

Reflections of Information Sharing and Collaborative Innovation in the Social Responsibility of Cooperatives

Ilse Maria Beuren¹
Vanderlei dos Santos¹
Daniele Cristina Bernd¹
Celliane Ferraz Pazetto¹

¹*Federal University of Santa Catarina, Graduate Program in Accounting, Florianópolis, SC, Brazil*

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Abstract

Purpose – This study analyzes the reflections of information sharing and collaborative innovation in the social responsibility, in its environmental, economic, and social dimensions, of cooperatives that form part of strategic alliances.

Design/methodology/approach – A survey was conducted of managers of Brazilian agricultural cooperatives that have strategic alliances and 91 valid questionnaires were obtained. The data collected were analyzed through structural equation modeling.

Findings – Information sharing had positive effects on collaborative innovation and the environmental dimension of social responsibility. No significant relationships were found between information sharing and social responsibility, in the economic and social dimensions, nor between collaborative innovation and social responsibility, in the environmental and economic dimensions.

Originality/value – The main contribution of the research is to examine the links between information sharing, collaborative innovation, and social responsibility. The study provides empirical evidence that information sharing between cooperative partnerships favors the exploration of new knowledge/technologies. It also reveals that information sharing helps social responsibility in its environmental dimension by providing information that can contribute to reducing the environmental impact of the activities of cooperative alliances. However, it suggests that information sharing influences collaborative innovation and social responsibility in its environmental dimension, but not in its economic and social dimensions.

Keywords – Information sharing; Collaborative innovation; Economic responsibility; Environmental responsibility; Social responsibility.



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I Introduction

Organizations are increasingly encouraged to work in networks, instead of competing as isolated entities (Wu, Wang, & Chen, 2017). In this context, cooperative societies feature as alternatives to the traditional business model, and are important drivers of innovation and sustainable economic development (Figueiredo & Franco, 2018). This is in line with the idea that cooperatives favor the social responsibility of their members. Social responsibility is not only an intrinsic element, but also essential in building competitive advantage.

Corporate Social Responsibility (CSR) represents a social strategy capable of generating value for cooperatives (Gallardo-Vázquez, Sánchez-Hernández, & Castilla-Polo, 2014). Amonarriz, Landart, and Cantin (2017) found that it is inherent to cooperative activity, as it is strategically proactive in facing economic crises and maintaining or even improving competitiveness. Social responsibility is analyzed in this study in its economic, environmental, and social dimensions (Triple Bottom Line).

The economic dimension is related to aspects of value generation (socioeconomic and financial) in cooperative management (Cuesta González & Valor Martínez, 2003). The environmental dimension covers issues related to minimizing the environmental impact of an organization in its productive activity and the appropriate use of resources to preserve the environment (Gallardo-Vázquez et al., 2014). The social dimension covers issues concerning the cooperative's impact on employees, members, and the community in terms of common well-being (Gallardo-Vázquez et al., 2014), which involves political (laws, customs) and cultural issues in the society in which it operates (Cuesta González & Valor Martínez, 2003).

The Triple Bottom Line is especially relevant for cooperatives, since it allows their social function to be incorporated into the economic function (Castilla-Polo, Gallardo-

Vásquez, Sánchez-Hernández, & Ruiz-Rodríguez, 2018). The literature recognizes that it affects quality indicators relating to the service provided by the cooperative, the satisfaction of its members, and performance (Gallardo-Vázquez et al., 2014). In most studies, social responsibility is considered an antecedent, usually of performance (Reverte, Gómez-Melero, & Cegarra-Navarro, 2016) or innovation (Peñalver, Conesa, & Nieves, 2018; Ueki, Jeenanunta, Machikita, & Tsuji, 2016).

Innovation is associated with the organization's reputation (Castilla-Polo et al., 2018). According to An, Deng, Chao, and Bai (2014), organizations need innovative processes, which can minimize costs and improve productivity, in order to survive in competitive markets. Borgen and Aarset (2016) observed that some cooperatives increased their competitiveness through collaborative innovation. For Sordi, Nakayama, and Binotto (2018, p. 44), "sharing knowledge efficiently becomes essential in this context, as it is from new knowledge that innovations are fundamentally conceived."

Collaborative innovation is an alternative geared toward problem solving, with the ability to adapt more easily to the demands of interorganizational parties (Donaldson, O-Toole, & Holden, 2011). It is the innovation resulting from a process, product, technology, or business, conceived by enhancing interorganizational relationships (Andersen & Drejer, 2009). Donaldson et al. (2011) warn that collaborative innovation requires communication at all levels of cooperating organizations. This is essential in sharing knowledge and building an understanding or shared expectation of the partnership.

In this study, it is assumed that the sharing of information stimulates cooperative innovation and the social responsibility of cooperatives, with the purpose of improving their reputation in the market and obtaining results and greater competitiveness. Information sharing implies ensuring that everyone involved in the partnership obtains timely and interesting information (Hu, Xu, Zhang, & Liu, 2017).

For Christ and Nicolaou (2016), partners can improve the efficiency, effectiveness, and control of an alliance through the implementation of an integrated information system. This is vital for the socio-economic well-being of those involved in the collaboration and its socio-ecological sustainability (Galappaththi, Kodithuwakku, & Galappaththi, 2016).

The literature highlights the importance of information sharing, collaborative innovation, and social responsibility in the formation of interorganizational strategic alliances, in different types of arrangements. However, little is known about how these constructs interrelate in alliances between cooperatives. As alliances are part of strategy (Nicolaou, Sedatole, & Lankton, 2011), the following research question arises: What are the reflections of information sharing and collaborative innovation in social responsibility (in its economic, environmental, and social dimensions) in cooperatives that form strategic alliances?

Cooperatives are the target of this research due to their ability to integrate different interest groups (suppliers, customers, shareholders, and employees) as partners. In these interactions, dialogue between stakeholders and democratic participation in decisions is encouraged through transparency, which contributes to meeting the expectations of the various interest groups in a balanced way (Belhouari, Buendía, & Tremblay, 2005). The European Commission (2002) highlights that cooperatives combine viability and social responsibility through dialogue and the participatory management of stakeholders.

Gallardo-Vázquez et al. (2014) warn that cooperatives present peculiarities that deserve to be studied. They emphasize that the difference lies in the dual nature of fulfilling economic and social objectives, which gives a more humanistic perspective to day-to-day operations and differentiates cooperatives from private companies, which are concerned mainly with financial returns. For Amonarriz et al. (2017), cooperatives contribute to sustainable economic,

social, and environmental development, expanding social responsibility as a means of development. CSR has been considered more effective in cooperative societies than in other organizational configurations because they share common values and principles, according to the International Cooperative Alliance (ICA, 2018). Informational integration can lead to behaviors that incite innovations with peers (collaboration) and incentives for CSR.

This study contributes by offering insights on how information sharing can improve collaborative innovation and have an impact on social responsibility in cooperatives that made strategic alliances with a view to achieving competitiveness. This involves: (i) minimizing the environmental impact of the cooperative in its productive activity; (ii) using resources properly; (iii) promoting efforts to preserve the environment; (iv) seeking the common welfare of employees, members, and the community; (v) serving different stakeholders; (vi) developing new products and services quickly and efficiently; and (vii) being economically viable.

2 Theoretical bases

2.1 Literature review

Business models are increasingly engaging in interorganizational collaborations (Nicolaou et al., 2011). A stream of research has outlined the results from interorganizational collaborations, empirically attesting that collaborations between organizations result in the sharing of critical resources, facilitate the transfer of knowledge, and help the organizations to achieve a more central and influential position compared to others (Hardy, Phillips, & Lawrence, 2003). The sharing of critical resources at the interorganizational level depends on the objectives of the strategic alliance, but one common element is information sharing (Christ & Nicolaou, 2016).

For Lin (2007), information sharing should be understood as a culture of social interactions, due to the exchange of knowledge,

experiences, and skills. Galappaththi et al. (2016) add that in the economic conception, information is a resource that can be used for income generation and business activities, if it is widely shared and easily accessible; otherwise, it can become a barrier, triggering negative results. Khan, Hussain, and Saber (2016) point to information sharing as a basis for developing, maintaining, and strengthening the process of managing the environmental and social impacts of a supply chain. The sharing of information between partners is essential to coordinate and control the alliance (Christ & Nicolaou, 2016).

Dekker, Ding, and Groot (2016) found in their literature review that companies in interorganizational relationships exchange information to examine previous results, coordinate and readjust their position, solve joint problems, and facilitate the establishment of goals and controls. They also found that this sharing favors the use of information related to performance, since it: (i) allows partners to create a common orientation; (ii) encourages them to act in the best interests of the collaboration; and (iii) encourages them to act to maximize the interests of the collaboration and emphasizes the parties' responsibility for the results.

The relevance of collaboration is determined by the different goals that organizations seek in it and the importance attached to those goals (Dekker et al., 2016). One of the elements required in cooperations relates to innovation, which increasingly depends on collective actions to improve technologies (Andersen & Drejer, 2009), as in the case of collaborative innovation. Collaborative innovation is a spontaneous alternative oriented toward problem solving, with the ability to adapt more easily to interorganizational demands and reduce transaction costs and risks associated with the involvement of external people (Donaldson et al., 2011).

Reverte et al. (2016) investigated the mediating effect of innovation on the relationship between CSR and performance. They observed

positive and significant effects of CSR on performance and innovation, and confirmed the mediating effect of innovation in this relationship, but the study was restricted to the manufacturing segment. With the increasing race to develop new products and services, companies tend to foster collaborative innovation, for example in their supply chains, in order to maintain and improve their performance in the long term (Wang & Hu, 2017).

Rexhepi, Kurtishi, and Bexheti (2013) mention that there is no absolute definition for corporate social responsibility and conceive it as the continuous commitment of organizations to behave ethically and contribute to economic development, improving the quality of life of the workforce and their families, as well as the local community and society in general. According to Ribeiro (2002), social responsibility can be linked to the idea of acting correctly, as well as to contributing to the development of a more sustainable world.

Carrasco (2007) highlights that corporate social responsibility has recently gained greater emphasis. This is reflected in the opinions of the European Commission (2002), which defines CSR as a company's contribution to sustainable development, in addition to covering agreements and legal commitments and duties of the company with its stakeholders (stakeholders), where it adopts a medium and long-term view of the business. It is necessary for a company to be socially responsible not only to fulfill its obligations, but also to go beyond them and make greater investments in human capital, in the environment, and in the relationships with its stakeholders (Taddei & Delécolle, 2012).

Among the different ways of understanding CSR, Gallardo-Vázquez et al. (2014) presented as a theoretical basis for studying the paradigm that: (i) considers CSR as a social strategy, capable of generating value for organizations; and (ii) is aligned and is congruent with the adopted business strategy. In the literature on CSR, there are studies that have investigated this

phenomenon in cooperatives (e.g., Amonarriz et al., 2017; Gallardo-Vázquez et al., 2014; Taddei & Delécolle, 2012). Using different methodologies, the organizational approach has involved CSR, in its three dimensions (economic, environmental, and social), also referred to as 3P (people, planet, and profit).

The economic dimension applied in this context is related to socioeconomic and financial aspects of the management of cooperatives, involving a responsible way of doing business. It involves delivering products and/or services to customers, maintaining stable relationships with responsible suppliers, and managing possible complaints (Agudo-Valiente, Garces-Ayerbe, & Salvador-Figueras, 2012). The social dimension corresponds to the impacts of cooperatives on society. It involves external social issues, such as education, social inclusion, the generation of employment, and volunteering (Rexhepi et al., 2013). The environmental dimension relates to the adequate use of resources and efforts to preserve the environment (Gallardo-Vázquez et al., 2014). It involves considering emissions and waste control, energy use, product life cycles, and sustainable development (Rexhepi et al., 2013).

To perform in all three dimensions, organizations need new, long-term economic, environmental, and social partnerships that help each partner to perform traditional tasks more efficiently, thus achieving greater results than they could achieve alone (Elkinton, 1998). When analyzing CSR, Gimenez, Sierra, and Rodon (2012) found that collaboration in a value chain contributed to improving the three dimensions and, despite possible negative (short-term) effects of social practices, it is necessary to implement collaborative practices with partners as the individual measurements did not show an impact on the dimensions.

When proposing a theoretical model to explain social responsibility in cooperatives, Gallardo-Vázquez et al. (2014) identified an orientation measured by a set of indicators, among them the three dimensions of CSR. This involves

a multidimensional construct and is reflected in its three sub-constructs: (i) information (on issues related to CSR); (ii) disclosure (information inside and outside the cooperative that favors competitive advantages); and (iii) response (to the three elements of the Triple Bottom Line). The innovation of cooperatives is among the related variables used for guidance (Gallardo-Vázquez et al., 2014).

2.2 Justification of the hypotheses

Christ and Nicolaou (2016) confirmed in an interorganizational context the model that predicts that when organizations are engaged in alliances with a high degree of collaboration, they are more likely to use integrated information systems, as they allow the sharing of information between alliance partners. Sharing and collaboration are elements that explain the performance of interorganizational relationships, since sharing favors collaboration between members (Wu, Chuang, & Hsu, 2014).

Collaborative agreements affect innovation management, especially with regard to innovative capabilities and techniques for managing information, knowledge, ideas, patents, and licenses (Hülsmann & Pfeffermann, 2011). Donaldson et al. (2011) highlight that when parties come together to innovate, this involves communication. The authors emphasize the relevance of the relational communication strategy, which is capable of providing a basis for promoting a favorable environment for innovation projects, in addition to a culture of open and shared communication.

Communication in collaborative innovation projects is essential, considering that it is a notable part of the process and dialogue between partners (Donaldson et al., 2011). This involves bipartisan exchange, which can be strengthened by communication and the information-sharing network (Chesbrough & Appleyard, 2007). Communication provides better coordination of the flow of information and collaborations among the members of

these interactions, through the sharing of ideas, exchanges with the parties involved, and dialogues related to innovation processes (Donaldson et al., 2011).

Among the interorganizational information commonly shared, the following stand out: market demands, customer preferences, sales promotion, and the introduction of new products (Mentzer, Min, & Zacharia, 2000). Information about market preferences and competition allows for the development of innovative mechanisms in pricing strategies and enable sales, distribution, and interaction marketing. Lin, Chen, and Chiu (2010) found a positive and direct relationship between information sharing and innovation capabilities.

Damanpour (1991) observed that organizational innovation is subject to individual, organizational, and environmental influences. Of all these potential influences on innovation, organizational variables have been the ones most explored in the literature. Among numerous organizational variables that have an impact on innovation, external and internal communication stands out. Thus, it is postulated that these relationships should be positive, facilitating the spread of ideas and enabling new ideas and information exchange. Thus, the first hypothesis is formulated:

H_1 : Information sharing directly and positively affects collaborative innovation.

In addition to the existence of collaborative interactions, organizations need to achieve innovation, greater customer satisfaction, comply with legal requirements, and pay attention to CSR (Ueki et al., 2016). For Peñalver et al. (2018), innovation can be expanded when the company is considered socially responsible. Just as an increase in innovation can foster competitiveness, it allows for an increase in the effect on CSR (Gallardo-Vázquez et al., 2014). Previous studies have already demonstrated a connection between the capacity for innovation and commitment to CSR (Taddei & Delécolle, 2012). Graafland and Zhang (2014) highlight that the literature has paid

more attention in recent years to the association between innovation and CSR.

According to Martínez-Conesa, Soto-Acosta, and Palacios-Manzano (2017), the relationship between innovation and CSR has been analyzed and proven to be positive in several previous studies. Gallego-Alvarez, Prado-Lorenzo, and Garcia-Sanchez (2011) point out that the association between innovation and CSR has been studied as a two-way phenomenon, although much of the literature has focused more on analyzing the influence of social responsibility practices on innovation. Ueki et al. (2016) found a relationship between social responsibility and innovation.

Gallardo-Vázquez and Sanchez-Hernandez (2014) found a direct and positive relationship between the level of information on environmental responsibility that managers have, its dissemination, and the predisposition to respond favorably to society's social demands, represented by environmental responsibility. Reverte et al. (2016) found a positive and significant relationship between CSR and innovation. Other studies have identified positive impacts of collaborative innovation, such as that of Wang and Hu (2017), who in an interorganizational context observed that collaborative innovation activities increased innovation performance.

Collaborative innovation can be an explanatory element of social responsibility actions, since it acts as a coordination mechanism for sharing knowledge, information, and technologies in strategic alliances (Donaldson et al., 2011). Despite evidence of the link between innovation and CSR, little attention has been paid to these interactions in the interorganizational context. This field requires research that considers that collaborative structures cause re-adaptations, which may represent innovations, and are based on the precepts of CSR in management, products, and processes.

In this research, it is assumed that innovation has the characteristic of disseminating

values shared by the team, within different types of organizational cultures, thus having different effects (Cabello, Carmona, & Valle, 2005). This favors the adoption of new ideas or behaviors in an organization (Damanpour & Gopalakrishnan, 2001) and is reflected in CSR actions. Thus, the second hypothesis is formulated:

H₂ – *Collaborative innovation directly and positively affects CSR, and has positive associations with the environmental (H_{2a}), economic (H_{2b}), and social (H_{2c}) dimensions.*

It is suggested, therefore, in the scope of environmental responsibility (H_{2a}), that companies need to adopt innovation in processes and products to increase energy efficiency and reduce the consumption of materials and the impact of the use of products/services on the environment, such as through emissions of CO₂ (Gallego-Álvarez et al., 2011). Investments in research and development provide opportunities for the use of modern and greener technologies (Rexhepi et al., 2013). In terms of economic responsibility (H_{2b}), the behaviors of organizations can be expanded by generating value for: a) the shareholder or owner; b) the customer, by meeting their demands (competitive prices, etc.); c) suppliers, by paying fair prices for their products or services; and d) employees and managers, by preserving and generating jobs, fair wages, social benefits, training, stability, and motivation. And in terms of social responsibility (H_{2c}), innovation involves initiatives that improve the general well-being of society, aiming to respect customs and cultural heritage and encourage more active involvement of the organization in political and cultural life (Cuesta González & Valor Martínez, 2003).

Corporate social responsibility can offer opportunities for innovation and CSR practices can lead to innovation through the use of social, environmental, or sustainability factors to create new ways of working, new products, services, processes, and new market space (Gallego-Álvarez

et al., 2011), which requires sharing information in contexts of strategic alliances. The cooperative movement has been a pioneer in the development of CSR, since it recognized from the beginning that its actions affect its members, workers, and the community in which it operates (Mariño, 2015). In addition to being based on the ethical values of honesty, transparency, social responsibility, and care for others, it is also based on values of genuine long-term commitment to CSR.

Taddei and Delécolle (2012, p. 74) found that in French cooperatives “the motivation of managers is rarely related to sustainable development practices,” and they generally find aspects of CSR that guarantee benefits, such as improved economic performance. The dissemination of information about CSR is important for managers to accept these practices, as it affects their attitudes; therefore, such information must consider the social consequences of the organization’s operations, best practices, and cost/benefit resulting from the responsibly sustainable approach.

Khan et al. (2016) highlight that information sharing is fundamental to development, maintenance, and improvement, in addition to being essential to the process of managing environmental and social impacts in the supply chain. In this sense, it is assumed that cooperatives’ information sharing can act to promote social responsibility. Efforts to share ideas and information can improve the organization’s commitment to developing social projects, aiming to legitimize its CSR (Lyra, Gomes, & Pinto, 2017). Based on these arguments, the third hypothesis is formulated:

H₃ – *Information sharing has a direct and positive impact on CSR and has positive associations with the environmental (H_{3a}), economic (H_{3b}), and social (H_{3c}) dimensions.*

In interorganizational relationships, where information sharing proves to be a mechanism that expands communications, it is relevant

to understand the phenomena that surround these partnerships. In this context, the direct and indirect reflections of information sharing in the innovation and CSR of cooperatives are highlighted. The role of collaborative innovation is considered, which easily adapts to the demands of interorganizational parties (Donaldson et al., 2011). Among the studies that have addressed innovation as a mediating variable, that of Peñalver et al. (2018) stands out as it confirmed the partial mediation of innovation in the relationship between cooperation and performance in cooperatives.

In interorganizational relationships, partners need to share information, which favors collaborative behavior in carrying out activities among the parties. This may be what results and financial and non-financial benefits are expected

from both (Wu et al., 2014). In the present study, it is postulated that information sharing provides positive and socially responsible results based on the three dimensions of CSR, through the mediation of collaborative innovation in this relationship. Based on the arguments presented, and those that supported the previous hypotheses, the fourth hypothesis is formulated:

H₄ – *Collaborative innovation positively mediates the relationship between information sharing and CSR, in the environmental, economic, and social dimensions.*

Figure 1 shows the theoretical model of the research, with the constructs and the direction of the proposed hypotheses.

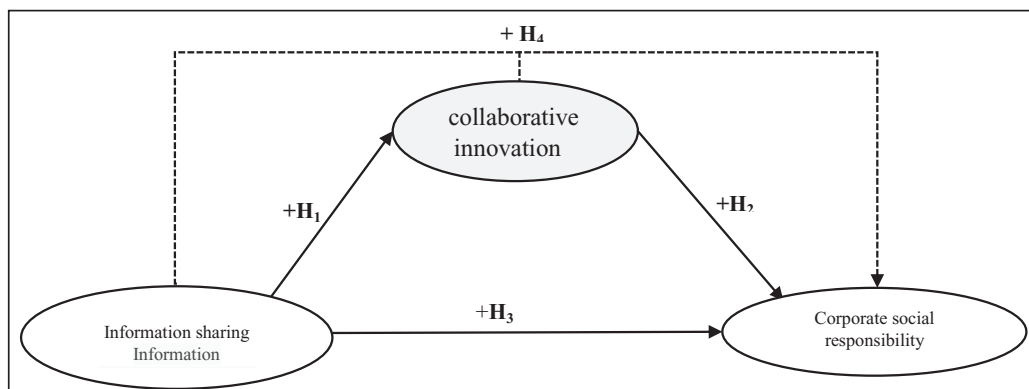


Figure 1. Theoretical research model.

As shown in Figure 1, the proposal is to analyze the direct effect of information sharing on collaborative innovation (H_1), the direct effect of collaborative innovation on CSR (H_2), the direct effect of information sharing on CSR (H_3), and the mediating effect of collaborative innovation in the interaction between information sharing and CSR (H_4).

3 Methodological Procedures

3.1 Population and sample

The research population consists of Brazilian agricultural cooperatives, which bring together cooperatives of rural, agropastoral, and fishery producers, and whose role is to receive, trade, store, and industrialize their members' production, in addition to offering technical, educational, and social assistance (Organization of Brazilian Cooperatives - *Organização das*

Cooperativas Brasileiras – OCB, <http://www.ocb.org.br/OCB>, retrieved on June 21, 2018). The choice of cooperatives is due to their common practice of forming alliances among themselves and their cooperation in innovation projects, in order to obtain competitive advantages (Peñalver et al., 2018).

According to the International Cooperative Alliance (ICA, 2018), a cooperative is defined as an autonomous association of people voluntarily united to satisfy their common economic, social, and cultural needs and aspirations through a jointly and democratically controlled enterprise. For Galappaththi et al. (2016), cooperatives are locally owned entities, owned by their members and managed collectively, and affect the well-being of the community. The members are simultaneously owners, controllers, and economic partners and, therefore, the cooperative's main stakeholders. This explains the motivation for them forming alliances among themselves.

Cooperatives play an increasingly important role worldwide, employing over 100 million people and fostering job creation, economic growth, and social development (Ruostesaari & Troberg, 2016). In Brazil, cooperativism has been seen as a modernization mechanism, for example for agriculture, a strategy for economic growth, and an instrument of social change. It seeks to harmonize the economic, social, and cultural dimensions of the country's development process, regardless of the structural conditions on which it overlaps (Scopinho, 2007).

Of the cooperatives listed on the OCB website, the largest agricultural sector was selected, resulting in 939 cooperatives in 14 Brazilian states. For each of the cooperatives with strategic alliances, in LinkedIn the positions of "manager," "coordinator," and "supervisor" were used as filters, therefore focusing on an intermediate level. An invitation was sent to the 1,255 managers identified, and access to the questionnaire on SurveyMonkey was provided to the 530 who accepted the invitation, with subsequent reminders sent in the months from June to August 2018. This resulted in a sample of 91 valid questionnaires.

3.2 Measurement of variables

The three constructs – information sharing, collaborative innovation, and social responsibility – were measured by multiple items. Each statement was based on a Likert-type or seven-point semantic differential scale.

In the case of the information sharing construct, there were five statements about the information system available to be used by the cooperatives of the strategic alliance, which were adapted from the research conducted by Christ and Nicolaou (2016), using a scale ranging from totally disagree (1) to totally agree (7). Five statements from the study by Dekker et al. (2016) were used to find out how much information they exchange in the alliance on costs, marketing activities, operational performance, recruitment, and product/technology development, using a scale from 1 to 7 (1 = very little and 7 = a lot).

In addition, three statements were presented to the managers to assess how they characterize the exchange of information with alliance partners, extracted from the research conducted by Christ and Nicolaou (2016). To analyze the perceived effects of information sharing, a semantic differential scale was used in each situation (significant threat versus significant opportunity, potential for loss versus potential for gain, negative situation versus positive situation).

Therefore, the central variables of the information sharing construct were: (i) integrated information systems; (ii) quantity and type of information shared; and (iii) information sharing effects. The exploratory factor analysis grouped the statements into four groups: sharing of economic and financial information (costs and sales), sharing of operational information (product and technology development, marketing activities, recruitment and training, and operational performance, but this was excluded), effects of information sharing, and integrated information systems. The total explained variance was 76.43% and the Cronbach's alpha was 0.885.

The collaborative innovation construct, based on the study conducted by Wang and Hu

(2017), is composed of collaborative innovation activities and collaborative innovation capacity, which formed a single component in the factor analysis. Of the seven statements on the scale from 1 to 7 (1 = infrequent and 7 = very frequent), five measured the frequency of the involvement of each cooperative in collaborative innovation activities in the interorganizational relationship, in the last five years; and two measured the ability to ensure that the knowledge/technology generated by any cooperative in the alliance is captured and exploited. One component was extracted from the exploratory factor analysis and the Cronbach's alpha was 0.915.

The social responsibility construct was analyzed under three dimensions: environmental, economic, and social. The respondents indicated their degree of agreement with each statement, on a scale from 1 to 7 (1 = strongly disagree and 7 = strongly agree). These statements were extracted from the study by Gallardo-Vázquez et al. (2014), who proposed a framework with eight statements in each dimension to assess social responsibility in cooperative societies. In the economic dimension, six factor statements were used to capture aspects of the quality of products/services offered by the cooperative, customer satisfaction, the relationship with suppliers, and management of possible complaints, among others. The Cronbach's alpha was 0.903.

In the environmental dimension, seven statements were used related to minimizing the cooperative's environmental impact in its productive activity and adequate use of resources to preserve the environment (Gallardo-Vázquez et al., 2014). The Cronbach's alpha was 0.911. In the social dimension, six statements were used related to the determinants of pleasant working conditions and oriented towards social well-being, especially social development. The Cronbach's alpha was 0.895. The exploratory factor analysis confirmed the three dimensions as being distinct, and the total explained variance was 68.48%. The Cronbach's alpha for the social responsibility construct was 0.940.

3.3 Statistical procedures

In order to test the hypotheses, the structural equation modeling (SEM) technique estimated from partial least squares (PLS) was used. PLS is a multivariate analysis technique that provides conclusions in a comprehensive and systematic way by simultaneously modeling the relationships between multiple dependent and independent constructs (Hair, Anderson, Tatham, & Black, 2016).

A PLS-SEM model is usually analyzed in two sequential steps: measurement model and structural model (Hair Jr. et al., 2016). The measurement model evaluates: (i) average variance extracted (AVE); (ii) Cronbach's alpha; (iii) composite reliability; and (iv) discriminant validity. In the structural model, the path coefficients and their level of significance are analyzed, as well as indicators to assess the quality of the model.

The information sharing construct was analyzed jointly with a second order variable, formed by the statements on integrated information systems, the effects of sharing, sharing of economic and financial information and operational information. When evaluating the measurement model, it was necessary to consider the results obtained with the first order model (Becker, Klein, & Wetzels, 2012). Finally, it was analyzed whether collaborative innovation plays a mediating role in the relationship between information sharing and corporate social responsibility.

4 Data Analysis

4.1 Measurement model

In order to validate the measurement model, the validity and reliability of the constructs were verified (Table 1). Internal (Cronbach's alpha) and composite reliability (greater than 0.7) were found, ensuring the consistency and capacity of the instruments adopted to measure the phenomena. Convergent validity was also

found, as the AVE coefficients are above 0.50 (Peng & Lai, 2012), signaling the adequacy of the correlations between the external loads of the indicators and the latent variables (LVs). Discriminant validity was also found, since when comparing the square root of the AVE of each

construct with the other correlation coefficients, these were found to be superior (Fornell & Larcker, 1981), indicating that each construct is capable of capturing unique phenomena of the model proposed.

Table 1
Validity of the measurement model

	1	2	3	4	5	6	7	8
1. Integrated Information Systems	0,804							
2. Sharing Effects	0,359	0,922						
3. Economic and Financial Information	0,473	0,407	0,925					
4. Operational Information	0,454	0,362	0,550	0,827				
5. Collaborative Innovation	0,384	0,182	0,308	0,449	0,815			
6. Environmental Responsibility	0,371	0,122	0,214	0,350	0,378	0,811		
7. Economic Responsibility	0,330	0,275	0,190	0,226	0,364	0,550	0,825	
8. Social Responsibility	0,256	0,213	0,152	0,427	0,427	0,642	0,635	0,815
<i>AVE</i>	0,646	0,851	0,856	0,684	0,665	0,658	0,681	0,664
<i>Composite Reliability</i>	0,901	0,945	0,927	0,866	0,933	0,930	0,927	0,922
<i>Cronbach's Alpha</i>	0,867	0,914	0,851	0,770	0,916	0,913	0,905	0,897

Note. N=91. The diagonal elements represent the square roots of the average variance extracted (AVE). The elements outside the diagonal represent the correlations among the constructs.

The correlation coefficients (Table 1) show that all the constructs have positive associations with each other. The dimensions of information sharing, integrated information systems, sharing effects, economic-financial information, and operational information, even though they are complementary and have associative interactions, denote independence in their representation units. The same occurs in the dimensions of CSR.

As for the correlations between collaborative innovation and the information sharing LVs, greater associations are observed with operational information (0.449) and integrated information systems (0.384). Collaborative innovation is more strongly associated with the social dimension (0.427) of CSR. In the correlations between the information sharing LVs and CSR LVs, the interactions between sharing operational information and social responsibility (0.427) and between integrated information

systems and environmental responsibility (0.371) stand out.

High correlations can signal the presence of multicollinearity (Hair et al., 2016). Thus, the variance inflation factor (VIF) was analyzed in SmartPLS, which had a maximum value of 1.726, indicating the absence of multicollinearity between the latent variables.

4.2 Structural model

In the structural model, estimates of structural equations were performed to validate the relationships based on the theoretical foundations; thus, the bootstrapping and blindfolding techniques were performed (Hair Jr. et al., 2016). The coefficients of the relationships estimated in the structural model and the levels of significance of the relationships are shown in Table 2.

Table 2
Validation of the structural model and hypotheses

Hypotheses	Direct relationships between constructs	Path	T Value	P Value
H ₁	Information Sharing ⇒ Collaborative Innovation	0,475	4,521	0,000
H _{2a}	Collaborative Innovation ⇒ Environmental Responsibility	0,241	1,862	0,064
H _{2b}	Collaborative Innovation ⇒ Economic Responsibility	0,238	1,649	0,100
H _{2c}	Collaborative Innovation ⇒ Social Responsibility	0,325	2,397	0,017
H _{3a}	Information Sharing ⇒ Environmental Responsibility	0,290	2,248	0,025
H _{3b}	Information Sharing ⇒ Economic Responsibility	0,265	1,903	0,058
H _{3c}	Information Sharing ⇒ Social Responsibility	0,214	1,556	0,121

Note: N=91.

R²= Collaborative Innovation (0.225); Environmental Responsibility (0.209); Economic Responsibility (0.187); Social Responsibility (0.217).

F²= Collaborative Innovation (0.291); Environmental Responsibility (0.083); Economic Responsibility (0.067); Social Responsibility (0.045).

Q²= Collaborative Innovation (0.186); Environmental Responsibility (0.168); Economic Responsibility (0.086); Social Responsibility (0.147).

The Pearson's coefficients (R²) indicate that collaborative (22.5%), environmental (20.9%), economic (18.7%), and social (21.7%) innovation have a moderate effect on the predictive accuracy of the model. The performance of each construct in explaining the model (F²) showed a moderate effect of collaborative innovation (0.291) and a small effect of the CSR variables, which indicates

low performance (effect) of the CSR dimensions in the design of the model structural. The Q² values indicate that the model has predictive relevance, since all of them were higher than zero (Peng & Lai, 2012). This suggests that the predictors of these variables are able to explain interactions between them. Figure 2 shows the structural model.

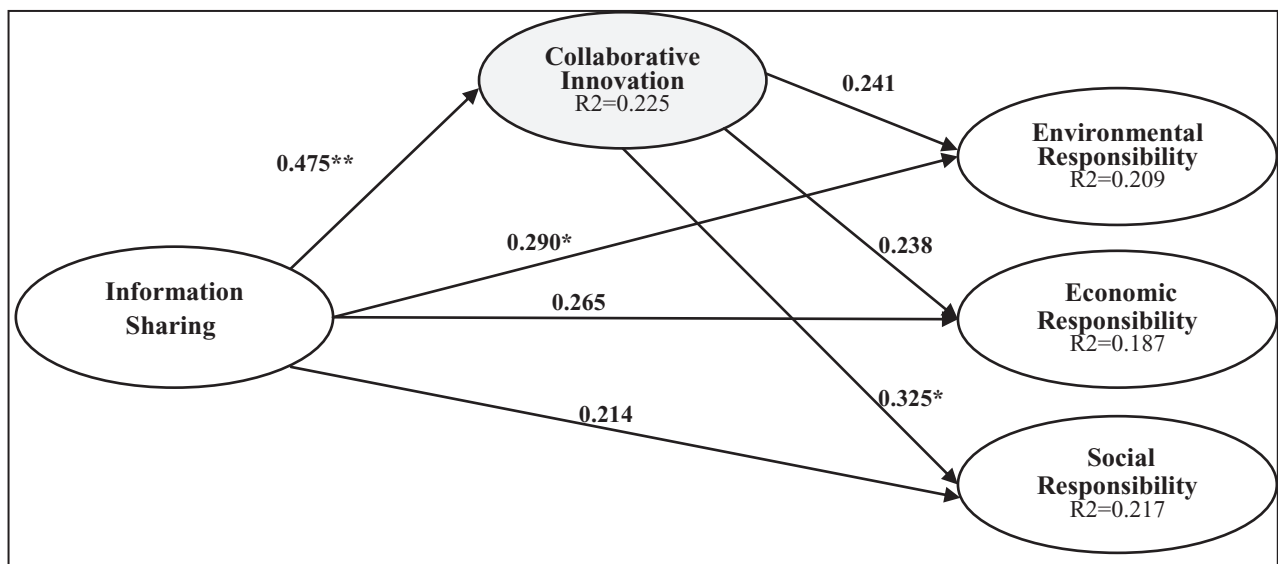


Figure 2. Structural model.

Note: N=91. *= $p < 0.05$; **= $p < 0.01$.

The data in Table 2 and Figure 2 confirm H_1 , in that there is a positive and significant relationship between information sharing and collaborative innovation (β 0.475; $p < 0.01$). This suggests that the systems used to share information between partner cooperatives foster collaborative innovation by expanding the network of access and collaboration resources and the interactions between them. The relationship between collaborative innovation and CSR (H_2) was partially confirmed, only for social responsibility (H_{2c} - β 0.325; $p < 0.05$). This suggests that, even if there are collaborative activities and the capacity to innovate in partnerships, these may not be directly disseminated through CSR actions, in all their dimensions. No significant positive associations were found between collaborative innovation and environmental responsibility (H_{2a}) and between collaborative innovation and economic responsibility (H_{2b}).

For H_3 , which predicted direct relationships between information sharing and social responsibility, only the environmental dimension showed a positive and significant relationship (β 0.290; $p < 0.05$), which leads to the confirmation of H_{3a} . These results reinforce what was observed in the study by Gallardo-Vázquez et al. (2014), where there was a more significant association between both the economic and environmental dimensions of CSR and information sharing. The interaction between information sharing and the social dimension of CSR was not supported (H_{3c}), nor with the economic dimension (H_{3b}). It is possible that this interaction did not capture certain elements, as CSR tends to be largely concerned with the cooperative's impact on society, including long-term actions (Gallardo-Vázquez et al., 2014).

The non-confirmation of H_2 for the environmental and economic dimensions and of H_3 for the economic and social dimensions of CSR made it impossible to test H_4 , involving the mediation of the collaborative innovation variable between information sharing and CSR. In other words, H_4 cannot be confirmed due to the non-

significance of the influence of direct relationships between the other constructs and CSR. These results prompt more research to understand the non-significance of the relationships between information sharing and the CSR dimensions and the effect of collaborative innovation.

4.3 Discussion of results

The results indicate that the sharing of information among the cooperatives studied stimulates collaborative innovation and CSR in the environmental dimension. No significant relationship was found between collaborative innovation and environmental and economic responsibility, or between information sharing and the economic and social dimensions of CSR. These results suggest that the sharing of economic-financial (costs and sales) and operational information (product/technology development, marketing activities, recruitment) favors interaction between the partner cooperatives so that new knowledge/technologies are captured and exploited. It also allows cooperatives in the alliance to cooperate in carrying out collaborative research and product development projects.

The positive association between information sharing and collaborative innovation suggests that integrated information systems serve as a platform to provide technical support to partner cooperatives, manage relationships based on mutual trust, identify the main collaborative innovation partners for each phase of a project, allow associations with suppliers or customers in the chain to research and develop new products, and improve administrative processes and innovations. These results are in line with the findings of Christ and Nicolaou (2016), in that organizations get involved in alliances to obtain knowledge and expertise, manufacturing capacity, and access to intellectual property and financing. They also reinforce the understanding of Chesbrough and Appleyard (2007), in that collaborative innovation can be strengthened by the communication network and the sharing of information.

Although there was a positive association between information sharing and collaborative innovation (H_1), there was no empirical support for H_2 in the economic and environmental dimensions; however, collaborative innovation has positive and significant effects on social responsibility. This may signal that the reflections of collaborative innovation are not immediate in the economic and environmental dimensions. The correlation coefficients shown in Table 1 reinforce this understanding, where collaborative innovation is associated with the social dimension (0.427), followed by the environmental (0.378) and economic (0.364) dimensions. However, the structural relationships shown in Table 2 were not significant for the economic and environmental dimensions, which does not allow for their effects to be confirmed. Gallego-Alvarez et al. (2011) and Martinez-Conesa et al. (2017) highlight that the association between innovation and CSR is a bidirectional phenomenon, which may explain these results.

The non-significant relationship between information sharing and the economic and social dimensions may result from the fact that strategic alliances have multiple objectives and encompass any or all of them simultaneously (Christ & Nicolaou, 2016). Thus, the sharing of information between the cooperatives investigated may be more focused on the coordination and control of interorganizational relationships, and prioritize information as a resource for carrying out activities and generating income, without delving into the cooperatives' impacts on society (Gallardo-Vázquez et al., 2014). In addition, the use of integrated management systems and the sharing of economic-financial and operational information are characterized as formal controls, while the social dimension includes informal controls (customs, political, social, and cultural involvement) (Cuesta González & Valor Martínez, 2003). As the social dimension (H_{2c}) is intrinsic in each cooperative, it may not be necessary to use a formal system to foster cooperatives' concern for the well-being of stakeholders.

5 Final Considerations

5.1 Theoretical implications

This study contributes to the literature by examining the connections between information sharing, collaborative innovation, and social responsibility (environmental, economic, and social) in cooperatives that form part of strategic alliances. Most of the literature has addressed the interaction between up to two of these constructs. The results of this study indicated that the sharing of information in a cooperative alliance is essential to foster innovation and be reflected in CSR, in its environmental dimension, as long as it is perceived as having potential for gains and opportunities. They also suggest that the effects of collaborative innovation on the economic and environmental dimension of CSR are not immediate. However, the role of social concerns has received less attention in CSR research, despite the growing need for greater transparency (European Commission, 2002).

The study also contributes to investigating the scope of CSR in cooperatives. Although some studies have assumed that cooperatives represent entities based on constitutive values of CSR (Gallardo-Vázquez et al., 2014), most of them in the area of social responsibility have concentrated on corporations of different sizes (Amonarriz et al., 2017). One of the contributions of this study relates to the evidence that information sharing stands out in collaborative contexts, fostering innovation, mainly for strengthening and enhancing relationships. It also validates the social responsibility constructs theoretically proposed by Gallardo-Vázquez et al. (2014) in the context of cooperatives.

5.2 Practical implications

The results of the study also have practical implications for cooperative societies by indicating that information sharing is a mechanism that contributes to the cooperatives of a strategic alliance fulfilling their environmental objectives.

To foster collaborative innovation and develop CSR, partner cooperatives must provide access to relevant parts of their internal databases and use information systems that enable the management of the supply chain and assist in the relationship with their customers. It also requires a variety of information to be shared, of both an economic-financial and operational nature. Information sharing should not be perceived as an immediate risk, but should result from cooperation and trust between the parties.

5.3 Limitations and suggestions for future research

The limitations of this research must be considered in the analysis of the proposed causality relationships, since the results show only statistical associations between the paths of the model. The effects of innovation on CSR were addressed, but the two-way relationship was not explored. Alternative research methods could be adopted to provide more concise information about the model's causal relationships. Future research could investigate the effects of informal controls on the development of the social dimension of CSR. It could also explore the effects of information sharing on the performance of alliances, mediated by the three dimensions of CSR. The perceived risks of information sharing may be moderating variables in the relationship between information sharing and collaborative innovation.

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Appendix A

1 Information Sharing

1.1 Shared information

Indicate on the scale from 1 to 7 (1 = very little and 7 = a lot) how much information your cooperative and the other partners (central and other network/alliance cooperatives) exchange regarding:

1. Costs
2. Sales
3. Product/technology development
4. Marketing activities
5. Operational performance
6. Recruitment and training

1.2 Effects of information sharing

How would you characterize the exchange of information with your alliance and central cooperative partners? Consider the scale from 1 to 7 for each of the statements.

- | | |
|-------------------------------|----------------------------|
| 1. Significant threat | 7. Significant opportunity |
| 1. Potential for losses | 7. Potential for earnings |
| 1. Negative situation | 7. Positive situation |

1.3 Integrated information systems

Indicate your level of agreement with each of the statements below regarding the Information System available for use in your strategic alliance, considering the scale from 1 to 7, where 1 = strongly disagree and 7 = strongly agree.

1. The Information System allows the use of extranets via the web or other methods of sharing data with partner cooperatives.
2. My network/alliance partners allow me to have electronic access via the web to relevant parts of the central database.
3. The network/alliance's Information Systems served as an essential platform to help build my cooperative's information infrastructure, including via web training resources.
4. My cooperative's Information System allows the use of complementary modules over the web, including management of the supply chain and customer relationship management.
5. My cooperative uses collaboration resources over the web, enabled by our Information System.

2 Collaborative Innovation

Indicate the frequency of your organization's involvement in collaborative innovation activities in the supply chain network, in the last five years, considering the scale from 1 to 7, where 1 = infrequent and 7 = very frequent.

2.1 Capacity for collaborative innovation

1. We are able to build and manage relationships based on mutual trust, communication, and commitment to ensure that new knowledge or technology is captured and exploited in the supply chain network.
2. We are able to identify key collaborative innovation partners, along with their roles and responsibilities, and cooperate with them to build collaborative research and development projects in the supply chain network.

2.2 Collaborative innovation activities

1. We often partner with suppliers or customers in the supply chain network to research and develop new products.
2. We often provide technical support to other partners in the supply chain network.
3. Suppliers or customers are frequently consulted about the new products in research and development.
4. Suppliers or customers have become fully involved in the process of researching and developing new products.
5. Our product research and development teams, made up of two or more other supply chain organizations, frequently interact with each other.

3 Social Responsibility

Indicate your level of agreement with each of the statements below in relation to your organization, considering the scale of 1 to 7, where 1 = strongly disagree and 7 = strongly agree.

3.1 Environmental dimension

1. We use products with a low environmental impact.
2. We plan our investments to reduce the environmental impact.
3. We use recyclable containers and packaging.
4. We take energy savings into account to improve our efficiency levels.
5. We attach a high value to the introduction of alternative energy sources.
6. We design environmentally friendly products and services.
7. We promote reductions in gas emissions and waste production.
8. We promote responsible consumption (information on the efficient use of the product, waste, etc.).

3.2 Economic dimension

1. The cooperative is characterized as having the best quality/price ratio.
2. The guarantee of our products and/or services is better than the industry average.
3. We offer customers accurate and complete information about our products and/or services.
4. Respect for consumer rights is a priority for the administration.
5. The cooperative strives to improve stable relationships with suppliers based on collaboration and mutual benefits.
6. The cooperative understands the importance of incorporating responsible purchasing (we prefer and select responsible suppliers).
7. We are aware of Corporate Social Responsibility (CSR) in the supply chain.
8. The cooperative has effective procedures for handling complaints.

3.3 Social dimension


1. The cooperative supports the employment of people at risk of social exclusion.
2. We are committed to job creation (scholarships, job opportunities...).
3. We have human resources policies that aim to facilitate the reconciliation of employees' professional and personal lives.
4. We have health and safety standards that go beyond the legal minimum.
5. The professional development of cooperative members and general and specific continuing education are encouraged in the cooperative.
6. The cooperative supports educational and cultural programs in the community.
7. The cooperative participates in social projects for the community.
8. We encourage employees to participate in voluntary activities or in collaborations with NGOs.

Authors:

1. Ilse Maria Beuren, PhD in Accounting, University of São Paulo, Brazil.

E-mail: ilse.beuren@gmail.com

ORCID

 0000-0003-4007-6408

2. Vanderlei dos Santos, PhD in Accounting, Federal University of Santa Catarina, Brazil.

E-mail: vanderleidossantos09@gmail.com

ORCID

 0000-0002-9841-3780

3. Daniele Cristina Bernd, Master's in Accounting, University of Paraná, Brazil.

E-mail: dcbernd@hotmail.com

ORCID

 0000-0002-9195-9510

4. Celliane Ferraz Pazetto, Master's in Accounting, Federal University of Santa Catarina, Brazil. E-mail:

cellianeferraz@gmail.com

ORCID

 0000-0002-7413-1981

Contribution of each author

Contribution	Ilse Beuren	Vanderlei dos Santos	Daniele Bernd	Celliane Pazetto
1. Definition of research problem	√	√	√	√
2. Development of hypotheses or research questions (empirical studies)	√	√	√	√
3. Development of theoretical propositions (theoretical Work)	√	√	√	√
4. Theoretical foundation/ Literature review	√	√	√	√
5. Definition of methodological procedures	√	√	√	√
6. Data collection	√	√	√	√
7. Statistical analysis	√	√	√	√
8. Analysis and interpretation of data	√	√	√	√
9. Critical revision of the manuscript	√	√	√	√
10. Manuscript Writing	√	√	√	√
11. Other (please specify which)				