

Proposal of a theoretical model for the evaluation of sustainability in Higher Education Institutions

Propuesta de modelo teórico para la evaluación de la sustentabilidad en Instituciones de Educación Superior

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Abstract

Resumen

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Introduction

The capacities of higher education institutions (HEIs) in teaching, research and outreach, as well as their contribution to civic, social and community leadership, mean that they have a unique role to play in helping society address today's sustainability challenges. Arguably, none of the Sustainable Development Goals (SDGs) will be fully achieved without the contribution of this sector (Sustainable Development Solutions, 2020). According to Zainordin and Ismail (2018), apart from financial issues, other types of information are not relevant in most HEI sustainability statements. The most prominent framework for voluntary reporting of non-financial information in the world is the Global Reporting Initiative (GRI); however, it was not designed for HEIs, so the integration of ad hoc international frameworks is needed (Sepasi, Rahdari, and Rexhepi, 2018).

According to Ai, Kjerland, Klein-Banai, and Theis (2019), heterogeneities among sustainability indicators used by HEIs, such as variability of variable data and complex relationships between criteria over time, present major challenges for an integrated analysis. Lozano, Llobet and Tideswell, cited by (Sepasi et al., 2018), found that, in sustainability reporting for a university, it is vital to adopt a holistic perspective that addresses different interrelationships between indicators, categories and dimensions, and the system. Meanwhile, Yarime and Tanaka, cited by (Sepasi et al., 2018), point out that HEI functions are not well addressed in sustainability assessment tools and identified the need to develop a holistic sustainability assessment. In this sense, is it possible to develop a comprehensive model for sustainability assessment in HEIs? The aim of this research is to develop a proposed model for sustainability assessment in HEIs in order to contribute to the holistic and systemic evaluation of higher education.

Method

A two-part literature review was carried out: 1) Focused on the analysis of theories and concepts related to the evaluation of sustainability in HEIs. As a result, eight variables were identified from: a vision of sustainable development based on four pillars: environmental, economic, social and cultural (Hernández-Ayón et al., 2016), which, according to the Earth system approach of Jimeno, G. T. and Herrero (1998), can be considered holistic and systemic; and, four dimensions related to the higher education system: teaching, research, liaison, and management, (ANUIES, 1978a, 1978b); Diario Oficial de la Federación, 2019 and 2020; UNESCO, 2020). 2) Aimed at the critical analysis of the state of the art.

For the latter, a bibliometric study was carried out in the Scopus database of studies with keywords in the title: (sustainability AND assessment) AND ((higher AND education AND institution) OR (universities OR university)). Thirty-one papers were identified covering up to 2019 (the most recent) and seven were discarded as they did not contribute to the objective of the study.

In the qualitative analysis of the remaining 24 studies, the eight identified variables (four from sustainable development and four from the higher education system) were used to identify their consideration in the assessment of HEIs.

Results

According to Pascual Trillo (2013), what is known as the Earth system, i.e., the natural and the anthropogenic, can be considered as a closed system, except for the energy exchange with the sun. In this sense, the Earth system is holistic because it considers the whole (Table 1).

The natural is composed of atmosphere (gaseous part), geosphere (solid part), hydrosphere (liquid part) and biosphere (plants and animals) (Pascual Trillo, 2013). The anthropic is integrated by: technosphere (it is man-made and can be touched: materials, equipment, technology, infrastructure and money) (Buzai and Ruiz, 2018; Ayestarán Uriz, 2008); sociosphere (individual and/or organisational relationships: owners, employees, customers, suppliers, competitors, other organisations) (García-Chato, 2014; Pardo, 1998; Quétier et al, 2007; Ketzal, 2001); and, noosphere (it is man-made and cannot be touched: mission, vision, values, normativity, customs, traditions, knowledge) (Mantovani, 2009; Buzai and Ruiz, 2018; Ayestarán Uriz, 2008).

Natural	Atmosphere
	(Gaseous part)
	Geosphere
	Biosphere
Anthropic	(Plants and animals)
	Technosphere
	(Can be touched)

Table 1. Subsystems of the Earth system
Source: Own elaboration, based on (Jimeno, G. T. and Herrero, 1998).).

Since the Earth Summit in 1992, it has been recognised that moving towards sustainable development implies the balancing of three pillars: environmental, economic and social (UNCED, 1992). However, according to the United Nations Educational, Scientific and Cultural Organisation (UNESCO), sustainable development can be conceptualised in four spheres or pillars: environmental, economic, social and cultural (UNESCO, 2001).

The environmental, economic, social and cultural pillars of sustainable development correspond to the natural, technosphere, sociosphere and noosphere systems of the Earth system, respectively (Figure 1). As a consequence, the four-sphere conception represents a holistic and systemic approach to sustainable development.

Earth System	Sustainable development
Natural	Environmental
Technosphere	Economic
Sociosphere	Social
Noosphere	Cultural

Ambiental	Económica	Social	Cultural
Atmósfera	Materiales	Propietarios y empleados	Misión, visión, valores
Geósfera	Tecnología y equipos	Clientes y comunidad integral	Normatividad
Hidrosfera	Infraestructura	Competidores y proveedores	Costumbres, tradiciones
Biófera	Dinero (recursos financieros)	Gobiernos y otras org.	Conocimiento

Figure 1 Correspondence between the earth system and sustainable development
Source: Own elaboration, based on Pascual Trillo (2013), Ayestarán Uriz (2008), Quétier et al. (2007), D. Kullock et al., cited by Ketzal (2001) and (Mantovani, 2009)

On the other hand, the substantive functions: teaching, research and outreach, and the adjective functions: related to management, constitute the whole (the Greek hólós), through which the "doing" of HEIs is conditioned (UNESCO, 2001; ANUIES, 1978a; ANUIES, 1978b; Diario Oficial de la Federación, 2019, Diario Oficial de la Federación, 2020); "doing", which in terms of the General Law of Education in Mexico, Art. 7, is related to the integral formation of the individual (Diario Oficial de la Federación, 2019); that is, to the future professional. From the link between these six functions, the following interrelationships emerge: 1) teaching-research, 2) teaching-linkage, 3) teaching-management, 4) research-linkage, 5) research-management, 6) linkage-management; these relationships condition future professionals (Figure 2).

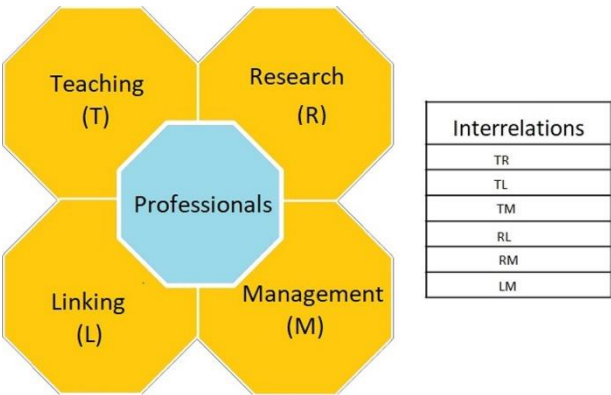


Figure 2 The higher education system
Source: Own elaboration, based on ANUIES (1978a)

In organisations in general, the creative effort is materialised in the product or service; similarly, in HEIs, the transformative effort is crystallised in their "doing". It is through the holistic analysis of the six interrelationships mentioned above that the fulfilment of the functions of the HEI and their gradual materialisation and transformation in the future professionals can be verified.

In the bibliographic analysis carried out in Scopus of 24 studies identified up to 2019, according to the aforementioned search parameters and criteria, Hawboldt, Veitch and Waheed were identified as the authors with the greatest number of publications on the aforementioned subjects, with a total of three publications; Brazil has 7 publications, while the United States has 4; the main type of publication is the article, which accounts for 58.1%; and the greatest contribution of studies comes from the social sciences (31.7%). The variables or categories used in the evaluation of HEI sustainability by different authors are very different and lack a holistic approach to sustainable development and education; according to (Caeiro, Hamón, et al., 2020), in order to achieve the maturity of sustainability in HEIs, there is a lack of integration in all dimensions from a whole-school approach (Table 2).

	Autor	E	EC	S	C	D	R	L	M
1	Nicolino, G., Barros, SRS, 2020								
2	Draheim, AD, De Lima, EP, Da Costa, SEG, 2019								
3	Ai, N., Kjerland, M., Klein-Banai, C., Theis, TL, 2019								
4	Pacheco, RM, De Medeiros Machado, M., et al, 2019								
5	Wiganingrum, R., Handayani, et al, 2018								
6	Sepasi, S., Rahdari, A., Rexhepi, G., 2018								
7	Aznar Minguet, PA, et al 2017								
8	Alghamdi, N., den Heijer, A., de Jonge, H., 2017								
9	Alshuwailkhat, HM, Adenle, YA, Saghir, B., 2016								
10	Cronemberger de Araujo Góes, H., Magrini, A., 2016								
11	Nicolino, G., Barros, S., 2016								
12	Moslehi, S., Arababadi, R., 2016								
13	Abubakar, IR, Al-Shihri, FS, Ahmed, SM, 2017								
14	Fischer, D., Jenssen, S., Tappeser, V., 2015								
15	Palma, LC, Pedrozo, E.A., 2015								
16	Urbanski, M., Filho, VL., 2015								
17	Togo, M., Lotz-Sisitka, H., 2013								
18	Waheed, B., Khan, FI, Veitch, B., Hawboldt, K., 2012								
19	Alba Hidalgo, D., Barbetos Alcántara, R., et al 2012								
20	Waheed, B., Khan, F., Veitch, B., Hawboldt, K., 2011								
21	Waheed, B., Khan, FI, Veitch, B., Hawboldt, K., 2011								
22	Lozano, R., 2006								
23	Klucinkas, L., 2001								
24	Lee, YS, 2000								

Table 2 Studies and variables considered. Symbology: environment (A), economy (E), social (S), cultural (C), dissemination (D), research (I), linkage (V), and management (G)
Source: Own elaboration

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By relating higher education and its aims to sustainable development, a series of complex interrelationships emerge that condition the higher education system and, as a consequence, future professionals (Figure 3).



Figure 3 Holistic view of sustainable development and higher education
Source: Own elaboration

Higher education in the framework of sustainable development can be observed through the analysis of 36 complex interrelationships; each of them will require the identification and/or creation of indicators (Table 3).

	DI	DV	DG	IV	IG	VG
AE	AEDI	AEDV	AEDG	AEIV	AEIG	AEVG
AS	ASDI	ASDV	ASDG	ASIV	ASIG	ASVG
AC	ACDI	ACDV	ACDG	ACIV	ACIG	ACVG
ES	ESDI	ESDV	ESDG	ESIV	ESIG	ESVG
EC	ECDI	ECDV	ECDG	ECIV	ECIG	ECVG
SC	SCDI	SCDV	SCDG	SCIV	SCIG	SCVG

Table 3 Interrelationships of higher education and sustainable development
Source: Own elaboration

Analyzing higher education institutions by means of the proposed sustainability interrelationships guarantees a holistic and systemic evaluation of these institutions, in which all key aspects that condition future professionals are considered.

Conclusions

- The assessment of sustainability in higher education institutions is not holistic.

- A holistic view of the higher education system could be observed through the functions: teaching, research, networking and management, which condition the future professional.
- A holistic approach to sustainable development could be seen through the environmental, economic, social and cultural spheres; this approach corresponds to the subsystems of the Earth system: nature, technosphere, sociosphere and noosphere. It is from here that sustainable development based on four spheres inherits its holistic and systemic characteristic.
- From the above considerations, it was possible to develop a holistic model for the evaluation of sustainability in higher education institutions.
- The future professional is conditioned throughout his or her stay in HEIs by the interrelationships that arise between teaching, research, networking and management; in the framework of sustainable development, this system in turn is conditioned by the environmental, economic, social and cultural spheres.
- 36 interrelationships were identified that guarantee the holistic assessment of sustainability in HEIs. It is necessary to determine appropriate indicators to measure these interrelationships. This is a pending task beyond the scope of the present study.

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