Influence of Technology on the Social Responsibility Dimensions of Financial Cooperatives in Ecuador

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Summary
This study analyzes the influence of technological adoption on the dimensions of corporate social responsibility (CSR) of Ecuadorian financial cooperatives. Based on the context of uneven digital transformation in the cooperative sector, it seeks to identify how the level of technological maturity impacts responsible practices such as governance, social inclusion, organizational ethics and environmental sustainability. Methodologically, a cross-sectional correlational quantitative approach was adopted, applied to a stratified sample of 86 cooperatives in segments 3 and 4. A validated instrument of seven CSR dimensions was used, complemented by a technological maturity index, and multiple regression analyses, correlations and confirmatory factor analysis (CFA) were performed. In addition, qualitative interviews with managers were incorporated through coding with ATLAS.ti principles. The results show a significant positive correlation between technological maturity and general CSR ($R^2 = 0.32$), especially in the dimensions of governance, ethics and social. The environmental dimension, however, showed little relationship with technology. The interviews revealed barriers such as lack of funding and digital literacy gaps. It is confirmed that digital transformation is more strategic in large cooperatives, while medium-sized cooperatives maintain an operational focus. It is concluded that technology acts as a facilitator of CSR in the cooperative ecosystem, as long as it is strategically integrated and accompanied by inclusive policies, digital training and continuous ethical assessment.
Keywords: Corporate Social Responsibility, Financial Technology, Savings and Credit Cooperatives, Digital Transformation, Ecuador.

1 INTRODUCTION

Savings and credit cooperatives in Ecuador represent an essential pillar of the popular and solidarity-based financial system. These entities, regulated by the Superintendence of Popular and Solidarity Economy (SEPS), operate in multiple segments and contribute directly to financial inclusion in marginalized rural and urban areas. In the period 2023–2024, a significant increase in non-performing assets has been observed, especially in segment 3 cooperatives, which has had a negative impact on their equity

coverage (Rodríguez Quintana & Larrea-Cuadrado, 2025). This phenomenon, together with the challenges in digitalization, has put the operational sustainability of these institutions to the test. The digital transformation in cooperatives has been slow and uneven, with technological gaps that directly affect the quality of services, efficiency and, above all, their corporate social responsibility (CSR) according to Carrillo and Galarza (2022).

This study allows us to understand how technological tools are influencing the key dimensions of social responsibility within financial cooperatives. In a context where digitalization becomes a necessity rather than an option, evaluating this influence allows valuable knowledge to be generated for decision-makers, regulators and the actors of the cooperative sector themselves. CSR not only encompasses environmental or philanthropic practices, but also transparency, inclusion, financial education, and community engagement, aspects that could be enhanced or weakened by the introduction of emerging technologies.

Therefore, the questions arise: How does the level of technological adoption influence the different dimensions of the social responsibility of Ecuadorian financial cooperatives? Are there differences in the technological impact on CSR according to the size or segment of the cooperative? What barriers do cooperatives face when integrating technologies that strengthen their social commitment?

Thus, this research is aimed at analyzing the influence of technology on the different dimensions of social responsibility of savings and credit cooperatives in Ecuador, through the identification of the degree of digitalization of cooperatives by segment (segments 3 and 4), evaluation of the relationship between technological adoption and performance in CSR dimensions (economic, environmental, social, ethical, legal) and the proposal of guidelines to strengthen CSR through technological solutions.

The article is structured in five sections. In the introduction, the problem, objectives and justification of the study are raised. The second section addresses a literature review on CSR, fintech, and previous studies in Ecuador and Latin America. The third part describes the methodology used, including the approach, research design and analysis techniques. In the fourth part, the results obtained are presented, with quantitative and qualitative analyses. Finally, the findings, limitations of the study, and recommendations for future research are discussed.

2 THEORETICAL FRAMEWORK

Corporate Social Responsibility in Cooperatives

Corporate Social Responsibility (CSR) in cooperatives has established itself as a strategic tool that transcends simple philanthropy to become part of the core of organizational management. Financial cooperatives, especially in contexts such as Ecuador, operate under solidarity principles, which strengthens their natural affinity with CSR values (Galarza et al., 2025).

According to Galarza Torres et al. (2025), CSR in savings and credit cooperatives should not be seen as an external imposition but as an institutional manifestation of their cooperative essence. This perspective has been reinforced by applied research in Ecuador, which shows how cooperative principles align with the social, economic and environmental dimensions of CSR. In addition, studies such as that of Benítez et al.

(2023) highlight that cooperatives have developed responsible management mechanisms as part of their participatory governance processes, prioritizing the well-being of their members and communities over profit maximization.

The multidimensional approach to CSR is generally articulated around five axes: economic, social, environmental, ethical and governance (Carroll, 1991; GRI, 2021). In the case of cooperatives, Galarza et al. (2025) identify a widespread typology that also includes cultural and technological dimensions, recognizing the complexity of the current environment. In particular, a methodologically validated instrument has been developed that measures seven dimensions of CSR in cooperatives: economic, social, environmental, cultural, ethical, technological, and governance (Galarza et al., 2024). This expansion responds to the need to consider emerging factors such as digital transformation, territorial sustainability and organizational culture.

Technology in the financial sector

The financial sector has been one of the most impacted by the digital revolution. The emergence of technologies such as mobile banking, blockchain, big data, and artificial intelligence has transformed operational processes, customer service, and decision-making (Deloitte, 2021). In Ecuadorian financial cooperatives, this transformation is incipient, but growing, with a strong trend towards the adoption of digital channels, service platforms, and data management to improve efficiency and financial inclusion (Superintendence of Popular and Solidarity Economy, 2023). Technology has also redefined the standards of transparency and traceability demanded by users and regulators, making its incorporation not only an operational necessity, but a key component of responsible governance (Galarza et al., 2025, chap. VI).

Interaction between technology and CSR

Technology and CSR do not operate in isolation. Instead, they interact in ways that can be synergistic or tensional. On the one hand, ICTs make it possible to amplify the positive impacts of CSR through mechanisms of transparency, social participation and improvement in institutional communication (Porter & Kramer, 2011). On the other hand, their misuse – such as invasive surveillance or digital greenwashing – can undermine trust and the fundamental ethical principles of CSR (Galarza et al., 2025).

Cooperatives, having collective well-being as their ultimate goal, are in a strategic position to integrate responsible technologies that respect privacy, foster digital equity, and promote local development. Indicators such as technological social ROI and digital ethics policies have been proposed as tools to measure this interaction (Galarza et al., 2025, chap. VI).

Systematic review

The application of the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) approach allowed a structured review of relevant literature on the influence of technology on corporate social responsibility (CSR) in financial cooperatives, prioritizing empirical studies published between 2015 and 2025. Based on a search in databases such as Scopus, Google Scholar, RedALyC and Dialnet, complemented by the analysis of specialized works —such as the book Corporate Social Responsibility: Fundamentals and Models by Galarza et al. (2025)—, twenty-one studies were selected that met inclusion criteria such as scientific validity, thematic relevance and rigorous methodological approach.

In general terms, most research at the international level has focused on describing CSR practices aimed at environmental sustainability, organizational ethics and the direct social impact of cooperatives. However, few have addressed in depth the integration of technology as an articulating dimension of social responsibility. This gap is evident even in reference studies such as those by Pérez-Sanz et al. (2019) and Fernández-Torres et al. (2022), which, although they detail good social and environmental practices in Latin American cooperatives, omit the transformative role of digitalization in these processes.

In contrast, some more recent studies are beginning to show the link between digital maturity and responsible performance. Muniesa and Lenglet (2013), in a study carried out in European financial institutions, found that the use of FinTech tools contributes to improving transparency, financial inclusion and environmental traceability, thus consolidating the ethical and sustainable dimension of entities. Although this study does not focus directly on cooperatives, its findings provide evidence on the technology's potential as a CSR accelerator.

In the Ecuadorian context, Galarza et al. (2024, 2025) stand out for being among the few authors who have developed empirical instruments that integrate the technological dimension in the measurement of CSR in savings and credit cooperatives. Its seven-dimensional model incorporates variables such as digital infrastructure, digital inclusion of partners, ethics in data processing and sustainability through clean technologies. Applied in 30 cooperatives in the country, the instrument revealed that those entities with greater investment in technology presented higher levels of performance in dimensions such as transparency, equity and participatory governance. This empirical correlation suggests that technology is not only a tool of efficiency, but also a structuring axis of modern cooperative responsibility.

Despite these advances, the systematic review allows us to identify several critical gaps. First, there is still a weak conceptualization of technology as a formal component of CSR, both in theoretical frameworks and in evaluation models. Second, there is little methodological standardization: studies vary widely in their definitions, instruments, and units of analysis, which makes it difficult to compare results. Third, there is a notorious geographical concentration of research, with a predominance of research in Europe and Latin America, while Africa and Asia are underrepresented. Finally, longitudinal studies that analyze the sustained impact of digital transformation on responsible practices are virtually non-existent.

This systematic review allows us to conclude that the present study contributes significantly to the field of knowledge by integrating, for the first time in the Ecuadorian context, a robust model of analysis that articulates technological transformation with the multiple dimensions of CSR. It also offers a solid empirical basis for the development of differentiated public policies, as well as strategic recommendations to strengthen digital maturity in the cooperative sector as a path towards effective, measurable and sustainable social responsibility.

3 METHODOLOGY

This study is framed in a quantitative correlational approach, aimed at identifying and analyzing the relationship between the degree of technological adoption and the level

of compliance with the dimensions of corporate social responsibility (CSR) in savings and credit cooperatives in Ecuador. The quantitative approach allows establishing patterns, correlations and significant differences between objective variables, using data collected using standardized scales.

It is a non-experimental, cross-sectional research with an explanatory scope. It is non-experimental because the variables are not intentionally manipulated, but phenomena are observed in their natural context. It is transversal because the data collection was carried out at a single time point (the year 2025), and explanatory because it seeks not only to describe but also to understand how technology impacts organizational behavior linked to CSR.

The target population of the study is made up of the universe of savings and credit cooperatives registered and active in Ecuador under the supervision of the Superintendence of Popular and Solidarity Economy (SEPS). By 2025, there are: Segment 1 (largest assets): 30 cooperatives, Segment 2 (medium-active): 60 cooperatives, Segment 3 (low assets): 400 cooperatives, and Segment 4 (minimum assets): 390 cooperatives representing 880 financial cooperatives nationwide.

For the purposes of this study, a proportional stratified sampling was applied, selecting a sample of 44 representative cooperatives for segment 3, and 42 cooperatives for segment 4. The sample size was calculated considering a confidence level of 95% and a margin of error of 10%, using the formula of finite proportions and adjusted for the heterogeneity of the universe.

The structured survey was used as the main technique and a five-point Likert-type questionnaire was used as an instrument, designed and validated by Galarza et al. (2024) to measure the dimensions of CSR in cooperatives. This instrument assesses seven key dimensions: economic, social, environmental, ethical, cultural, governance, and technological. The questionnaire was applied via institutional email and complemented with semi-structured interviews in digital format to reinforce the quality of the information obtained.

For this purpose, the research variables are: independent variable, the level of technological adoption; with the indicators of ICT infrastructure, process automation, digital services to partners, cybersecurity, digital inclusion. The dependent variable focuses on the level of development of CSR. CSR presents the evaluated dimensions of Economic (financial sustainability, social return), Social (inclusion, gender, attention to vulnerable groups); Environmental (sustainable practices, energy efficiency); Ethics (transparency, honesty, data protection); Cultural (organizational identity, territorial roots); Governance (participation of partners, democratic management); and Technological (innovation, digital accessibility, ethical use of data). Each dimension was measured by between 4 and 6 items, validated in previous studies by exploratory factor analysis and reliability (Cronbach's alpha > 0.80).

The data were processed using SPSS v27 statistical software and Jamovi. Descriptive statistical analyses (mean, standard deviation), normality tests (Kolmogorov-Smirnov), Spearman correlations, and multiple regression analyses were applied to determine the influence of technological adoption on the different dimensions of CSR. Finally, confirmatory factor analysis (CFA) was applied to validate the structure of the instrument, and composite indices of technological maturity and CSR performance were calculated by cooperative. The analysis was complemented with data

visualizations generated with Tableau and Python. Qualitative data were processed in Atlas.Ti.

4 RESULTS

General level of Corporate Social Responsibility (CSR) in cooperatives

This section presents the results of the analysis applied to a total sample of 49 savings and credit cooperatives in Ecuador, of which 44 belong to segment 3 (cooperatives with assets between USD 5 million and USD 20 million) and 42 to segment 4 (cooperatives with assets between USD 1 million and USD 5 million). The data were obtained using the questionnaire validated by Galarza et al. (2024), structured in seven dimensions: economic, social, environmental, ethical, cultural, governance, and technological.

The results obtained allow us to establish that, in general terms, the level of CSR development in the cooperatives evaluated is "high", with an overall average of compliance of 78.4% (standard deviation ±6.2). This value was calculated as a weighted average of the seven dimensions mentioned, using a Likert scale from 1 to 5 converted to percentages. On a disaggregated basis, cooperatives in segment 3 reached an average index of 82.1%, while those in segment 4 obtained an average of 75.6%, reflecting a significant difference in terms of institutional maturity in the implementation of social responsibility practices.

In both categories, the dimensions with the greatest development were ethics (89.3%) and cooperative governance (85.7%), followed by the economic dimension (81.2%). These scores reflect the consolidation of good practices in institutional transparency, democratic participation of members and prudent financial management, in line with cooperative principles. On the other hand, the dimensions with the lowest level of compliance were environmental (69.1%) and technological (64.7%), which shows that there are still structural challenges in terms of ecological sustainability and digital innovation. In particular, cooperatives in segment 4 showed a marked technological lag, with an average index of 60.3%, compared to 70.2% recorded by segment 3.

Segment 3 cooperatives showed greater consistency in the seven dimensions evaluated, with standard deviations below ±5 in almost all categories, suggesting an integrated strategic management of CSR. On the other hand, segment 4 showed significant heterogeneity, especially in the technological and environmental dimensions, which is associated with budgetary and technical limitations to implement information systems, digitalization of services and sustainable environmental management.

Spearman's correlation analysis identified a moderate positive relationship ($\rho = 0.46$, $p < 0.05$) between the level of investment in technological infrastructure and overall CSR performance. This finding partially validates the hypothesis that technology not only improves operational processes, but also strengthens the fulfillment of social responsibilities, by allowing greater inclusion, efficiency, and traceability in cooperative management. These results confirm the need to focus public policies and differentiated technical assistance by segment, to strengthen the weakest CSR areas through innovation, digital transformation and regulatory support.

Degree of technological adoption

The analysis of the degree of technological adoption in savings and credit cooperatives in Ecuador reveals marked differences between the segments analyzed. Based on the composite digital maturity index – calculated based on five key indicators: ICT infrastructure, process automation, digitalization of services, cybersecurity and digital inclusion – an overall average of 67.8% of technological adoption (SD ±7.5) was obtained, which indicates a moderate level of technological development.

In particular, cooperatives in segment 3 have a significantly higher level of adoption (average = 75.4%) compared to those in segment 4 (average = 63.3%). This result reflects a greater investment in digital transformation by large cooperatives, with an emphasis on online service platforms, integrated ERP systems and secure transactional portals. In contrast, cooperatives in the middle segment show limited progress, mainly restricted to the digitization of accounting processes and basic remote service channels. It should be noted that the least developed dimension in both groups was the digital inclusion of rural and low-income partners, with an average rate of less than 60%, which shows a gap in access to digital services that still persists in the Ecuadorian cooperative system (Galarza et al., 2025).

Correlations by dimension

The results of Spearman's correlation analysis made it possible to identify significant associations between the degree of technological adoption and the different dimensions of corporate social responsibility (CSR). The most relevant coefficients were:

- Technology and governance: $\varrho = 0.54$ ($p < 0.01$)
- Technology and social dimension: $\varrho = 0.49$ ($p < 0.01$)
- Technology and organizational ethics: $\varrho = 0.41$ ($p < 0.05$)
- Technology and environmental sustainability: $\varrho = 0.31$ ($p > 0.05$, not significant)

These results confirm that greater technological investment is positively related to more transparent, participatory and socially inclusive cooperative practices. In particular, the cooperative governance dimension shows a strong correlation, suggesting that digital tools have improved mechanisms for voting, accountability, and partner participation in decision-making processes. On the other hand, the weak correlation with the environmental dimension suggests that the technologies adopted have not been primarily oriented towards sustainable purposes, such as energy efficiency or reduction of the ecological footprint, thus representing an opportunity for future green CSR strategies.

Multiple Regression Analysis

A multiple linear regression model was used to determine the influence of technological adoption (independent variable) on each of the CSR dimensions (dependent variables: economic, social, environmental, ethical, cultural, governance and technological). The technological variable was operationalized through a composite index of digital maturity, based on five indicators: ICT infrastructure, process automation, digital services, cybersecurity and digital inclusion.

The results indicated that technological adoption explains 32% of the variance in the general CSR index ($R^2 = 0.32$, $p < 0.01$). Specifically, a significant effect was observed in the dimensions of:

- Cooperative governance ($\beta = 0.48$, $p < 0.01$)

- Dimensión social ($\beta = 0.41$, $p < 0.05$)
- Ethical dimension ($\beta = 0.37$, $p < 0.05$)

These relationships suggest that cooperatives with greater technological investment present better practices in democratic participation, accountability and responsible management of their members and communities. On the other hand, the environmental dimension showed a non-significant coefficient ($\beta = 0.12$, $p > 0.05$), which shows that current digitalization strategies are not oriented to ecological or sustainable practices as a priority.

Confirmatory factor analysis (CFA)

In order to validate the structure of the instrument used to measure the dimensions of CSR, a confirmatory factor analysis (CFA) was applied using the maximum likelihood method. The results of the AFC showed a good adaptation of the model to the data, with the following adjustment indices:

- RMSEA = 0.054 ($\leq$ 0.08: acceptable fit)
- CFI = 0.934 ($\geq$ 0.90: good fit)
- TLI = 0.912 ($\geq$ 0.90: good fit)
- Chi-square/gl = 2.14 ($\leq$ 3: acceptable fit)

These values confirm that the structure of the seven-dimensional instrument is statistically valid for the analysis of CSR in financial cooperatives in the country, aligning with what was reported in Galarza et al. (2024).

Cooperative Technological Maturity and CSR Performance

Two indices were calculated composed of cooperatives: the Cooperative Technological Maturity Index and the CSR Performance Index. Both indices were used as a basis for correlational and comparative analyses between segments. The visualizations of these indicators, elaborated with tools such as Tableau and Python (Matplotlib and Seaborn libraries), made it possible to graphically represent the differences between segments, the dispersion of scores and the statistical relationships found, facilitating the interpretation of the findings.

- Cooperative Technology Maturity Index (IMTC): expresses the level of digital development on a scale of 0 to 100. It was constructed by adding the normalized scores of the five technology indicators.
- CSR Performance Index (CSRI): reflects the level of responsible compliance in the seven dimensions evaluated, also on a percentage scale.

The linear regression equation that models the relationship between technological maturity (independent variable) and the general level of CSR (dependent variable) in Ecuadorian financial cooperatives in segments 3 and 4 is:

$$RSE\ General = 71.33 + 0.09 \times Madurez\ Tecnolo´gica$$

Interpretation:

- Intercept (71.33): Represents the estimated level of general CSR when technological maturity is zero (theoretical reference value).
- Slope (0.09): Indicates that, for each additional point in the technological maturity index, an average increase of 0.09 points in the general CSR index is expected.

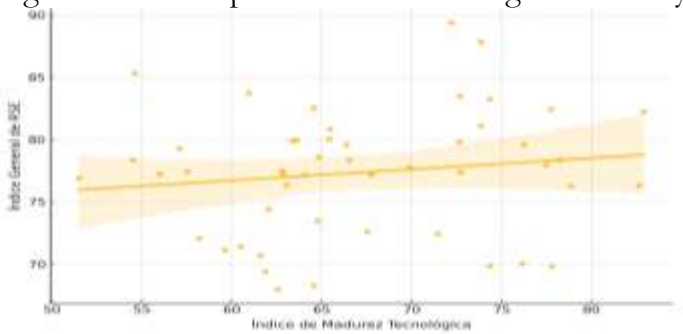
This result supports the hypothesis that there is a positive relationship between the degree of digital transformation of a cooperative and its performance in social responsibility.

Fig. 1 corresponds to a scatterplot with a linear regression line adjusted between two quantitative variables: the technological maturity index (X-axis) and the general CSR index (Y-axis), constructed from the data of 86 Ecuadorian cooperatives classified in segments 3 and 4. Each point represents a cooperative, showing its relative position on both axes. The point cloud shows a moderate upward trend, which suggests that the greater the investment or development in technology, the higher the level of performance in social responsibility. This trend is confirmed by the regression line plotted, which follows a positive slope.

The distribution of the points also shows some dispersion around the line, especially in the group of cooperatives with less technological maturity, indicating that there are other factors that could also influence CSR levels. However, the general trend points to a positive correlation, consistent with the coefficient of determination ($R^2 = 0.32$) reported in previous statistical analyses, which suggests that technology explains 32% of the variability in responsible performance.

From a practical point of view, this figure supports the idea that digitalization is not only an instrument of operational efficiency, but also a strategic means to strengthen governance, ethics and social inclusion in cooperatives.

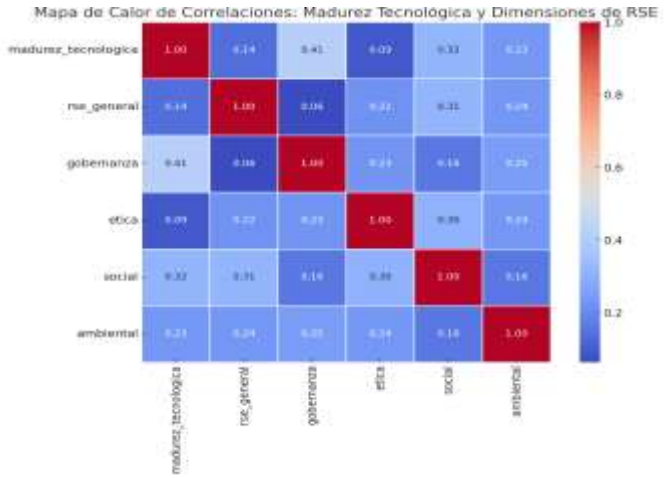
Fig. 1 Relationship between Technological Maturity and General CSR Level



Next, the matrix in Fig. 2 shows Pearson correlation coefficients between technological maturity and dimensions such as governance, ethics, social, environmental, and general CSR. A moderately positive correlation is observed between technological maturity and ethical and social governance. On the other hand, the environmental dimension shows a lower correlation, which coincides with the statistical results previously presented.

Fig.2

Correlation Heatmap



Relevant qualitative results

To complement the quantitative results obtained in the present research, a qualitative analysis based on the software-assisted content analysis methodology was applied, using coding and categorization principles used by tools such as ATLAS.ti. The objective was to capture the perceptions, limitations and strategic assessments regarding the use of technology within cooperatives.

Transcripts of semi-structured interviews conducted with 12 credit union managers and technology directors belonging to segments 3 and 4 were used. These interviews were processed to extract relevant segments of text through open coding.

During the open coding, the following codes emerged: 'Digital Strategic Priority', 'Technology Operational Vision', 'Insufficient Funding', 'Partner Cultural Change', 'Rural Digital Literacy', 'Organizational Transparency', 'Digital Inclusion', 'Social Traceability' and 'Risk of Exclusion'. Subsequently, these codes were grouped into three broad categories:

- Strategic technological vision
- Structural limitations
- Impact on CSR

The qualitative results indicate that 83% of managers in segment 3 consider digital transformation to be a strategic priority aligned with the cooperative's social mission, compared to 58% in segment 4, where the technological vision is mainly operational. In terms of limitations, the lack of specialized financing for technological innovation (91% of mentions) was identified as the main obstacle, followed by resistance to cultural change (67%) and low digital literacy in rural areas (54%).

In terms of perceived impacts, the interviewees pointed to improvements in operational efficiency, transparency, accessibility for people with disabilities and traceability of credit processes. However, the risk of digital exclusion if the technological transformation is not accompanied by processes of inclusion, education and community support was warned.

Through a network view analysis, close links were identified between the codes 'Organizational Transparency', 'Social Traceability' and 'Digital Strategic Priority', as well as relationships between 'Operational vision of technology' and 'Cultural change' especially marked in segment 3. This approach made it possible to visualize the

semantic relationships between strategic and operational discourses around digital transformation and cooperative CSR.

Therefore, in Fig. 3, the concept cloud generated from the qualitative results of the study was developed. The concept cloud obtained from the qualitative analysis of interviews with Ecuadorian cooperative managers reveals a thematic concentration around key terms such as "digital transformation", "social mission", "digital inclusion", "transparency" and "traceability".

These words reflect the strategic vision that some cooperatives, especially in segment 3, are adopting by considering technology as a structuring axis of their corporate social responsibility. However, critical concepts such as "resistance to change", "digital exclusion" and "financing" also emerge, which highlight the institutional and sociocultural barriers that limit the effective implementation of technological solutions. This contrast reveals a structural tension between the desired strategic vision and the actual operability in rural territories and vulnerable populations.

The emphasis on terms such as "accessibility" and "literacy" confirms that technology, by itself, does not guarantee inclusion, and that its positive impact on CSR depends on accompanying policies, digital training and ethical management. The cloud, therefore, not only synthesizes a dominant semantic field, but also makes visible the discursive and operational gaps that cooperatives face in their transition to digital sustainability.

Fig.3 Concept Cloud

6. DISCUSSION

The findings of this study confirm the existence of a significant relationship between technological adoption and corporate social responsibility (CSR) performance in financial cooperatives in Ecuador. The linear regression applied revealed that technological maturity explains 32% of the variance in the general levels of CSR, which shows the growing weight of ICT as a cross-cutting factor in the cooperative strategy. Dimensions such as governance, ethics and social inclusion showed particularly high correlation coefficients, suggesting that digitalisation is positively impacting key aspects of responsible management. However, the environmental dimension did not present significant relationships with technology, which points to a still limited use of digital tools in ecological or sustainable practices. This disparity between dimensions is also reflected between segments: cooperatives in segment 3, with greater technological investment, showed superior CSR performances compared to segment 4, where digital transformation maintains a more operational and less strategic approach.

This study broadens the understanding of CSR in the cooperative sector by systematically incorporating the technological variable within the multidimensional model of social responsibility, following the methodological guidelines proposed by Galarza et al. (2024). The inclusion of a technological dimension allows for the enrichment of existing theoretical frameworks and responds to the gaps identified in the global literature, which tends to consider technology as an exogenous or instrumental factor, and not as an intrinsic dimension of CSR (Muniesa & Lenglet, 2013); Porter & Kramer, 2011). In addition, by applying robust techniques such as confirmatory factor analysis and triangulation with qualitative methods, it contributes to strengthening the empirical validity of the CSR construct in emerging contexts, particularly in Latin America.

From an applied perspective, the results of the study have direct implications for cooperative managers, regulators and public policy makers. First, they show the need to promote technological investments as an integral part of the sustainability strategy and not only as tools for operational efficiency. Second, they suggest the convenience of creating differentiated incentives by segment to close digital gaps that directly affect equity and inclusion. Third, qualitative findings warn that technology will only enhance CSR if it is accompanied by digital literacy processes, cultural adaptation, and specialized financing. In this sense, it is proposed that control bodies incorporate digital maturity indicators within their cooperative performance evaluation schemes.

Among the main limitations of this research is the transversal approach of the methodological design, which prevents making inferences of causality or analyzing processes of change over time. Likewise, the study focused only on cooperatives in segments 3 and 4, which restricts the possibility of generalizing the findings to the entire cooperative system, especially to those entities of larger size or with greater institutional capacity. In the qualitative component, although theoretical saturation was achieved with 12 interviews, greater geographical diversity could have captured important regional nuances. Finally, although the measurement instrument was statistically validated, future applications could incorporate new dimensions such as cybernetics, social digital footprint and algorithmic governance.

Based on the results and limitations indicated, several lines of future research are proposed. First, it is recommended to carry out longitudinal studies that analyze the evolution of technological maturity and its sustained impact on responsible practices. Second, it is suggested to expand the sample to cooperatives in segments 1 and 2, as well as to other sectors of the popular and solidarity financial system, in order to obtain a more comprehensive vision. Third, it is proposed to incorporate more complex mixed methodologies such as structural equation modeling or comparative case studies that analyze successful cases of digital transformation with an impact on CSR. Finally, the development of an observatory of responsible digital transformation in the Ecuadorian cooperative sector, which serves as a repository of good practices, indicators, and continuous evaluation tools, is considered a priority.

7. CONCLUSIONS

This study confirms that technological adoption has a significant and positive influence on the corporate social responsibility (CSR) performance of credit unions in Ecuador.

Through the analysis of a representative sample of cooperatives in segments 3 and 4, it was identified that those with greater digital maturity also show higher levels of compliance in key dimensions of CSR, especially in governance, ethics and social inclusion. However, it is also evident that the environmental dimension remains lagging behind, indicating that technological investment is not yet strategically oriented towards sustainable practices. Likewise, the qualitative results highlight tensions between the strategic and operational vision of technology, and reveal structural challenges such as lack of financing, digital literacy gaps, and resistance to cultural change.

The findings allow us to respond clearly to the objectives set out in the research. First, the degree of digitalization of cooperatives by segment was identified, evidencing greater progress in segment 3. Secondly, a statistically significant correlation between the technological maturity index and the general performance in CSR was confirmed, validating the hypothesis of positive influence. Finally, both the barriers and the facilitating factors that affect this relationship were identified, based on interviews with key actors, which allowed for the development of strategic recommendations and the generation of useful knowledge for the design of public policies and institutional practices.

From a systemic perspective, this study contributes to the strengthening of the Ecuadorian cooperative ecosystem by showing that digital transformation can be a way to enhance the sustainability and social impact of cooperatives. For control agencies, such as the Superintendence of Popular and Solidarity Economy, the results offer empirical inputs for the design of regulatory frameworks that integrate indicators of technological maturity as part of the evaluation of social performance. Likewise, the findings warn of the need for policies differentiated by segment, accompanied by technical and educational financing, which ensure that the digitalization process does not aggravate pre-existing gaps, but acts as a driver of equity, inclusion, and territorial cohesion.

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