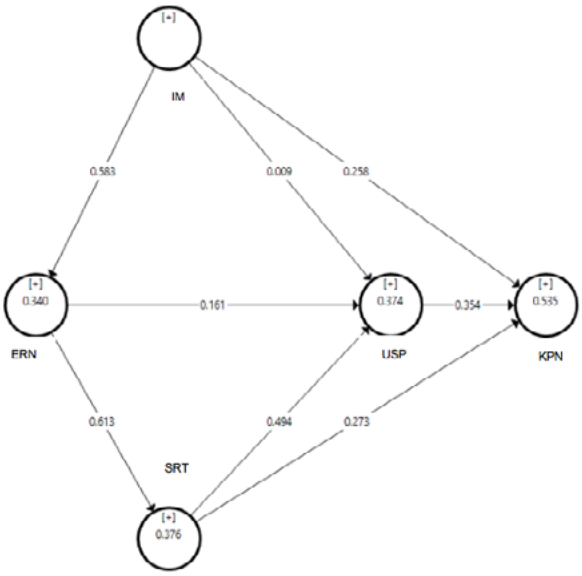

Figure 2 | University Social Responsibility Variables Model

Source: Personal elaboration in Smart PLS, V. 3.0, based on field information.

In Figure 1, the structural model is seen in graphic form and represents the relationships between constructs that are hypothesized in the proposed model. To analyze the structural model with PLS a recursive model is needed, meanings that loops are not allowed in structural relationships. Because the primary objective of the PLS is prediction, the accuracy of the model is evaluated by two main indices: the coefficients of the structural paths and the combined predictivity (R^2) of the endogenous constructs (CHIN, 2010). (DUARTE; RAPOSO, 2010), used the criterion that the explained variance (R^2) for endogenous variables must be greater than 0.1.

In Figure 2, the evaluation of the coefficients path described that these coefficients have standardized values, approximately between -1 and +1. Coefficients closer to +1 indicate a strong positive relationship, in contrast to -1, while coefficients close to 0 indicate weakness with no significance. Table 5 describes the relationships between the constructs based on the coefficients path representing the hypothesized relationships between the constructs. It can be fully appreciated that the most significant relationship is the ERM variable (0.583) with the SRT variable (0.613) and the least significant relationship is that of the IM with the USP (0.009).

Table 5 | Coefficients Path

	SRT	*IM*	*KPM*	*ERM*	*USP*
SRT			0.273		0.494
IM			0.258	0.583	0.009
KPM					
ERM	0.613				0.161
USP			0.354		

Source: Personal elaboration in Smart PLS, V. 3.0, based on field information.

The coefficient of determination (R^2) is the most used to evaluate a structural model and is a measure of the model's predictive capability. This is calculated as the square of the correlation between an endogenous construct and the predicted values. It represents the amount of variance in the endogenous construct explained by all the endogenous constructs linked to it. The values of R^2 from 0 to 1, with levels close to the unit R^2, indicate a higher level of predictive precision.

In Table 6, it is described that the KPM variable for the USR is the one that presents the highest indicators, R^2 by 0.535 and R^2adj 0.533, they can also be seen graphically in Figures 1 and 2. In Table 6, it is possible to notice that both the Cronbach's Alpha coefficient and the Composite Reliability measure are higher than 0.70, so that each of the constructs shows validity and internal consistency. Concerning the Average Extracted Variance, two variables show a value greater than 0.53, USR with 0.675 and ERM with 0.252. The results show that the Structural Model have robust constructs since the validity levels are accepted and give high reliability to the values obtained by the latent variables based on the observable variables.

Table 6 | Reliability, Construct Validity and Determination (R^2)

Variables	*Cronbach's Alpha*	*rho_A*	*Compound reliability*	*Media extracted variance (AVE)*	*R^2*	*$R^{2\ Adjusted}$*
SRT	0.788	0.805	0.843	0.408	0.376	0.375
IM	0.778	0.802	0.837	0.398	--	--
KPM	0.853	0.856	0.891	0.578	0.535	0.533
ERM	0.786	0.789	0.833	0.252	0.340	0.339
USP	0.838	0.843	0.892	0.675	0.374	0.372

Source: Personal elaboration in Smart PLS, V. 3.0, based on field information.

When performing the process of each of the indicators using the PLS-SEM technique, the factors that affect each index are shown, considering those with a total effect greater than 0.40, as seen in Table 8 and Figure 2. Based on the previous information, the correlation of latent variables was obtained (Table 7) and the indices were grouped, resulting in the variables as observed in Table 8. In which the KPM variable for the USR as the most significant is observed since it presents a positive association with each of the independent variables ERM, IM and SRT.

Table 7 | Latent Variables Correlation

Variables	*I*	*II*	*III*	*IV*
I. SRT				
II. IM	0.582			
III. KPM	0.635	0.555		
IV. ERM	0.613	0.583	0.505	
V. USP	0.598	0.390	0.618	0.469

Source: Personal elaboration based on the information obtained from the fieldwork using the PLS.

For the Heterotrait-Monotrait (HTMT) measurement, the value for the relationship between KPM and SRT was 0.764, for ERM and SRT 0.761 and between KPM and USP 0.734 (see Table 9). With these values, it is considered that the indicators that make up each of the proposed variables meet the discriminant validity criteria.

Following the procedure of Hair et al. (2016), the first step is the evaluation of any sign of collinearity, for which the VIF values were used, represented in Table 10. The SRT, IM and USP constructs are predictors of the KPM construct, and all the values are below the limit value of 5, so there is no collinearity between the constructs and thus, we can proceed to the evaluation of the structural model.

Table 8 | Affected Factors by Variable and Considered Index (total effect greater than 0.40)

KEY	*SRT*	*IM*	*KPM*	*ERM*	*USP*	*KEY*	*SRT*	*IM*	*KPM*	*ERM*	*USP*
AL1		0.706				ICE5				0.513	
AL2		0.571				ICE6				0.538	
CM1			0.812			IN1		0.696			
CM2			0.716			IN2		0.53			
CRS1	0.619					IP1			0.764		
CRS2	0.707					IP2			0.799		
CS1			0.783			MRA1				0.573	
CS2			0.681			MRA2				0.556	
EX1					0.868	MRA3				0.56	
EX2					0.859	PD1		0.772			
FI1	0.636					PD2		0.692			
FI2	0.753					PE				0.403	
FM1	0.695					PE2				0.406	
FR1	0.682					PE3				0.535	
FR2	0.525					RC3		0.605			
FR3	0.434					TCA1				0.452	
ICE1				0.439		TCA2				0.498	
ICE2				0.503		UE1				0.569	
ICE3				0.466		VN1					0.825
ICE4				0.472		VN2					0.727

Source: Personal elaboration based on the information obtained from the fieldwork using the PLS.

Table 9 | *Heterotrait-Monotrait Ratio (HTMT) Test Results*

Variables	*SRT*	*IM*	*KPM*
SRT			
IM	0.725		
KPM	0.764	0.664	
ERM	0.761	0.710	0.609
USP	0.723	0.464	0.734

Source: Personal elaboration based on the information obtained from the fieldwork using the PLS.

Table 10 | *VIF Values of Structural Model*

Variables	*SRT*	*IM*	*KPM*	*ERM*	*USP*
SRT			2.002		1.825
IM			1.517	1.000	1.725
KPM					
ERM	1.000				1.829
USP			1.563		

Source: Personal elaboration based on the information obtained from the fieldwork using the PLS.

As for the f^2 effects, values greater than 0.02 indicate there is an effect between the latent variables. In this case, it is considered the variables SRT with USP is 0.214, IM with ERM is 0.514, ERM with SRT is 0.602, mainly, since they all have values greater than 0.02, (see Table 11).

Table 11 | Efectf2

Variables	*SRT*	*IM*	*KPM*	*ERM*	*USP*
SRT			0.080		0.214
IM			0.094	0.514	
KPM					
ERM	0.602				0.023
USP			0.173		

Source: Personal elaboration based on the information obtained from the fieldwork using the PLS.

5.3 DISCUSSION OF RESULTS

The investigation was presented with a model showing validity; therefore, the results are reliable to perceive what happens between the interaction of variables and indicators of the USR implemented in the *UMSNH*. The statistical description presents a quantifiable performance and the structural model is consistent with the expected results from the perception of the university actors.

The USR has been a management instrument to promote a change in socio-environmental culture and which seeks to impact society. The present work has reviewed the implementation of the USR in the *UMSNH* evaluated from the actors' perception through five years. The overall average performance was fair, with values close to 3 out of 5 possible points. This implies that in the *Nicolaitas* global perception, the USR has provided regular, rather than good or excellent results.

One of the most relevant results is shown in Table 8, indicating the impact that each index had per variable. For example, for SRT two indicators showed greater relevance: CRS2 and FR1, and significant relevance: FI1, FI2, FM1, FR2, FR3, CRS1. This is important when evaluating the aspects that should be strengthened to improve the USR and the type of expected effect.

Another element that provides valuable information for the USR is that three variables have the greatest directional impact on the entire model, these being: SRT, IM and KPM, which can help to improve the results of the USR's implementation to impact ERM and USP more efficiently, suggesting that, to have better results in the performance of the USR, the performance in these three variables is fundamental; more so, the performance in the most influential indicators.

The objectives set for quantifying the variable performance on the USR and the impact of each variable served for measuring the relationships between the indicators and the variables. At the level of the variable interaction, the IM has a directional impact on the ERM both variables are operative, meaning highly visible in practice, which may explain the direction and intensity of the impact.

One of the most heterogeneous indicators is the USR training, in which authority appears high and with a wide difference with the administrative staff and professors. It can also be noticed that the sectors with the highest variance were AUT and ST, which suggests a very different perception of both sectors that may also denote a bias in the responses, given their political pose. Which represents one of the job's weaknesses.

It also highlights that the SRT has a relatively considerable impact on the USP since it deals with bounding and university extension with the environment. At the same time, the SRT impacts the KPM, although to a lesser extent. As expected, the KPM is directly impacted by three paths with the variables USP, SRT and IM; this would be explained because the generated knowledge is directly related to academic training, university policy and the university projection. In summary, the trials show expected relationships, however; low coefficients would indicate a regular performance of the USR.

The low value for USP would reflect the lack of bonding with the outside, a not isolated situation in the Ibero-American universities that have implemented the USR and maintain the practices in diverse social environments, as one of their main challenges, relating their policies to the problems in their communities, (AYALA-RODRÍGUEZ *et al*., 2010). This implies considering Higher Education a common good, incorporating the stakeholders into the governance, and including in its action focus not moving away from its immediate reality, in the search for an international ranking (MARTÍ-NOGUERA; LICANDRO; GAETE-QUEZADA, 2018).

An unresolved aspect in the exploration of the results is the expectation and monitoring of the patterns that the USR instils on the actors involved outside of the university campuses. As shown by some studies around, graduate students give high importance to USR in their expectations and it may influence behaviours and inclusion of categories and topics related to ethics, environment and sustainable development (ESPITIA-CUBILLOS; MENESES-PORTELLA; HUERTAS-FORERO, 2020). Thus, the results show the interaction between the variables from the perspective of the actors, but it is still pending to complement the perceptions from the thematic categories; especially for the academic community.

It should also be noted that the response of universities to the current socio-environmental crisis finds conceptual and practical support in the USR which constitutes an important challenge because it touches sensitive fibres in different dimensions of the process. It ranges from the production of knowledge and the "hidden" curriculum to teaching methods and formal content (ARANGO *et al*., 2014; CHIRINOS; PÉREZ, 2016; GASCA; OLVERA, 2011; NÚÑEZ, 2013; RODRÍGUEZ *et al*., 2020; VALLAEYS, 2013; YURÉN; GARCÍA; BRISEÑO, 2019). As could be seen in the case study, a change in behaviour is slow and implies strategies that seek synergies to improve performance, in the beginning, the main variables (such as IM), but then it is necessary to insist on the approach of new paradigms beginning with knowledge and followed by example, in the adoption of standards, which are not always popular at first.

Another aspect the USR explores is its function as a binding axis with social environment involving a variety of elements from consulting and technology transfer (MARTÍNEZ DE CARRASQUERO *et al.*, 2008); and the USR as social innovation (AGUIRRE; **GÓNZALEZ**, 2020); to the university role as a stakeholder, transmitting the concerns to all the areas of influence, not only employees, (professors

and administrative staff) and students (clients), but also the suppliers of material goods, services and financing (CONTRERAS; ANDRADE, 2012; GÓMEZ; NAVEIRA; BERNABEL, 2018). This is an aspect gaining importance, but it still faces barriers in the comprehensive implementation. However, in the sectors with direct involvement; (professors, researchers, authorities and administrative staff -employees- and clients -students-) there is a promising and favourable perspective.

6 CONCLUSIONS

The Policy regarding the installation of the USR management model has been around for five years at the time of performing this study and ten years since the Institutional Environmental Plan set the antecedent on environmental management in the *UMSNH*. The USR goes beyond the approaches on environmental management, covering areas such as principles of identity, social projection, organizational structure, democracy, freedom and gender equality. But the main focus is the role that the university plays in society. As can be denoted, progress has been made, but it is still necessary to continue improving this aspect.

The performance regarding the implementation of the USR in the *UMSNH* was regular, implying that there are still areas of opportunity to attend and improve. These areas can be found in the structural analysis. As expected, IM turns out to be a key variable in the model behaviour since it directly impacts ERM and KPM as well as SRT indirectly. Likewise, the most important management indicator was the labour environment. All that is present in knowledge-based societies and ecosystems. In this sense, the actions that impact this variable (particularly the AL1 indicator) will have an important effect on the behaviour of the model. As an area of opportunity, AL2 remains pending to improve its attentiveness.

One of the contributions of this work was to analyze the USR performance in the UMSNH, from a relatively new SEM-PLS Model. The results have shown the relationship between the variables and their expected behaviour. This model was represented by the constructs of five variables and 17 indicators.

The Cronbach's Alpha and Composite Reliability tests result established that each of the constructs showed validity and internal consistency. The most significant relationship was presented between the variables: ERM with SRT (0.613) and the least significant relationship is found between the IM variable with USP (0.009). From the Determination Coefficient calculation, it was possible to establish KPM for the USR being the one with the highest indicators, the R2 by 0.535 and the R2adj 0.533.

The variables ERM, SRT and KPM, showed the highest impacts and the greatest interaction in the USR. While the USP and the IM show areas of opportunity. Specifically, it could be denoted for each indicator in Figure 1, which summarizes the PLS-SEM result.

Among the limitations of the study and a pending research line, are the lack of representation of those who do not directly belong to the university (graduate students, independent professionals, companies, government and civil society). In this sense, the existence of a response bias regarding the actors participating in the research is likely.

The role of universities towards sustainable development is still a road under construction, however, efforts such as the USR policies show firm elements of progress in institutional commitment. Nonetheless, these measures have yet to be generalized and internalized in the communities so that their impact may become more noticeable. Once the USR in the UMSNH was analyzed we could see the most important variables to promote a higher positive impact in the USR. At the same time, we can notice the differences in perceptions among the university sectors, which should be considered in the monitoring strategy of the USR.

We, the authors, declare to have no conflict of interest when presenting the results of this research.

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