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Explanatory settings of the development of resilience in public administration supply networks

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Social capital is an important theoretical lens for explaining interorganizational relationships and building resilience in supply networks. This study corroborates this perspective, aiming to identify which attributes of social capital contribute to explaining the development of resilience in public administration supply networks and how they combine in this explanation. A qualitative and descriptive research was carried out, using interviews with the repertoire grid technique for data collection. Data were analyzed using Honey's content analysis and coincidence analysis (CNA). The research results indicate that social capital proved to be fundamental to developing resilience in supply networks in public administration, through the attributes of sharing technical information, precision in communication, anticipation in communicating relevant information, reciprocity, trust, transparency, and commitment. The originality of the study lies in the use of social capital theory in studies on resilience in public administration and in the adoption of a robust data collection and analysis method that has not yet been explored in research in Brazilian public administration. The main contributions of the study were: (1) to highlight social capital as a multilevel construct that influences the development of resilience, (2) to expand studies on resilience in public administration, (3) to provide information that public managers can use to avoid or minimize the risks that jeopardize the provision of public services, and (4) to adopt an unprecedented research method in the Brazilian public administration.
Keywords: resilience; social capital theory; public purchases; Honey's content analysis; coincidence analysis.

Configurações explicativas do desenvolvimento da resiliência nas redes de suprimentos da administração pública

O capital social é uma lente teórica importante para explicar os relacionamentos interorganizacionais e a construção da resiliência nas redes de suprimentos. Para corroborar essa perspectiva, este estudo visa identificar quais atributos do capital social contribuem para explicar o desenvolvimento da resiliência nas redes de suprimentos da administração pública e de que forma eles se combinam nessa explicação. Para tanto, foi realizada uma pesquisa qualitativa e descritiva que utilizou entrevistas com a técnica da grade de repertório para a coleta de dados. Os dados foram analisados mediante a análise de conteúdo de Honey e a análise de coincidência (CNA). Os resultados da pesquisa indicam que o capital social se mostrou fundamental para desenvolver resiliência nas redes de suprimentos na administração pública, por meio dos atributos de compartilhamento de informações técnicas; precisão na comunicação; antecipação na comunicação de informações relevantes; reciprocidade; confiança; transparência e comprometimento. A originalidade do estudo reside na utilização da

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teoria do capital social em estudos sobre resiliência na administração pública e na adoção de um método de coleta e análise de dados robusto e ainda não explorado em pesquisas na administração pública brasileira. As principais contribuições do estudo foram: 1) destacar o capital social como constructo multinível que influencia o desenvolvimento da resiliência; 2) ampliar os estudos sobre resiliência na administração pública; 3) fornecer informações que podem ser utilizadas por gestores públicos, a fim de evitar ou minimizar a ocorrência de riscos que comprometam a prestação de serviços públicos e 4) adotar um método de pesquisa inédito na administração pública brasileira.
Palavras-chave: resiliência; teoria do capital social; compras públicas; análise de conteúdo de Honey; análise de coincidência.

Ámbitos explicativos del desarrollo de la resiliencia en las redes de abastecimiento de las administraciones públicas

El capital social es una lente teórica importante para explicar las relaciones entre organizaciones y desarrollar la resiliencia en las redes de suministro. Corroborando esta perspectiva, este estudio tiene como objetivo identificar qué atributos del capital social contribuyen a explicar el desarrollo de la resiliencia en las redes de suministro de la administración pública y cómo se combinan en esta explicación. Se realizó una investigación cualitativa y descriptiva, utilizando entrevistas con la técnica de rejilla de repertorio para la recolección de datos. Los datos se analizaron utilizando el análisis de contenido de Honey y el análisis de coincidencia (CNA). Los resultados de la investigación indican que el capital social demostró ser fundamental para desarrollar resiliencia en las redes de abastecimiento de la administración pública, a través de los atributos de compartición de información técnica, precisión en la comunicación, anticipación en la comunicación de información relevante, reciprocidad, confianza, transparencia y compromiso. La originalidad del estudio radica en el uso de la teoría del capital social en estudios sobre resiliencia en la administración pública y en la adopción de un método robusto de recopilación y análisis de datos que aún no ha sido explorado en investigaciones en la administración pública brasileña. Las principales contribuciones del estudio fueron: (1) resaltar el capital social como un constructo multinivel que influye en el desarrollo de la resiliencia, (2) ampliar los estudios sobre resiliencia en la administración pública, (3) proporcionar información que pueda ser utilizada por los administradores para evitar o minimizar la ocurrencia de riesgos que comprometan la prestación de los servicios públicos y (4) adoptar un método de investigación inédito en la administración pública brasileña.
Palabras clave: resiliencia; teoría del capital social; compras públicas; análisis de contenido de Honey; análisis de coincidencia.

1. INTRODUCTION

To varying degrees, risks are present in all procurement processes and must be managed (Munnukka & Järvi, 2015). Agencies and entities must strategically conduct their procurement processes in the public sector. So, it is necessary to consider the risks that arise, such as failures in the technical specification of the object, difficulties in price research, and deserted or failed bids (Universidade Federal do Ceará, 2017). Given the risks in public procurement, the need to deal with an increasingly interdependent world, and the public sector's adaptations to the global economy, many countries have developed a more strategic approach to public procurement, emphasizing interdepartmental coordination and establishing partnership relationships with suppliers (Erridge & Greer, 2002).

Steane and Walker (2000) argue that developing relationships with suppliers facilitates interaction, creates greater interdependence, establishes common inter-organizational networks, and assists in building social capital. Developing social capital is beneficial to the public sector as it reduces transaction costs, stimulates links between the public, private, and voluntary/nonprofit sectors, and develops social cohesion.

In the public administration field, social capital has been used in previous research, such as Fernandes (2002), who investigated the relationship between social capital, institutional performance, and public policies. Prates' study (2009) verified the relationship between social capital, collective mobilization, and access to public benefits in poor communities in Belo Horizonte. Santos and Nunes (2016) analyzed the development of social capital and municipal public policies.

It can be observed that the social capital theory has been applied from different perspectives in the Brazilian public sector. However, this work used an analytical angle yet to be explored: the relationship between social capital, government procurement, and resilience development in public administration supply networks. To corroborate this argument, a systematic literature review was conducted.

Searches were done in the Web of Science and Scopus journal databases because they are among the most prominent digital catalogs offering papers with integrated, relevant, and credible information. The searches in the databases above were done based on the combination of three sets of keywords in the articles' titles (social capital and supply chain/social capital and resilience/social capital and supply chain and resilience) and on the temporal filter between 2000 and 2020.

A total of 294 articles were found, with 112 duplicates. The abstracts of 182 studies were read, excluding documents outside the research scope. After this refinement, 28 articles were selected for a full reading. Notably, of the 28 articles chosen, only five had the potential to contribute to the theme of resilience and social capital as a multilevel construct. Still, none of these studies focused on the public sector. In this sense, the systematic literature review corroborates and justifies the need for further study which links the three dimensions of social capital and resilience in public administration supply networks.

Given the above, this study proposes to answer the following research question: "Which social capital attributes contribute to resilience development in public administration supply networks?" Aligned with the research problem, the paper aims to identify which social capital attributes contribute to building resilience in public administration supply networks and how they combine.

2. THEORETICAL FRAMEWORK

2.1. Social capital Theory

The basic proposition of social capital is that relationship networks are a valuable resource to conduct social affairs, providing their members with the ownership capital of the collectivity, which is a kind of "credential" that gives them credit in various senses of the word (Bourdieu, 1986). Social capital refers to the set of social resources in the relationships between different actors and their derived (Nahapiet & Ghoshal, 1998). Social capital is the set of resources created through various relationships, including interpersonal and organizational networks (Bourdieu, 1986; Nahapiet & Ghoshal, 1998).

In the literature, there are two categorizations for social capital. The first defines social capital as a bonding, bridging, and connecting concept (Woolcock, 2001). The second structures social

capital based on three dimensions: structural, relational, and cognitive (Nahapiet & Ghoshal, 1998). Considering that the present paper focuses on the social structure of relationships between public buyers and suppliers, the categorization presented by Nahapiet and Ghoshal (1998) proves to be more adherent to this study.

Structural capital refers to the strength and frequency of connections with business partners (Burt, 1992). Partners can accumulate experience through repeated communication and decision-making processes in networks with stronger structural capital. So, actors have a greater opportunity to access tacit knowledge from partners. In addition, constructing a supplier system based on stronger structural capital increases the parties' willingness to engage in resource exchange (Hung, Chen, & Chung, 2014).

Cognitive capital consists of shared languages, codes, and narratives (Nahapiet & Ghoshal, 1998). Language is how people exchange information, and as individuals share a common language, this facilitates access to people and information (Nahapiet & Ghoshal, 1998). By developing common codes and narratives, knowledge and communication advance, constituting a valuable asset within organizations (Nonaka & Takeuchi, 1995).

Relational capital is also composed of all the resources linked to the firm's external relationships with customers, suppliers, and other partners (Mousavi & Takhtaei, 2012). The literature review conducted by Ocicka and Wieteska (2019) identified five components that are recurrently noted as relational capital attributes in supply networks: trust, close interaction, respect, reciprocity, and commitment.

2.2. Social capital theory in public procurement

Social capital for public sector organizations is related to the collaboration and behavior of public servants and citizens who use the various services offered by the public administration. Since social capital resides in social organization characteristics such as trust, norms, and networks that can improve the efficiency of society by facilitating coordinated actions (Putnam, Leonardi, & Nanetti, 1993), it benefits those involved and society at large.

Social capital means making connections between people, establishing bonds of trust and understanding, and building toward community (Putnam, Feldstein, & Cohen, 2003).

Social capital enables citizens and organizations to collaborate, socialize, partner, and live better together (Canel & Luoma-aho, 2019). Within public administration, social capital provides a framework for measuring the value of intangible (e.g., relationships, reputations, trust) and tangible (e.g., financial profitability) outcomes (Dodd, Brummette, & Hazleton, 2015).

Specifically, in government procurement, Steane and Walker (2000) point out that social capital can establish networks with private sector suppliers to steer public procurement away from competitive long-distance bidding.

Social capital built with suppliers can facilitate public-private interaction, establish common inter-organizational networks, and create greater interdependence between the parties. In addition, it is beneficial to the public sector and procurement as it reduces transaction costs, stimulates links between the public, private, and voluntary/non-profit sectors, and develops social cohesion.

Empirical research shows that pockets of social capital have developed in more integrative relationships, which involve a network approach and closer cooperation with private network suppliers. Public-private partnerships have increased interaction and allowed purchasing and supplier staff to develop relationships, conduct joint activities, and establish common inter-organizational networks to improve service delivery effectiveness (Erridge & Greer, 2002).

Despite the benefits, implementing the partnership approach to public procurement proves difficult since the public sector's operational structure and culture have historically hindered the development of inter-organizational relationships and trust (Erridge & Greer, 2002). One of the main obstacles to building social capital between government departments and suppliers is that most public procurement is developed within a culture that is bounded by rules, risk-averse, and resistant to change. In addition, the rigid bureaucratic structure can discourage procurement personnel from adopting innovative approaches in dealing with suppliers.

Given the benefits and despite the difficulties, social capital development is becoming a goal for the public sector, as it allows access to many resources present in relationships, contributing to effective and legitimate governance, focused on robustness, flexibility, and adaptability to avoid, minimize, or overcome crises (Duit, 2016).

2.3. Resilience in supply networks

Resilience is a supply network's ability to persist, adapt, or transform itself in the face of change (Wieland & Durach, 2021). Proactive resilience refers to actions taken before a disruption occurs and involves planning to reduce its likelihood or mitigate the severity (Thun, Druke, & Hoenig, 2011). Reactive resilience refers to a company's ability to gather and interpret relevant information to decrease detrimental impacts after a disruptive event occurs (Bode & Macdonald, 2017). Many national governments have implemented reforms in their public administrations using resilience as a guiding principle. For example, the United Kingdom launched a program for disaster management entitled The National Resilience Capabilities Programme in 2013, and the United States established a federal resilience network within the homeland security office (Duit, 2016).

Resilience in public administration lies in the ability to learn; to think of creative solutions to solve problems; to foster bonds of trust among public actors and institutions; and in the diversity of actors, sources of knowledge, ideas, institutional forms, and forms of governance (Milley & Jiwani, 2014). Complexity in the face of crises and disasters challenges the government and private companies to develop innovative strategies and responses to disruptions.

In this sense, the relationships between the public sphere and the private sector create an opportunity to elaborate crisis prevention and recovery actions (Stewart, Kolluru, & Smith, 2009). Additionally, the relationships between public buyers and private sellers contribute to increased risk sharing, responsibilities, and transparency, stimulating the development of trust between the parties and mutual interest (Johnson, Mcmillan, & Woodruff, 2002).

3. METHODOLOGY

An applied, descriptive, qualitative research was developed using interviews with the repertory grid technique. The research's unit of analysis was the relationships between buyers and sellers, and the observation units were buyers in public institutions. The data was evaluated using Honey's content analysis and coincidence analysis (CNA).

3.1. Empirical field

The empirical field of research was public administration, which is justified given this area's importance as a vehicle for social development, whether in the provision of essential services, the preservation of common resources, or the promotion of each individual's right to health services (Farca & Dragoș, 2020), a role reinforced by the COVID-19 pandemic.

In the public sphere, government procurement plays a significant role. Despite its relevance, it is vulnerable to mismanagement, corruption, and other types of risk, so it is necessary to implement risk management measures to reduce vulnerability and increase resilience.

3.2. Samples

To compose the study sample, two non-probability sampling techniques were used: sampling by accessibility or convenience and snowball sampling. In the first, the researchers select the participants to whom they have access, assuming they can somehow represent the universe (Prodanov & Freitas, 2013). In snowball sampling, an initial group of participants is selected, and the subsequent participants are chosen based on information and referrals from the initial participants (Malhotra, 2019).

The participants who made up the study sample were selected based on three criteria:

(1) Professional experience as a buyer or public procurement manager for five years or more;
(2) Involvement with at least nine suppliers;
(3) Acceptance of the Informed Consent Form.

Twenty-five interviews were conducted. The research participants were employed in agencies belonging to the three branches of government and in various sectors, such as health, education, and public safety. Notably, after the 11th interview, no new construct categories were observed, indicating that the theoretical saturation criterion was reached.

3.3. Data collection

Data were collected using interviews with the repertory grid technique, which provides a structured approach to data collection and analysis focusing on differences and similarities related to the investigated subject (Clauss & Tangpong, 2019). The repertory grid provides rich qualitative data,

uncontaminated by the interviewer's viewpoint and based purely on the interviewees' reflections on their own experiences (Jankowicz, 2003).

The interviews were conducted using the repertory grid resource to collect information from public buyers about their relationship with suppliers associated with resilience development in public procurement. Thus, the data could subsidize public agencies' and entities' actions to reduce government procurement vulnerability.

To collect the data, a structured interview script was prepared and could be requested by e-mail to the article's authors. The data were collected following the steps:

Step 1: Elicitation of elements – an element is an "example of", or "an instance of" in a given research topic (Jankowicz, 2003), and in this study, the elements were the vendors indicated by the participants. The participants chose nine suppliers (elements of the technique).

Step 2: Elicitation of constructs – constructs are the elements' basic units of description and comparative analysis. Participants were asked to identify the social capital constructs that influence resilience development. For each construct elicited, its opposite pole was identified. In addition to the constructs indicated by the participants, an overall construct was provided, represented by "higher resilience potential – lower resilience potential".

Step 3: Evaluating the constructs - participants were asked to evaluate all suppliers on all elicited constructs and the general construct, considering a scale of 1 to 6 points, where 1 = supplier performance is closest to the elicited construct and 6 = supplier performance is closest to the opposite pole.

3.4. Data Analysis

The data were analyzed using Honey's content analysis and coincidence analysis.

3.4.1. Honey's content analysis

Honey's content analysis was developed by Honey (1979), and the process took place in eight steps:

Step 1: Reverse the participant's ratings on the overall construct provided. For example, the provider was rated "1" on the 1 to 6 point scale, which was transformed to "6" on the 6 to 1 point scale.

Step 2: Calculate the sum of the absolute differences between the ratings of the provided construct and each elicited construct. The sum of the differences was also calculated for the inverted ratings of the overall construct.

Step 3: Calculate the percent similarity for the non-reversed and reversed ratings for the overall construct provided. The percent similarity was calculated using Shcheglova's (2009) formula:

$$Pcc' = 100\% - \frac{200\% \times Dcc'}{(m-1) \times E}$$

In which:

Pcc' = similarity percentage;

Dcc' = sum of the differences;
m = maximum possible evaluation (ex.: 6);
(m-1) = maximum possible difference between evaluations;
(m-1) × E = largest possible sum of the differences between constructs across the grid;
E = number of grid elements.

Step 4: Identify the highest similarity percentage of each elicited construct.
Step 5: Calculate the H-I-L index (high, intermediate, and low) according to Table 1:

TABLE 1 CALCULATION OF THE H-I-L INDEX INTERVALS

High		Intermediate		Low	
Upper limit	Lower limit	Upper limit	Lower limit	Upper limit	Lower limit
Hi = hi	$\underline{Hi} = li + \frac{2\,(hi-li)}{3}$	$Li < li + \frac{2\,(hi-li)}{3}$	$\underline{li} = li + \frac{(hi-li)}{3}$	$Li < li + \frac{(hi-li)}{3}$	$\underline{Li} = li$
Hi = 100	$\underline{Hi} = 0 + 2\,(100-0)/3$ $\underline{Hi} = 66.67$	$Li < 0 + 2\,(100-0)/3$ $li < 66.67$	$\underline{li} = 0 + (100-0)/3$ $\underline{li} = 33.33$	$Li < 0 + (100-0)/3$ $Li < 33.33$	$\underline{Li} = 0$

Source: Research data.

Step 6: Allocate the constructs according to the ranges obtained with the formulas in Table 1.
Step 7: Identify the categories and allocate the constructs into their respective categories.
Step 8: Summarize the results in a table.

3.4.2. Coincidence analysis

Coincidence analysis (CNA) uses Boolean logic through a formal algorithm implemented in an R® software package (Baumgartner & Ambühl, 2020). Synthetically, the algorithm operates in two steps: 1) from the provided list of coincidences, it searches for all minimally sufficient conditions of all construct poles under study to instantiate a specific result, starting by testing individual poles in isolation; if the search is not successful, it moves on to test the poles of different constructs combined conjunctively by the logical operator "and"; 2) it searches for conditions that are minimally necessary for the instantiation of the outcome (output) under analysis, starting by testing individual minimally sufficient conditions; if the search is not successful, it moves on to test minimally necessary disjunctions

of two or more minimally sufficient conditions (Baumgartner & Thiem, 2015). Upon passing this test, the conditions found are potentially causal models of the outcome (output) under analysis for the sample in question (Baumgartner & Falk, 2019). The expression taken from Baumgartner and Ambühl (2020) exemplifies a causal model output:

$(A + B \leftrightarrow C) * (D + A*B \leftrightarrow E)$

In which:

A, *B*, *C*, *D*, and *E* represent factor values;

The asterisk symbol (*) represents the Boolean product and is translated as "and";

The addition symbol (+) represents the Boolean sum and is translated as "or";

The symbol ↔ represents Boolean equality and is translated as "if and only if," "necessary and sufficient for," or "sufficient and necessary for".

In plain language: 1) if and only if factor A's value or factor B's value are instantiated in a case, factor C's value is instantiated for the same case, and 2) if and only if factor D's value or factor A's value and factor B's value are instantiated in a case, factor E's value is instantiated for the same case.

For the causality analysis, the data from the repertory grids were treated. The first step was to reverse the scale scores to calibrate the repertoire grid scores for the CNA. Then calibration was performed using the direct assignment method and the Total Fuzzy and Relative Alternative (TFRa) approach, as shown in Tables 2 and 3.

TABLE 2 REVERSAL AND CALIBRATION BY DIRECT ASSIGNMENT

Original Scale Score	1	2	3	4	5	6
Reverse Scale Score	6	5	4	3	2	1
Calibrated score by direct assignment	1	0.8	0.6	0.4	0.2	0

Source: Research data.

TABLE 3 EXAMPLE OF RELATIVE CALIBRATION BY TFRA

Score	Frequency	Frequency in %	Frequency accumulated in %	TFRa
1	0	0.0000%	0.0000%	0
2	1	11.1111%	11.1111%	0.056
3	1	11.1111%	22.2222%	0.167

Continue

Score	Frequency	Frequency in %	Frequency accumulated in %	TFRa
4	1	11.1111%	33.3333%	0.278
5	3	33.3333%	66.6666%	0.500
6	3	33.3333%	99.9999%	0.833

Source: Research data.

Two causality analyses were performed for each repertory grid: 1) CNA for data with direct assignment calibration and 2) CNA for data with TFRa calibration. Additionally, two causality analyses (calibration by direct attribution and TFRa) were performed with the data from all the grids.

The analyses were conducted in R® software using the *frscored_cna*() function, which runs *cna*() serially for all combinations of construct pole values and identifies causal models with consistency and coverage ranging from 0.75 to 1, in descending order of fit-robustness. In CNA, the bounds of both criteria are conventionally set above 0.75 for the model to be considered valid (Haesebrouck, 2019).

4. RESULTS

4.1. Honey's content analysis results

We identified 247 constructs that were grouped into 18 categories allocated to the dimensions of social capital, as shown in Table 4.

TABLE 4 SUMMARY OF HONEY'S CONTENT ANALYSIS

Category	Dimension	Frequency	High	Intermediate	Low
Reciprocity	Relacional	23	17	4	2
Commitment	Relational	22	21	1	0
Communication accuracy	Structural	21	13	6	2
Sharing of technical information	Structural	20	12	6	2
Transparency	Relational	19	16	0	3
Aligned goals, expectations, and principles	Cognitive	19	16	1	2
Maintenance of a reference contact to share information	Structural	14	11	3	0

Continue

Category	Dimension	Frequency	High	Intermediate	Low
Anticipation when communicating relevant information	Structural	14	8	2	4
Agility in communication for problem-solving	Structural	14	10	4	0
Existence of formal and informal means of communication for exchanging information	Structural	13	9	3	1
Sharing of marketing information	Structural	12	9	1	2
Partnership in the relationship	Relational	11	7	3	1
Trust	Relational	10	7	1	2
Sharing information about government procurement legislation	Structural	9	5	3	1
Attention to the relationship's specifics	Relational	8	8	0	0
Proximity in the relationship with the supplier	Relational	7	6	1	0
Sharing information about the dynamics of the parties' functioning	Structural	6	6	0	0
Flexibility	Relational	5	5	0	0
Total		247	186	39	22

Source: Research data.

A construct category with a high H-I-L index demonstrates that the idea behind that category is important to individuals in the sample. If many participants cite the constructs that comprise a particular category, this indicates its relevance to the overall sample (Jankowicz, 2003). By analyzing the H-I-L (high, intermediate, and low) index, it can be observed that all construct categories were predominantly rated with a "high" percent similarity, i.e., a significant relationship to the overall construct provided (Jankowicz, 2003).

4.2. CNA Results

Box 1 presents the labels used to identify each factor in the CNA analysis. It is emphasized that the CNA factors are the construct categories identified by Honey's content analysis.

BOX 1 LABELS USED TO IDENTIFY THE FACTORS

Factor	Label
Reciprocity	REC
Commitment	COM
Communication accuracy	PRE
Sharing of technical information	CIT
Transparency	TRA
Aligned goals, expectations, and principles	OEP
Maintenance of a reference contact to share information	MCR
Anticipation when communicating relevant information	ANT
Agility in communication for problem-solving	ARP
Existence of formal and informal means of communication for exchanging information	EMC
Sharing of marketing information	CIM
Partnership in the relationship	PAR
Trust	CON
Sharing information about government procurement legislation	CIL
Attention to the relationship's specifics	AER
Proximity in the relationship with the supplier	PRO
Sharing information about the dynamics of the parties' functioning	CID
Flexibility	FLE
Reciprocity	RES

Source: Research data.

After the analyses were performed, the most robust models were chosen, observing the following criteria: 1) highest fit-robustness scores; 2) complexity equal to 1, i.e., a factor value on the left side of the causal model; 3) complexity greater than 1, with consistency and coverage multiplication considerably higher than lower complexity models; and 4) no contradictions between the logical expressions and the models analyzed (Parkkinen & Baumgartner, 2021). The selected models are shown in Box 2.

BOX 2 SELECTED MODELS

Interviewees	Selected models	
	Absolute attribute	Relative attribute
1	CIT + CON*TRA <-> RES	CON <-> RES
2	CIT + CON*TRA <-> RES	CIT*TRA + CON*OEP* TRA <-> RES
3	CIT <-> RES	CON*REC + CON*CIT + MCR* OEP <-> RES
4	CIT + COM*PRE <-> RES	ARP <-> RES
5	PRE <-> RES	EMC <-> RES
6	CIT <-> RES	COM <-> RES
7	CIL <-> RES	ANT <-> RES
8	CID + PRE*REC <-> RES	TRA* REC + PRE*AER + CID*CIT <-> RES
9	CIM + EMC*ANT + CIL*OEP* REC <-> RES	REC <-> RES
10	FLE <-> RES	FLE <-> RES
11	PAR <-> RES	PRO <-> RES
12	ANT <-> RES	TRA <-> RES
13	FLE + REC*PRE + REC*ARP <-> RES	REC <-> RES
14	ANT<->RES	ANT <-> RES
15	CON + CIT*COM <-> RES	COM <-> RES
16	TRA <-> RES	OEP <-> RES
17	REC <-> RES	PAR <-> RES
18	PRE <-> RES	PRE <-> RES
19	PAR <-> RES	CIL*CON + COM*AER + TRA*CON <-> RES
20	ARP <-> RES	ARP <-> RES
21	CIT <-> RES	MCR <-> RES
22	CID <-> RES	CID <-> RES
23	ARP*FLE*ANT <-> RES	COM <-> RES
24	FLE <-> RES	CID <-> RES
25	PRE <-> RES	PRE <-> RES
Aggregate data	CIT <-> RES	CIT+REC<->RES

Source: Research data.

The CNA analysis evaluated 18 factors (attributes of social capital) that could causally explain resilience in supply networks. Such factors proved causally relevant since they appeared in at least one of the selected solutions. Noteworthy are the factors that present a frequency higher than 10% of the solutions found (50 models), i.e., factors with a frequency higher than five occurrences.

The sharing of technical information is the most causally relevant factor in occurrence frequency since it appears in 12 solutions. It is the determining factor in four solutions with absolute attributes (solutions 3, 6, and 21 and the solution with aggregated data). Reciprocity is the second most causally relevant factor. It has a frequency of 10 occurrences in the solutions found, with reciprocity being the determining factor in three solutions (solution 17 of the absolute attribute and solutions 9 and 13 of the relative attribute).

Communication accuracy and trust are in third place as the most frequent and relevant social capital attributes. Communication accuracy is present in nine solutions, determinant in three absolute attributes solutions (solutions 5, 18, and 25) and two relative attribute solutions (solutions 18 and 25). Trust with an occurrence frequency equal to 9 is determinant in one relative attribute solution (solution 1) and appears combined with transparency in two absolute attribute solutions (solutions 1 and 2) and one relative attribute solution (solution 19).

Transparency, with an occurrence frequency of 8, occupies the fourth position in the list of the most frequent factors (social capital attributes) that causally explain resilience in supply networks. It is determinant in two solutions (solution 16 of the absolute attribute and solution 12 of the relative attribute). As said before, it stands out that transparency is associated with trust in three solutions found.

With an occurrence equal to 6, commitment and anticipation when communicating relevant information are in fifth place in the ranking. Commitment is shown to be determinant in three relative attribute solutions (solutions 6, 15, and 23). In three situations, commitment associates with attention to the relationship's specifics, communication accuracy, and sharing of technical information (solution 19 of relative attribute, solution 4 of absolute attribute, and solution 15 of absolute attribute). Anticipation when communicating relevant information is determinant in four solutions (solutions 12 and 14 of absolute attribute and solutions 7 and 14 of relative attribute).

4.3. Results discussion

Based on the social capital perspective, the inter-organizational relationships studied in this research indicate that structural and relational capitals are vital to developing resilience in public administration supply networks. On the other hand, social capital's cognitive dimension proved less relevant for the analyzed sample and the study context. This finding can be explained by the fact that the cognitive dimension includes subjective attributes, such as organizational culture, values, and principles. In many government agencies and entities, these factors are not developed internally, making it difficult to recognize these attributes in supplier relationships.

Among the social capital factors that influence resilience development in public administration supply networks, those that were relevant in Honey's content analysis and coincidence analysis were highlighted in Box 3:

BOX 3 RESULTS SUMMARY

Social capital dimensions	Category
Structural Capital	Sharing of technical information
	Communication accuracy
	Anticipation when communicating relevant information
Relational Capital	Reciprocity
	Trust
	Transparency
	Commitment

Source: Research data.

Regarding the structural capital dimension findings, they are in line with previous studies, suggesting that structural capital among partner firms creates a structure with dense interactions, i.e., a system with a high frequency of information sharing among partners and multiple connections that facilitate the exchange of diversified and reliable information (Koka & Prescott, 2002).

Prasad, Su, Altay, and Tata (2015) suggest that sharing information with supply network partners is a strategy for mitigating the impacts of a supply network disruption. Sharing knowledge is relevant, but more is needed. It is necessary to share accurate information at the right time. Scholten and Schilder (2015) point out that receiving accurate and timely information allows the flexibility and speed needed to make changes to processes in advance.

Concerning the relational capital dimension findings, they corroborate previous studies suggesting that a firm's relational capital plays an essential role in responding to disruptions (Ahangama, Prasanna, & Blake, 2019), which facilitates the development of solutions to manage unforeseen changes and direct joint efforts to achieve beneficial solutions for the parties involved (Ortiz-de-Mandojana & Bansal, 2016).

The reciprocity developed in supply network relationships reduces risks because partners establish trust, common goals, and values (Sukoco, Hardi, & Qomariyah, 2018). Trust influences speed by facilitating quick access to information and resources before, during, and after crises.

In relationships between partner companies, both parties are expected to share information transparently to maintain the data flow to avoid or minimize risks from materializing, increasing resilience (Johnson et al., 2002). In relationships where trust and commitment exist, information sharing between a company and its supply network partners is greater (Jia, Chowdhury, Prayag, &

Chowdhury, 2020), thereby minimizing the potential for future disruptions and improving resilience in supply networks.

4.4. Methodological rigor of the qualitative research results

In order to verify the reliability of the qualitative research results, the criteria pointed out by Pedrosa, Näslund, and Jasmand (2012), who analyzed the case study's quality, were adapted to describe this study's qualitative research with transparency and traceability. They can be found in Box 4.

BOX 4 CRITERIA FOR CHECKING THE RELIABILITY OF QUALITATIVE RESEARCH

Criteria	Criteria Description	Verification
Transferability (degree to which the research study's findings apply to other contexts)	Theoretical objective	Page 3
	Analysis Unit	Page 6
	Number of sectors investigated	Page 6
	Justification for selecting the research sector	Page 6
Truth value (congruence between the participants' information and the researcher's interpretation)	Precise description of the data analysis process	Pages 7 to 10
Traceability (documentation of the research process and data sources)	Data collection questions	Page 7
	Data collection guidelines	Pages 6 to 7
	Number of informants and criteria for their selection	Page 6
	Data sources and types to be collected	Page 7

Source: Adapted from Pedrosa et al. (2012).

Transferability is related to how much a study's findings can be applied to several contexts (Pedrosa et al., 2012). The transferability of the research findings was documented by pointing to four criteria: 1) the study's theoretical objective; 2) the analysis unit; 3) the number of sectors investigated; and 4) the justification for selecting the research sector.

Truth value concerns the correspondence between the informants' and researchers' constructed realities (Pedrosa et al., 2012). An accurate description of the data analysis process allows for an ex-post evaluation of how the data were processed and analyzed to generate the research findings and thus assess truth value.

Finally, traceability is related to the research process documents and data sources (Pedrosa et al., 2012). The research traceability was based on the use of a research protocol involving: 1) the questions for data collection; (2) the guidelines for data collection; 3) the number of informants and criteria for their selection; and 4) the sources and types of data to be collected.

5. CONCLUSION

The guiding question of this study was "Which social capital attributes contribute to resilience development in public administration supply networks?". We could observe that the inter-organizational relationships studied in this research indicate that social capital (sharing of technical information), structural capital (accuracy and anticipation when communicating relevant information), and relational capital (reciprocity, trust, transparency, and commitment) proved to be fundamental to develop resilience in public administration supply networks.

The study is original because it applies social capital theory linked with public administration supply networks resilience and adopts a robust and structured data collection and analysis method not yet explored in Brazilian public administration research.

This research makes theoretical contributions as it highlights social capital as a multi-level construct that influences resilience in supply networks and extends the studies in public administration.

As a managerial contribution, we highlight that this text provides information that public managers can use to avoid or minimize risks that may compromise the continuity, quality, and efficiency of public services.

Finally, we highlight the methodological contribution of the study, which lies in the adoption of an unprecedented research method in Brazilian public administration, whose results allowed us to robustly identify and prioritize the constructs that most impact resilience in the public sector, considering experts' perspectives in inter-organizational relationships.

The challenge facing public administration is to move government procurement away from traditional bidding procedures, to build links that go beyond the strictly formal and legal sphere that guides public procurement, and to establish relationships with suppliers that allow the government and the private sector to collaborate, develop, and implement disaster prevention, mitigation, and recovery actions, fostering resilience in the supply networks formed by public and private organizations.

Despite its originality, relevance, and contributions, the study's results have some limitations. One of them was analyzing the phenomenon considering only the public purchasers' perspective. The study could have also examined resilience in public administration considering suppliers of goods and services to public agencies and entities. Another limitation is that most purchases were from federal institutions. Since this is a developing research topic, there is limited specific literature on the theory of social capital and resilience in the public sphere. Finally, the cause of the interviewees' different perceptions was not analyzed, but we sought to explain the variations in their mental models in relation to their personal characteristics.

Future research should use other methodological approaches to investigate how social capital attributes are created, maintained, or strengthened to develop resilience in supply networks in public administration. Future studies may address the topic of social capital and resilience in public administration by considering the perspective of other public agents and suppliers of goods and services to the public sphere. Another suggestion is to identify how the different dimensions of social capital relate to building resilient supply networks, focusing on the public sector. Finally, it is suggested that future works develop comparative studies between the different branches of government or other federal bodies to identify similarities and differences between these contexts.

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