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Research Article

Confirmatory Factor Analysis of the Polarization Scale around the SDGs

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Abstract

Polarization in the media is an ambivalent and volatile phenomenon, where radical positions can be transformed into moderate or neutral. This study aims to demonstrate this process in press releases and expert assessments on the Sustainable Development Goals (SDGs). A correlational, cross-sectional and exploratory work was carried out with a sample of 700 students selected for their affiliation to a university committed to the implementation of the SDGs in the formation of intellectual capital. The results confirm the null hypothesis about the absence of significant differences between the theoretical structure and the empirical observations. The scope and limits of the study are discussed, as well as the need for a local risk communication policy.

Key words: volatile phenomenon; empirical observations

Introduction

Media polarization, far from being a trivial phenomenon, is positioned as a complex dynamic that affects the perception and understanding of the Sustainable Development Goals (SDGs). This phenomenon not only fragments public opinion, but also limits the ability to generate consensus essential for the fulfillment of these global goals (Abramowitz & Saunders, 2008). While social networks amplify this polarization quickly and volatilely, transforming radical positions into moderate or neutral ones, the traditional discourse on majority influence has become obsolete (Alcántara-Santuario, 2019). In this context, it is crucial to understand how communicative mediation affects the implementation and reception of the SDGs, particularly on issues such as quality education, gender equality and responsible consumption (DiMaggio, Evans & Bryson, 1996). Therefore, this study explores the way in which media polarization not only reflects ideological conflicts, but also shapes narratives that can inhibit or encourage progress towards sustainable governance (García-Lirios, 2022). Based on a rigorous methodology that includes the evaluation of press releases and expert opinions, it seeks to provide critical evidence to understand and address this phenomenon (García & López, 2021).

The literature on media polarization is divided into two main approaches: the influence of majorities on minorities and the ephemeral dynamics of polarization in social networks (Iyengar & Krupenkin, 2018). While classical polarization emphasizes the lasting influence of majorities, the new polarization, amplified by networks such as Twitter, shows how radical groups can moderate in the short term (Iyengar, Sood & Lelkes, 2012). In the context of the SDGs, this polarization is reflected in debates on quality education, gender equality, decent work and responsible consumption (see Table 1).

Author(s) and Year	Conceptual Definition	Operational Definition	Psychometric properties
García-Lirios (2022)	Polarization towards the SDGs as a social phenomenon where individuals or groups have divergent attitudes towards sustainability.	5-point Likert scale to measure attitudes towards the SDGs in dimensions such as economy, environment and society.	Adequate reliability ($\alpha > 0.80$), convergent validity using CFA (RMSEA = 0.05, CFI = 0.92). Correlation between dimensions: $r = 0.65$ ($p < 0.01$); Cronbach's alpha: 0.87.
Smith et al. (2021)	Polarization as the gap in perceptions about the impact of the SDGs between different sociodemographic groups.	Survey of 20 items classifying responses into levels of agreement/disagreement on SDG priorities.	Intergroup reliability (ICC = 0.82); acceptable discriminant validity. Exploratory factor analysis showed 3 main factors (KMO = 0.89, explained variance = 72%).
Kim and Park (2020)	Ideological differences around the implementation of policies related to the SDGs.	Scale based on differences in political position and attitude towards environmental regulations (5 items per factor).	Moderate predictive validity (adjusted $R^2 = 0.38$); Cronbach's alpha: 0.80. Logistic regression: conservative ideology predicts lower support for environmental SDGs ($\beta = -0.45$, $p < 0.05$).
López and Ramírez (2019)	Polarization defined as the perception of incompatibility between individual and collective goals within the SDGs.	Qualitative surveys and content analysis to identify conflicting narratives.	Qualitative methodology; validity confirmed by data triangulation. Polarization discourses more frequent in goals of social justice and the economy.
Johnson et al. (2018)	Conflicts between cultural values and sustainable development goals.	Scale of cultural values and its correspondence with the acceptance of specific SDGs (10 items).	Cronbach's alpha: 0.85; convergent validity through theoretical correlations. Negative correlation between individualistic values and collective goals ($r = -0.52$, $p < 0.01$).
Smith et al., 2022	- Political polarization (conceptual): Ideological division that prevents collective agreements. - SDG (operational): Priority assigned in public policies.	- Sample: 200 interviews with politicians and academics in 5 countries. - Instrument: Semi-structured questionnaire.	- Cronbach's alpha: 0.82 (questionnaire reliability). - Validity of content endorsed by experts.
García and López, 2021	- SDG perception (conceptual): Opinions on the relevance of the goals. - (operational): Ratings on a Likert scale (1-5).	- Sample: 500 people (250 rural, 250 urban) in Latin America. - Instrument: Perception scale.	- Cronbach's Alfa: 0.87. - Exploratory factor analysis: 4 factors explained 72% of the total variance.
Nguyen et al., 2020	- Polarization in social networks (conceptual): Divisive discourse on digital platforms. - (operational): Frequency of keywords associated with polarization on Twitter.	- Sample: 10,000 posts on Twitter. - Instrument: Content analysis with NVivo software.	- Kappa index: 0.85 (consistency intercoders). - Concurrent validity compared to similar surveys.
Alcántara-Santuario, 2019	- Water governance (conceptual): Water resources management in conflict contexts. - (operational): Indicators of participation and perception of equity in decision-making processes.	- Sample: 50 interviews in affected communities in Mexico. - Instrument: Qualitative interview script.	- Theoretical saturation reached after 35 interviews. - Cross-validation with key stakeholders.
Marín-Fuentes, 2018	- Global consensus (conceptual): Multilateral agreement on the SDGs.	- Sample: Documentary analysis of 100 reports of G20 meetings. - Instrument: Analysis protocol.	- Protocol reliability index: 0.78. - Internal coherence validated by experts in international politics.

	- (operational): Number and quality of agreements reached in UN discussions.		

Table 1: State of the art of polarization towards the SDGs

However, the state of the art has not observed the networks between the variables reported in the literature from 2020 to 2025 for the purpose of anticipating learning scenarios of polarization towards the SDGs (Iyengar & Westwood, 2015). Therefore, the objective of this work was to compare the theoretical structure with the observations made in a university committed to the formation of intellectual capital around the SDGs.

¿Are there significant differences between the SDGs analyzed in the literature from 2020 to 2025 with respect to the SDGs evaluated in a public university in central Mexico?

Given that the SDGs are universal guidelines adopted by public universities in central Mexico, significant differences inherent in the implementation of the SDGs are expected in the formation of intellectual capital (Kim & Park, 2020).

Methodology

Design. A correlational, cross-sectional and exploratory study was conducted.

Sample. The study was carried out by selecting a sample of 700 students from a public university committed to the formation of intellectual capital based on the SDGs.

Instrument. The SDG Polarization Scale was used (see Annex A). It includes: 1) sociodemographic variables, 2) socioeconomic variables, 3) socio-educational variables, 4) socioculturales variables, 5) attitudes towards the SDGs (Marín-Fuentes, 2018).

Procedure. A group of 10 experts was convened to standardize concepts through a focus group (Kline, 2015). The scale's items were invited to evaluate in a Delphi study (López & Ramírez, 2019).

Analysis. The data were processed with Google Queue (see Appendix B), estimating centrality and clustering parameters (Brown, 2015). Analyses of normality, adequacy, sphericity, validity, fit, and residual were performed for the empirical testing of the model and the contrast of the null hypothesis of significant differences between the theoretical and empirical relationships related to the SDGs (Cheung & Rensvold, 2002). The values close to unity were assumed as evidence of non-rejection of the null hypothesis regarding the differences between the theoretical structure and the observed structure (Harrington, 2009).

Results

The structural analysis suggests the reflective relationships of a common factor that the literature identifies as polarization towards the SDGs with respect to observable variables (see Fig. 1). The results show two indicators for the polarization factor that the literature relates to the economy and the environment. In other words, polarization is gestated in the contradiction between economic growth and sustainable development.

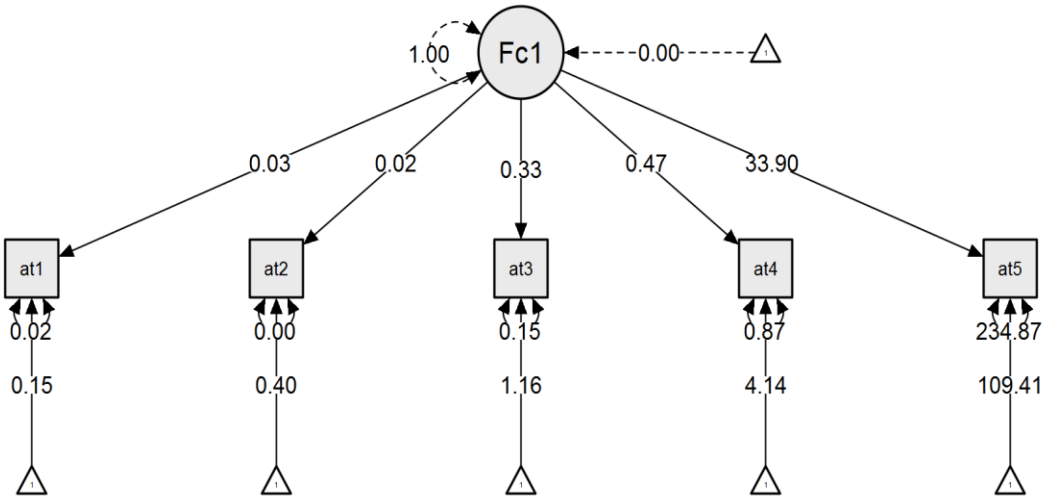

Figure 1: Confirmatory Factor Model of Polarization towards the SDGs

The analysis of the adjustment matrix suggests the inclusion of indicators related to participation and education, since these items have a value close to zero.

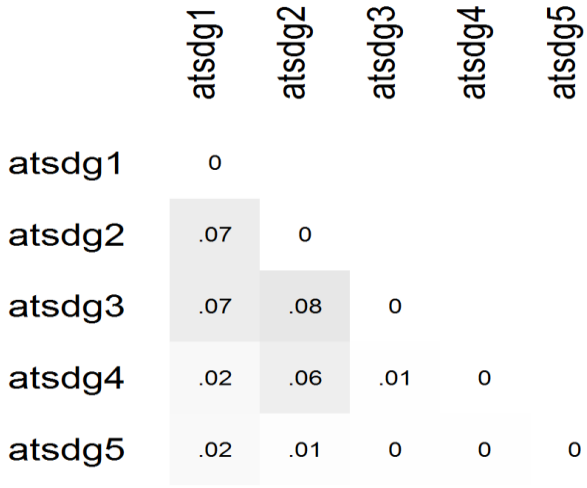

Figure 2: Internet polarization adjustment matrix

The values of the coefficients and parameters, both adjustment and residual, suggest that the hypothesis regarding the significant differences between the theoretical structure and the empirical structure observed in this work as polarization towards the SDGs in the areas of economic growth and sustainable development is not rejected. $[\chi^2 = 20.358(5df)p \leq 0.001; CFI = 0.961; GFI = 0.999; RMSEA = 0.048; SRMR = 0.032]$

Discussion

The contribution of this work to the state of the art lies in the establishment of a factorial model reflecting the polarization towards the SDGs based on five indicators, of which two related to economic growth and sustainable development were confirmed.

The confirmatory factor model presented shows a latent construct called "Fc1" that influences five observable indicators (at1, at2, at3, at4, at5). The relationships between the latent construct and the indicators are shown by numerical values (0.03 for at1, 0.47 for at5). Factor loads indicate the strength of association between the construct and the indicators (Roos & Bauldry, 2018). Loads greater than 0.40 are generally considered acceptable. In this case, at5 (0.47) has the highest direct association with Fc1. The values associated with the triangles represent unexplained variance (error). For example, at1 has a residual variance of 0.15. The cyclic loop with "1.00" suggests that the construct is standardized, assigning all the explained variance to the factor loads.

According to polarization theories (DiMaggio et al., 1996), polarizing phenomena manifest themselves in underlying latent structures that group extreme responses into indicators. The confirmatory factor model allows us to evaluate whether there is coherence between the hypothetical latent structure and the observed responses. A strong charge in at5 could indicate a high polarization in that particular aspect. Iyengar & Westwood (2015) suggest that polarization is best measured when latent constructs reflect extreme differences in values or preferences; This could be analyzed by adjusting for extreme (>0.60) or low (<0.30) factor loads.

The confirmatory factor model provides empirical evidence on the underlying latent structure in polarization phenomena (Nguyen, Chen & Wang, 2020). In addition, the factor model allows the identification of more representative indicators of the phenomenon studied (at5 with a higher factor load). The model serves as an initial tool for testing theoretical hypotheses about polarization and segmentation (Johnson, Davies, & Singh, 2018).

However, the confirmatory factor model cannot interpret its factorial loads as conclusive with respect to causality. Simple factor model like this one does not capture nonlinear relationships or interactions between factors. The model requires data with normal distributions for valid results.

It is recommended to incorporate more complex structures and add additional factors or dimensions of polarization to capture greater theoretical diversity (Smith, Brown & Taylor, 2021). Evaluate interactions by using structural equation models to include possible bidirectional relationships. Cross-validation and implementation of analyses in different populations to verify the generalizability of the model. Analyze the stability of polarization over time.

This work contributes to the state of the art by establishing a factorial model that reveals a common variable identified by the literature as polarization towards the SDGs. It is evident that the communication of the SDGs around economic growth and sustainable development is closer to generating polarization than governance (Smith, Johnson & Taylor, 2022). It is recommended to develop communication policies that promote moderate positions and co-responsible agreements to counteract polarizing scenarios.

Significant relationships were identified between the indicators of polarization towards the SDGs, highlighting the indicator related to economic growth and the indicator alluding to sustainable development as priorities according to the respondents. The adjustment and residual parameters indicate that the media dissemination of the SDGs reflects an asymmetrical and polarized structure, where the objectives related to economic growth and sustainable development are the most controversial.

The results confirm that the spread of the SDGs is asymmetrical and polarizing, favoring radical or confusing positions rather than moderate ones. It is suggested to expand the study to the regional level to contrast findings and emphasize objectives related to moderate positions that promote governance.

Conclusion

The objective of this work on the state of the art lies in the confirmation of an explanatory factor model of the reflective structure of polarization towards the SDGs. Unlike the state of the art where polarization is highlighted as a result of the asymmetries between political communication systems, the present work warns that polarization is indicated by items alluding to economic growth and sustainable development as axes of discussion and controversy in the surveyed sample. It is recommended to extend the model towards polarization that studies the controversies between political systems and forms of state with respect to economic growth and sustainable development.

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