



BBR. Brazilian Business Review

ISSN: 1807-734X

Fucape Business School

Beuren, Ilse Maria; Gomes, Tayse
Manager Resilience and The Formation of Networks: Effects of the Strategic Priority of Innovation
BBR. Brazilian Business Review, vol. 19, no. 4, 2022, July-August, pp. 414-430
Fucape Business School

DOI: <https://doi.org/10.15728/bbr.2022.19.4.4.en>

Available in: <https://www.redalyc.org/articulo.oa?id=123072403004>

- How to cite
- Complete issue
- More information about this article
- Journal's webpage in redalyc.org


UABM
redalyc.org

Scientific Information System Redalyc
Network of Scientific Journals from Latin America and the Caribbean, Spain and
Portugal

Project academic non-profit, developed under the open access initiative

ARTICLE

Manager Resilience and The Formation of Networks: Effects of the Strategic Priority of Innovation

Ilse Maria Beuren¹ilse.beuren@gmail.com |  0000-0003-4007-6408Tayse Gomes¹taysegomes_@hotmail.com |  0000-0003-4528-2155

ABSTRACT

This study analyzes the influence of manager's resilience in networks formation under the moderating effect of the strategic priority of innovation. A survey was conducted with managers of Brazilian incubated companies, producing a sample of 106 valid responses. Data analysis was performed using the partial least squares structural equation modeling. The results showed that managers with resilient characteristics tend to attract the interest of agents to form networks. The moderating variable strategic priority of innovation affects the strength of the relationship between manager's resilience and the formation of network, being positive for the prospector strategy and negative for the defender strategy. From the results, it is possible to conclude that the attitudinal actions of managers are reflected in the expansion of the organizational structure of incubated companies and in the construction of alliances and cooperation projects.

KEYWORDS

Individual resilience, Networks formation, Strategic priority of innovation, Prospector strategy, Defender strategy

¹Universidade Federal de Santa Catarina,
Florianópolis, SC, Brazil

Received: 09/28/2020.
Revised: 06/28/2021.
Accepted: 09/18/2021.
Published Online: 07/14/2022.
DOI: <http://dx.doi.org/10.15728/bbr.2022.19.4.4.en>



1. INTRODUCTION

The enhancement of the entrepreneurial characteristics of individuals in incubated companies is fundamental (Raupp & Beuren, 2006), but it is assumed that it must be accompanied by interfaces between the manager's individual resilience and network formation, plus the strategic priority of innovation. Resilience as a personal characteristic, as implicated in the work environment (Villavicencio-Ayub et al., 2014), helps to capture opportunities and act quickly and effectively in turbulent situations (Mallak, 1998). Resilience depends on a specific set of skills, practices, and attitudes; but for this potential to translate into resilient performance it must be supported by appropriate resources, system characteristics, and organizational structures that identify resilient patterns (Galizia et al., 2016).

Resilient behavior transcends the boundaries of the individual and/or the result of their interactions, crosses the boundary of the singular and extends into the concept of networks and relationships, which conditions the ability to move from the individual level to the realm of social networks (Reghezza-Zitt & Rufat, 2015). The expectation is that this interrelationship of resilient actors can facilitate the process of identifying personal strengths and competencies, build a strong foundation against obstacles, and achieve better performance. Lengnick-Hall and Beck (2009) note that resilience provides access to important resources and forms network relationships. The Actor-Network Theory (*ANT*) conceives the organization as a network (Ruiz-Martin et al., 2015), composed of people (actors) involved with the organization (nodes) and the relationships between them (*links*).

Choosing representatives or spokespersons for continuous interaction subsidizes the fate of innovation, its content, and its chances of success (Akrich et al., 1988). Together, the organization's strategic posture and structure can determine the organization's level of innovation. The study done by Miles et al. (1978) addresses one of the variables analyzed here: the strategic priority of innovation. This study focuses on innovation, discussed by the authors in a tangential way. Explicitly, individuals, both prospectors and defenders, are compared, as they clearly present the most contrasting behaviors (Miles et al., 1978; Hambrick, 2003) and for the fact that these strategic options, considered opposites, require differentiated competencies (Díaz-Fernández et al., 2014).

Although territories explored about individual resilience, network formation, and strategic innovation priority have previously denoted some relationship, the literature has not presented evidence of a moderating relationship, or even a joint relationship between the three variables, which urges its empirical investigation. Thus, this study is based on the possible existence of a relationship between these elements. Given the above and considering the conceptions presented, this study is guided by the following question: What is the influence of resilient managers in the formation of networks under the moderating effect of the strategic priority of innovation in incubated companies? In this regard, structural equation modeling was applied to the data collected from the survey carried out with managers of incubated companies at Brazil's largest incubators.

Incubated companies are windows to empirical knowledge because they are innovative and in an initial stage. Thus, the research presents evidence that managers with resilient characteristics tend to attract agents' interest for network formation. The moderating variable innovation as strategic priority affects the strength of the relationship between manager resilience and network formation, being positive for the prospector strategy and negative for the defender strategy. This suggests that the attitudinal actions of managers are reflected in the expansion of the organizational structure of incubated companies and in the construction of alliances and cooperation projects.

With this evidence, the intention is to contribute to the social context in which managers, entrepreneurs and researchers are situated.

The study is based on the need to recombine knowledge that goes beyond traditional fields and to build new paths, creating opportunities for the development of empirical-theoretical research and managerial practices. Although the categorization by Miles et al. (1978) is associated with factors such as environmental dynamism and technological routine, there may be other contextual dimensions that affect the costs and benefits of combinations of managerial control practices across firms (Bedford et al., 2016). This study contributes by examining other contextual factors, such as resilience and network formation. Multi-organizational collaboration is one of the elements that serves as a practical contribution, because, by analyzing and understanding the characteristics of incubated companies, it is possible to extend the results to the practical and auxiliary level of inter-firm relationships.

2. THEORETICAL BACKGROUND AND HYPOTHESES

2.1. INDIVIDUAL RESILIENCE AND NETWORK FORMATION

Resilience is a widely used term in the literature and studies that reveal particularities of the theme are scattered in several areas of knowledge. Although there are overlapping concepts in the literature, in a broad sense, resilience is understood as survivability, fault tolerance, flexibility and agility (Beuren & Santos, 2019). Resilience is an attribute resulting from cognitive, behavioral and contextual resilience (Lengnick-Hall & Beck, 2005), combining characteristics such as agility, robustness (Heinicke, 2014) and recovery (Carvalho et al., 2012). Three types of resilience (organizational, in teams, and individual) are inherent to its understanding in the literature, as they share a sense of adaptation and resistance at the same time.

Organizational resilience is treated as a macro element, characterized by a capacity for planning, rapid response, recovery (Lee et al., 2013), managing catastrophic and unexpected events (Gilly et al., 2014), adjusting to external changes (Akgün & Keskin, 2014), and mitigating negative effects (Galizia et al., 2016) arising from episodic events. The resilience of teams or groups in the same context is little explored, explicitly at least, in the literature, especially on how this type of resilience occurs. It is argued that resilient capacities in a group can be developed and manifested through attitudinal actions. In this regard, Kozlowski and Bell (2008) have conceptually explored themes centered on team learning, development and adaptation.

Individual resilience, sometimes treated as psychological resilience, is described as the positive psychological quality of overcoming adversity (Villavicencio-Ayub et al., 2014), which contributes to the formation of team or organizational resilience (Lengnick-Hall et al., 2011). Reghezza-Zitt and Rufat (2015) state that individual resilience can transcend the individual level and transition to a social level. Thus, managerial resilient characteristics can be expected to transcend their individual boundaries and to be conditioned to a broader characteristic, encompassing alliance networks, for example.

Focusing on individual resilience, Mallak (1998) sought to gauge resilience in healthcare companies. The author identified at least six aspects of individual resilience: goal-directed solution seeking, avoidance, critical understanding, role dependence, source reliance, and resource access. However, he pointed out that these six factors are just the start of a research stream targeted at identifying dimensions of resilient organizations and behaviors of resilient individuals. Furthermore, human resource managers in health sectors can use these findings to design interventions aimed at producing a more resilient workforce, and that many of the

resulting factors have cultural implications, thus requiring greater involvement of upper-level managers in the intervention process.

Cruz and Moraes (2013) investigated the resilience of small Brazilian entrepreneurs in the face of major difficulties they face or have faced in business. Based on semi-structured interviews with young entrepreneurs in the state of São Paulo, they mapped the ways entrepreneurs reacted in the face of these difficulties, enjoying the subjective attributes of individual resilience. In the study, the resilience of the entrepreneur proved to be essential to overcome obstacles and ensure business continuity.

Villavicencio-Ayub et al. (2014) assessed levels of work engagement in organizations in Mexico City and determined their link with the occurrence of occupational burnout, organizational socialization and psychological resilience. The sample comprised 1,110 individuals and a path analysis with structural equation modeling was performed to determine the causal relationship between the different variables. The model that was used demonstrated an adequate fit to the data and suggested that organizational socialization and resilience positively affected work engagement. They concluded that, under this perspective, an organization composed of resilient individuals is more likely to overcome, analyze, and react appropriately, and thereby promote superior performance.

The research by Lengnick-Hall and Beck (2009) indicates that companies with resilient managers are able to use relationships in their contacts with suppliers, customers, and strategic partners to secure resources and support adaptive initiatives. The resources obtained through the relationships network generate contextual resilience in various ways. The ability to obtain external resources tends to ensure continuous slack, since the more resources obtained, the greater the variety of alternatives for their application. This cycle stimulates innovation, ensures that links with various other agents are maintained and extends social capital beyond its boundaries.

From the network view, the characteristics of the actors in a network are emphasized, ranging from flexible and resilient to change-resistant. According to Actor-Network Theory, an actor or actant, “can literally be anything provided it is granted to be the source of an action” (Latour, 1996, p. 373). A study in this direction is that of Kozłowski and Bell (2008), which brought insight to alliance networks formation in order to develop flexibility and resilience to withstand crisis and overcome disorder. For Lee et al. (2013), organizations must foster their resilience since they are composed of networks of people and resources.

Resilience can provide access to important resources and contribute to building strong network relationships (Lengnick-Hall & Beck, 2009). Contextual resilience combines interpersonal relationships that subsidize the creation of networks of potential resource providers that, as a consequence, expand the range of options and combinations of resources that a firm can consider (Lengnick-Hall & Beck, 2009). Based on the presented arguments, it is hypothesized that:

- **H₁:** Manager resilience is positively associated with the network formation of human and non-human actors.

If there is a confirmation of this hypothesis, it will indicate that the level of resilience perceived by managers as an intrinsic characteristic produces an effect on the formation of networks of human and non-human actors. Thus, the expectation is that the manager’s level of resilience influences the formation of alliance networks of human and non-human actors in incubated companies.

2.2. MODERATING EFFECT OF THE STRATEGIC PRIORITY OF INNOVATION ON THE RELATIONSHIP BETWEEN MANAGER RESILIENCE AND NETWORK FORMATION

It is argued that the relationship between manager resilience and network formation may be moderated or mediated by singular elements. Dyer and Song (1998), for instance, argue that, when dealing with conflict, prospector firms hold a higher level of integrative behavior than defender ones. The authors state that strategy is associated with the conflict management mechanisms used by the company. And that a manager of a prospector company finds high use of integrative behaviors, with a high number of complex conflicts and frequent written and verbal exchanges. In this way, specific signs of resilience and interrelationships or networks are observed.

Miles et al. (1978) state that the choices executives make are the critical determinants of organizational structure and process. For Croteau et al. (1999), companies choose one type of strategy over another according to their perception of their environment. Thus, when considering the particularities in the literature concerning the strategic vertices (Miles et al., 1978), and the reflections about the contributions made to the strategic quadrant, it is claimed that the prospector's strategy is at one end of the *continuum* and the defender's strategy at the other (Croteau et al., 1999) and that both can be proactive in relation to their environment, although each one is proactive in a different way (Miles et al., 1978).

According to Miles et al. (1978), the prospector is exactly like the defender, because in this scenario there is a high degree of consistency between their solutions to the three adaptation problems (business problem, engineering problem and administrative problem). However, the prospector represents an environment that is more dynamic than those of other types of organizations. For a prospector, maintaining a reputation as an innovator in product and market development can be as important as high profitability. This type of organization invests heavily in individuals and groups who scan the environment looking for potential opportunities.

Apigian et al. (2006) adduce that prospector firms establish close ties with their customers. Their initiatives emphasize strengthening relationships with personalized service, providing real-time product information and *feedback*. Díaz-Fernández et al. (2014) mention that, in prospector firms, innovation competence plays a relevant role due to the emphasis on the continuous search for new market opportunities. In this sense, it is considered that personal competence for innovation defines the uniqueness of human capital in these firms, because what makes the knowledge and skills of these firms unique and idiosyncratic is the ability of their individuals to develop new knowledge (Díaz-Fernández et al., 2014).

Theoretical development suggests that the nature of the relationship between resilience and network formation varies (Gilly et al., 2014), depending on the strategic innovative profile adopted (Keramati et al., 2009). Thus, the relationship between resilience and network formation is presumably moderated by managers' innovative strategic choices. This study seeks to analyze directly, and through moderation of the strategic priority of innovation, the influence of manager resilience on the formation of networks of human and non-human actors in incubated companies, on the assumption described in the following hypothesis:

- **H₂:** The strategic priority of innovation moderates the relationship between manager resilience and the formation of networks of both human and non-human actors.

If this hypothesis is confirmed, it will indicate that the level of resilience perceived by managers as an intrinsic characteristic influences the constitution of networks of human and non-human actors, moderated by their managerial strategic-innovative stance.

Figure 1 presents the theoretical model of the research, with the constructs and hypotheses.

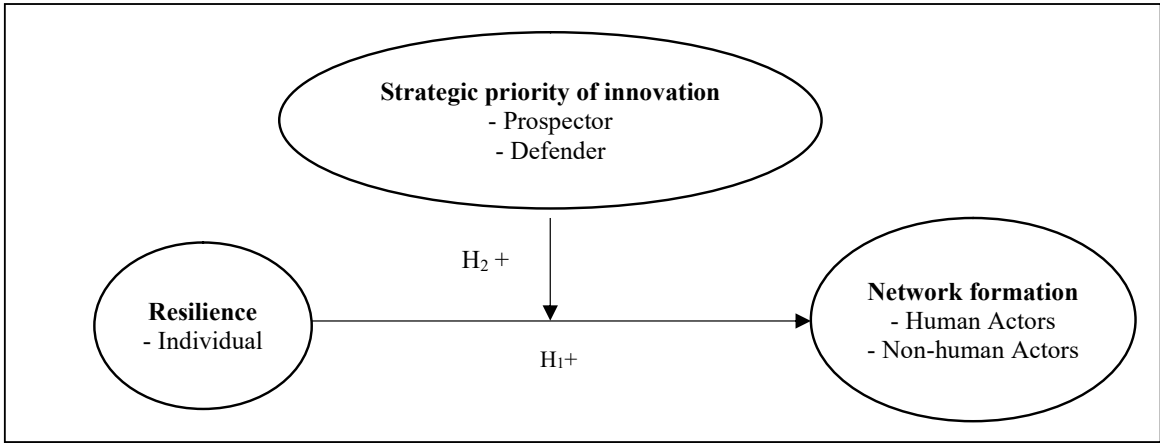


Figure 1. Theoretical model of the research
Source: The authors.

According to Figure 1, the variable strategic priority of innovation operates as a moderator for the relationship between the variables resilience and human and non-human network formation. This connection is a premise grounded in the theoretical framework of the study, and is expected to have a moderating force. The effectiveness of this process is properly evaluated in terms of its combined effects, requiring a holistic view of the existing relationships. Thus, the focus is on the nature of the relationships between the variables resilience, strategic priority of innovation, and network formation.

3. METHODOLOGICAL PROCEDURES

3.1. SAMPLE AND DATA COLLECTION

A *survey* was carried out with managers of incubated companies, from those listed as having attended the main incubators in Brazil. The focus was on the incubators with the highest number of incubated companies, whose information was obtained from the website of the National Association of Entities Promoting Innovative Enterprises (Associação Nacional de Entidades Promotoras de Empreendimentos Inovadores, ANPROTEC). Research in incubated companies is justified by their innovative characteristics and their early stages of strategy formulation (Pazetto et al., 2020). These characteristics can support alliance networks and the search for contacts (internal and/or external), constituting network formation, one of the pillars of this research.

The questionnaire formatted in QuestionPro was sent to approximately 1,000 managers of incubated companies, selected due to their interactions with the managerial practices adopted in the companies under study, besides their deep knowledge about the organization and influence on decision-making. These professionals were identified and contacted via the LinkedIn network.

Between December 2017 and January 2018, 112 answers were obtained, 6 of them incomplete, thus a final sample of 106 valid answers.

The sample size was determined using G*Power software (Faul et al., 2009), which resulted in a minimum of 98 respondents, with the following parameters: number of predictor variables (goal-directed solution seeking, avoidance, critical understanding, role dependence, source reliance, resource access) over the dependent variable (network formation), a mean effect size of (0.15), a significance level of ($\alpha=0.05$), and sample power of ($1-\beta=0.8$). In this way, there is statistical consistency to make inferences with the sample obtained, by satisfying the minimum threshold of respondents.

The final sample is characterized by the prevalence of male respondents (83%), age groups between 18 and 30 years old (49%) and 31 to 40 years old (31%), and the majority have an undergraduate degree (71%). This demographic data suggests that the sample meets the requirements to answer the questionnaire. Of the incubated companies where the respondents work, 43% in the technological area and 97% are self-managed. The number of employees is relatively low, as 67% are with up to 10 employees and only 6% with more than 30 employees. Most of them (83%) have business partners, and as for the stage of the incubation process, about 38% are in the growth process, 36% in development, 14% in release, 9% in implementation, and 3% in selection. As for the incubators, 57% are of the technological type, 7% mixed, 4% traditional business, 1% social, and 32% belong to a technology park.

3.2. CONSTRUCT MEASUREMENT

The constructs were measured with 5-point Likert scale (1 = extremely low; 5 = extremely high). Some precautions were taken to help reduce biases that could compromise the validity of the answers: (i) use of instruments composed of assertions with positive and negative statements (reverse questions), in order to keep the respondent alert; (ii) presentation of the questions and constructs with different response prompts to the participants; (iii) use of different instruments to avoid common method bias; and (iv) the anonymity of the respondents, and the companies where they work, was ensured to avoid embarrassment or bias in the answers (Scheaffer, Mendenhall & Ott, 1996).

The research instrument consisted of three blocks: resilience, network formation, and the strategic priority of innovation. The resilience construct was measured with 24 assertions, elaborated from the factors resulting from Mallak's (1998) research. Respondents were asked to indicate for each assertion their ability to adapt to significant changes and/or withstand pressure and stress in their company. Exploratory Factor Analysis (EFA) formed six groups: goal-directed solution seeking (RS3, RS13); source reliance (RS6, RS7); avoidance (RS9, RS10); critical understanding (RS15, RS16); role dependence (RS17, RS18, RS19); resource access (RS14, RS22, RS24). A KMO of 0.625 and a total variance explained (TVE) of 74.26% were obtained. In the structural analyses, avoidance was excluded from the model, since it interfered with the other interactions.

The construct *strategic priority of innovation*, with a defender and prospector profile, was adapted from Díaz-Fernández et al. (2014), and initially comprised 13 assertions (Cronbach's alpha of 0.849). The respondents were asked to mark the strategic priority of innovation that corresponds to their company. The EFA, as expected, formed two constructs: prospector strategy (PE2, PE3, PE4, PE6); and defender strategy (PE11, PE12). Together, they had a KMO of 0.739 and a TVE of 69.74%.

For the *network formation* construct, due to the specific focus of network formation in incubated companies, 13 assertions were developed, based on the theoretical platform of the study, in addition to adaptations of instruments from previous studies, such as those by Callon (1986), Lengnick-Hall and Beck (2009), Lee et al. (2013), Amaral et al. (2015), Mendonça and Wallace (2015), Reghezza-Zitt and Rufat (2015), Villavicencio-Ayub et al. (2014). For this block, the respondents were asked to indicate the level of correspondence of the assertions with their perception of network formation and search for new business partners in their company. The *Cronbach's* alpha of this construct resulted in 0.849 and three factors were formed in the Exploratory Factor Analysis (EFA): attraction of interest (FR4, FR5); network formation process (FR7, FR9, FR10); and attachment to initial purposes (FR10 and FR12). Together, these had a KMO of 0.644 and a total variance explained of 80.01%.

3.3. ANALYSIS PROCEDURES

Descriptive analysis and factor analysis procedures (IBM SPSS Statistic software) and Partial Least Squares Structural Equation Modeling (PLS-SEM) (SmartPLS) were used to analyze the results. PLS-SEM is recommended when the aim is to explain variation among the dependent variables in the model, due to its ability to estimate coefficients that can maximize the R^2 of the independent variables (Hair et al., 2014).

All structural procedures were performed with 5,000 interactions and two-tailed test (bias-corrected and accelerated) at 5% significance level (Hair et al., 2014). To analyze the moderation of the model, the recommendations of Hayes (2013) were followed, with analysis of the effects by bootstrapping and blindfolding. These models verify whether the interaction between the independent (resilience) and dependent (network formation) variables, with the inclusion of the moderating variable (prospector strategy and defender strategy), affects the direction, strength and/or sign of the relationship (Baron & Kenney, 1986). According to the authors, the interaction between the variables can be reduced to zero or reverse the sign with the inclusion of the moderator.

The constructs *resilience* and *network formation* were modeled as second-order reflective-formative. By including first and second-order constructs in the same model, the recommendations of Edwards (2001) were followed, which, in addition to enabling reflective testing with these constructs and their dimensions, assists in specific formative validations. The second-order constructs were analyzed in the form of repeated indicators, in order to identify the effects of the first-order construct on the higher-order construct. In structural validation, the two-stage approach was adopted to estimate the path coefficients of the higher-order constructs (Hair et al., 2014).

4. RESULTS ANALYSIS

4.1. EVALUATION OF THE MEASUREMENT MODEL

In the reflective-formative measurement model (type II), consisting of reflective indicators (questionnaire items), lower-order constructs, and higher-order constructs, measurement methods for reflective and formative models and indicator approach were applied (Hair et al., 2014). While in reflective models there is assessment of convergent and discriminant validity and internal and composite reliability of constructs, in formative models there is assessment of convergent validity of models, collinearity problems and importance/relevance of formative indicators (Hair et al., 2014). Table 1 shows the evaluations regarding the reflective constructs.

Table 1
Measurement model with first-order constructs

Constructs	1	2	3	4	5	6	7	8	9	10
1. Goal-directed solution seeking	0.836									
2. Source reliance	0.247	0.870								
3. Critical understanding	0.144	0.270	0.863							
4. Resource access	0.240	0.309	0.237	0.767						
5. Role dependence	0.070	0.168	0.152	-0.036	0.841					
6. Defender strategy	0.120	0.165	0.194	0.086	-0.060	0.888				
7. Prospector strategy	0.175	0.152	0.231	-0.006	0.009	0.370	0.798			
8. Attachment to initial purposes	0.120	0.270	0.176	0.111	0.239	0.275	0.131	0.913		
9. Network formation process	0.147	0.145	0.118	0.114	0.093	0.271	0.180	0.187	0.881	
10. Attraction of interest	0.204	0.166	0.126	0.138	0.018	0.085	0.206	0.381	0.328	0.854
<i>Cronbach's Alpha</i>	0.570	0.680	0.659	0.649	0.801	0.748	0.808	0.807	0.854	0.64
Composite reliability	0.822	0.862	0.854	0.811	0.878	0.881	0.875	0.909	0.912	0.843
Average Variance Extracted (AVE)	0.698	0.758	0.745	0.589	0.708	0.788	0.636	0.834	0.776	0.729
Average	3.925	4.137	3.892	3.915	3.528	3.259	3.453	3.901	4.211	3.854
Standard Deviation	0.803	0.876	0.882	0.833	1.058	1.362	1.135	1.142	0.901	0.995

Note: N=106. The diagonal elements correspond to the square roots of the AVE, and the off-diagonal elements correspond to the correlations between the constructs.

Source: Research data.

In Table 1, convergent validity is observed by the AVE, since all constructs showed coefficients greater than 0.50, which represents adequacy of the outer loadings of the indicators and the way the latent variables correlate with their constructs (Hair et al., 2014). Discriminant validity is observed by the square root of AVE (Fornell & Larcker, 1981) and the cross-loading criterion (Chin, 1998). With these tests, it was possible to confirm that each construct can differentiate itself from the others and capture unique phenomena (Hair et al., 2014). The model is adequate regarding the reliability of the answers, as all constructs showed composite reliability greater than 0.80, in line with the minimum value (<0.70) recommended (Hair et al., 2014), although *Cronbach's* alpha (internal reliability) for some resilience items was lower than the minimum value (<0.70). It was decided to keep these items, since, as a whole, they help explain resilience with great reliability, and for their exploratory nature, which allows the acceptance of smaller values in behavioral research (Hair et al., 2014).

Pearson's correlation coefficients show a predominance of positive significant associations among them. In general, the first-order constructs of resilience are found to be positively associated with the first-order constructs of network formation. This indicates that greater resilience on the part of managers can contribute to the formation of networks of human and non-human actors in incubated companies.

The correlations of the second-order (resilience and network formation) and moderating (defender strategy and prospector strategy) constructs were also observed. It was identified that manager resilience correlates positively with network formation (0.382, $p < 0.01$), positively with

prospector strategy (0.358, $p < 0.01$) and negatively with the defender strategy (-0.295, $p < 0.01$). The defender strategy correlates negatively with network formation (-0.400, $p < 0.000$), while prospector strategy correlates positively with network formation (0.500, $p < 0.000$). This evidence suggests that incubated firms with prospector strategies in dynamic environments and that invest heavily in individuals and groups (Miles et al., 1978) foster network formation, as opposed to those that prioritize defender strategies.

In assessing the formative models of the constructs manager resilience and network formation, convergent validity was also verified for both constructs, as it was found that each construct (first-order) was able to contribute to the formative construct (Hair et al., 2014). The strength of the path coefficients connecting the first and second-order constructs indicate validity of the formative constructs, with R^2 of 1 and significance ($p < 0.000$), which indicates that the second-order constructs are predicted by the dimensions (Appendix A). While testing the relevance of the indicators (lower-order constructs) with the higher-order construct, the external weights in Bootstrapping indicated significance for all indicators with the respective reflective and formative constructs.

For both the reflective and formative models, no multicollinearity problems were identified, as the internal and external VIF (Variance Inflation Factors) of all constructs were lower than 5 (Hair et al., 2014). Therefore, the results of the measurement model support its suitability to proceed with the assessment of the structural model.

4.2. ASSESSMENT OF THE STRUCTURAL MODEL

In the structural model assessment, a two-stage approach was adopted to estimate the model and hypotheses. The *path* coefficients, *t-value*, *p-value*, R^2 and F2 were obtained via *bootstrapping*. The F2 and Q2 values obtained by the *blindfolding* module are not relevant in the case of formative endogenous constructs (Hair et al., 2014), and are limited in the interpretation of the two-stage approach. Figure 2 shows the validation of the structural model and hypotheses of the research.

It is noticeable that hypothesis H_1 , that manager resilience is positively associated with network formation, is supported (0.328, $p < 0.000$, $R^2 = 0.107$, F2=0.120). These results indicate that managers who are more resilient when faced with instability and changes in their companies can enhance their competitive capabilities, to the extent that they can identify and attract new partners in order to contribute to network formation.

Hypothesis H_2 , which predicted the action of the construct strategic priority of innovation (prospector or defender) on the direct relationship between manager resilience and the formation of networks of human and non-human actors, was supported. After including the moderating variables, the interaction between resilience and network formation showed an R^2 of 0.324 and F2 of 0.224 (0.051 defender strategy and 0.173 prospector strategy). As expected, the direct relationship between resilience and network formation, under effect of the moderating variables, was reduced, and considered significant only at the 90% level (0.128, $p < 0.10$) (Baron & Kenney, 1986). These results indicate increased explanatory power in the resilience \rightarrow network formation interaction with the use of different strategies (moderating variables). Therefore, the adoption of different strategies (prospector or defender) by the companies can reflect in better or worse actions regarding the use of resources (technological, physical, human and financial), as well as the strengthening, or not, of professional networks.

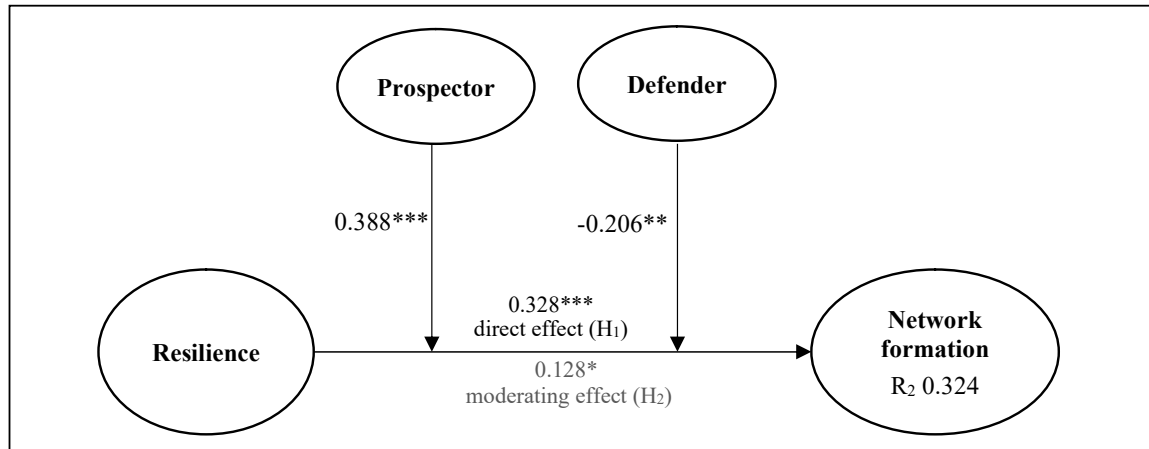


Figure 2. Validation of the structural model and research hypotheses

Note: N=106. Performed via bootstrapping, with two-tailed test at 95% significance level (bias-corrected and accelerated), with 5,000 interactions. Significant at the level (p-value, 2-tailed) of: $p < 0.1^*$; $p < 0.01^{**}$; $p < 0.000^{***}$

Source: The authors.

4.3. DISCUSSION OF THE RESULTS

In the analysis of the results, a positive relationship was confirmed between manager resilience and the formation of networks of human and non-human actors, as predicted in hypothesis H_1 . It can be inferred that managers who have the vision to guide creative processes take advantage of difficult problem resolutions and consider feasible solutions when trying to solve a problem. They also tend to attract agents' interest to create robust alliances, that is, resilient managers seek to align interests in order to form alliances with other actors. Beuren et al. (2020) state that the adaptive capacity of individuals is capable of transforming adversity into opportunity and, thus, provides a differential to the organization.

Goal-oriented solution seeking, within resilience, associated with attraction of interest and network formation process suggests that resilient individuals learn from their partners, reorganize their work processes, and bring problem solving closer to their routines. These actions should be expected to contribute to error mitigation and increased flexibility in times of crisis. The characteristic of resilience is the balance between learning from others and having room for individual innovation (Janssen et al., 2006). This perspective shares the concepts of the goal-oriented solution, focusing on the holistic view of the situation for performance.

Kozłowski and Bell (2008) state that, when faced with difficult situations, organizations have developed partnerships in order to reorganize work processes and discuss decisions together to overcome the problem. Thus, the relationship between goal-oriented solution seeking and attraction of interest, as well as goal-oriented solution seeking and network formation process, increases/decreases at equivalent levels. A possible explanation is based on the findings of Balestrin et al. (2010), regarding the antecedents that led to the formation of interorganizational cooperation networks, that there is an evident predominance of congruence of objectives among the various actors.

A moderating effect of the strategic priority of innovation on the relationship between manager resilience and human and non-human actor network formation was observed, which supports hypothesis H₂. All relationships were affected by the inclusion of the moderating variables, prospector strategy and defender strategy, both in terms of direction and strength, as established in the literature on moderating effects (Bennett, 2000). The results indicate that the strategic priority of innovation can influence the relationship between manager resilience and network formation in incubated companies.

The moderating effect of the prospector strategy on the interaction of resilience, in the case of trust in team decisions, with the network formation process may find support in the fact that the ideology of the networked firm is cooperation, based on trust and rapid communication (Mouritsen & Thrane, 2006). Trust is important in forming expectations because it allows network partners to develop a set of rules of behavior. In the absence of trust, prospector managers of incubated companies may feel that they are in an environment of limited cooperation and support. This can trigger feelings of insecurity, since start-ups, a common characteristic of incubated companies, lack mutual participation among the agents involved in entrepreneurial tasks.

In line with the actor-network theory, a team can be part of a network that does not necessarily operate in the same environment. This is another possible explanation for the relationship between trust in team decisions and the network formation process. The elucidation of this phenomenon is supported by Olave and Amato (2001), when they state that trust is intertwined with cooperation among companies, involving cultural and actors' interest aspects. Knowledge about the actors with common interests is the first step in creating the culture. In this sense, building trust between partners is fundamental to the networks' performance.

In prospector firms, innovation competence also plays a relevant role due to its emphasis on the continuous search for new market opportunities (Díaz-Fernández et al., 2014). Furthermore, the less standardized nature of individuals' goals, activities, and tasks in this context justifies that these companies need employees with adaptive skills due to the turbulent environment in which they are situated. The same can be observed in incubated companies, where resilience and innovation strategies coalesce harmoniously.

The moderating effect of the defender strategy on the interaction of resilience, in the case of resource access, with the network formation process reveals that this influence is negative. Thus, the greater the resource access of a manager with strategic defender priority, the less network formation will happen. In line with this, Balestrin et al. (2010) state that the need for access to resources presents itself as a motivating element for cooperation networks formation. Apigian et al. (2006) argue that generally defenders try to become more efficient and retain customers, but they can add value to their organization by developing a strategy that integrates their suppliers.

Therefore, if the incubated company has sufficient access to resources, the need to form partnerships decreases, that is, the search for cooperation between incubated companies and other actors decreases. For example, a manager with a defender profile whose focus is on efficient production, while he has satisfactory resources in his organization, does not need collaborative relationships as much as managers with limited access to resources or who do not have them. It is inferred, therefore, that an individual with a defender profile who has the necessary knowledge to do the job and has access to resources, financial or otherwise, tends not to form networks.

5. FINAL CONSIDERATIONS

This research analyzed the influence of manager resilience on network formation under the moderating effect of the strategic priority of innovation, in incubated companies. The results denote that firms with resilience skills tend to attract interest from agents to build alliances and cooperation projects. Furthermore, they revealed a positive moderating effect of the prospector strategy on the relationship between manager resilience and human and non-human network formation, but a negative moderating effect of the defender strategy on this relationship. However, the latter relationship may be bidirectional, as actors external to incubated firms may prefer to maintain strong interactions with stable company/actant networks with business consolidation strategies.

Some theoretical implications follow from this study. The first is that the results of the exploratory analyses did not show full theoretical-empirical adherence of the research instrument used to measure the manager resilience variable, developed from the factors resulting from Mallak's study (1998), which requires efforts to adapt and/or change it to improve reliability rates. The second theoretical implication refers to the strategic priority of innovation, which was not analyzed as a single outcome variable, but as a consequence of two archetypes brought up in the literature: strategic defender profile and strategic prospector profile. The innovation brought by the studies of Miles et al. (1978) constitutes only a part of the topic in question, but in this research it appears as a focal element, which provides a differentiated lens to the organizational strategy approach.

This study also presents practical implications for incubated companies, based on inferences about the relationship between resilient and innovative profiles of managers and network formation. The research findings suggest that the attitudinal actions of the managers are possibly reflected in the expansion of the organizational structure of these companies and in the building of alliances and cooperation projects. Also, even if the actor-network theory is perceived as having a qualitative approach, the elements in this study denote that one should not limit the scope of network formation, given the practical implications for the field.

Future research should analyze the relationship (which may be bidirectional) between manager resilience, when switching from defender to prospector strategy, and network formation, as well as its effects on performance. The network formation construct is an original contribution of this study and one that needs to be further tested in future research. Incubated companies have particular characteristics, be it due to their life cycle stages, their entrepreneurial and innovative management, or due to the support they seek for the development of their projects at business incubators, which may reflect in differences with other companies, a gap that is worth investigating.

REFERENCES

- Akgün, A. E., & Keskin, H. (2014). Organisational resilience capacity and firm product innovativeness and performance. *International Journal of Production Research*, 52(23), 6918-6937. <https://doi.org/10.1080/00207543.2014.910624>
- Akrich, M., Callon, M., & Latour, B. (1988). A quoi tient le succès des innovations?: L'art de l'intéressement. *Annales des Mines, Gérer et comprendre*, 11, 4-17.
- Amaral, A., Fernandes, G., & Varajão, J. (2015). Identifying useful actions to improve team resilience in information systems projects. *Procedia Computer Science*, 64, 1182-1189. <https://doi.org/10.1016/j.procs.2015.08.549>

- Apigian, C. H., Ragu-Nathan, B. S., & Ragu-Nathan, T. S. (2006). Strategic profiles and internet performance: An empirical investigation into the development of a strategic Internet system. *Information & Management*, 43(4), 455-468. <https://doi.org/10.1016/j.im.2005.11.003>
- Balestrin, A., Verschoore, J. R., & Reys, E., Jr. (2010). O campo de estudos sobre redes de cooperação interorganizacional no Brasil. *Revista de Administração Contemporânea*, 14(3), 458-477. <https://doi.org/10.1590/S1415-65552010000300005>
- Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51(6), 1173-1182. <https://doi.org/10.1037/0022-3514.51.6.1173>
- Bedford, D. S., Malmi, T., & Sandelin, M. (2016). Combinations of strategy and control: A set-theoretic approach. *Social Science Research Network (SSRN)*. <https://doi.org/10.2139/ssrn.2383010>
- Bennett, J. A. (2000). Focus on research methods-mediator and moderator variables in nursing research: conceptual and statistical differences. *Research in Nursing and Health*, 23(5), 415-420. [https://doi.org/10.1002/1098-240X\(200010\)23:5<415::AID-NUR8>3.0.CO;2-H](https://doi.org/10.1002/1098-240X(200010)23:5<415::AID-NUR8>3.0.CO;2-H)
- Beuren, I. M., & Santos, V. (2019). Sistemas de controle gerencial habilitantes e coercitivos e resiliência organizacional. *Revista Contabilidade & Finanças*, 30(81), 307-323. <https://doi.org/10.1590/1808-057x201908210>
- Beuren, I. M., Santos, V., & Bernd, D. C. (2020). Efeitos do sistema de controle gerencial no empowerment e na resiliência organizacional. *Brazilian Business Review*, 17(2), 211-232. <http://doi.org/10.15728/bbr.2020.17.2.5>
- Callon, M. (1986). Some elements of a sociology of translation: Domestication of the Scallops and the Fishermen. In J. Law (Org.), *Power, action and belief: A new sociology of knowledge?* (pp. 196-223). Routledge & Kegan.
- Carvalho, H., Cruz-Machado, V., & Tavares, J. G. (2012). A mapping framework for assessing supply chain resilience. *International Journal Logistics Systems and Management*, 12(3), 354-373. <https://doi.org/10.1504/IJLSM.2012.047606>
- Chin, W. W. (1998). The partial least squares approach for structural equation modeling. In: G. A. Marcoulides (Ed.). *Modern methods for business research* (pp. 295-336). Lawrence Erlbaum Associates, New Jersey.
- Croteau, A.-M., Raymond, L., & Bergeron, F. (1999). Testing the validity of Miles and Snow's typology. *Allied Academies International Conference: Proceedings of the Academy of Management Information and Decision Sciences*. Jordan Whitney Enterprises.
- Cruz, M. T. S., & Moraes, I. M. M. (2013). Empreendedorismo e resiliência: mapeamento das competências técnicas e comportamentais exigidas na atualidade. *Pensamento & Realidade*, 28(2), 59-76.
- Díaz-Fernández, M., López-Cabrales, A., & Valle-Cabrera, R. (2014). A contingent approach to the role of human capital and competencies on firm strategy. *BRQ Business Research Quarterly*, 17(3), 205-222. <https://doi.org/10.1016/j.brq.2014.01.002>
- Dyer, B., & Song, X. M. (1998). Innovation strategy and sanctioned conflict: a new edge in innovation? *Journal of Product Innovation Management*, 15(6), 505-519. <https://doi.org/10.1111/1540-5885.1560505>

- Edwards, J. R. (2001). Multidimensional constructs in organizational behavior research: An integrative analytical framework. *Organizational Research Methods*, 4(2), 144-192. <https://doi.org/10.1177%2F109442810142004>
- Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G* Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, 41(4), 1149-1160. <https://doi.org/10.3758/BRM.41.4.1149>
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39-50. <https://doi.org/10.1177%2F002224378101800104>
- Galizia, A., Simon, C., Weber, P., Iung, B., Duval, C., & Serdet, E. (2016). Markers and patterns of organizational resilience for risk analysis. *IFAC-PapersOnLine*, 49(19), 432-437. <https://doi.org/10.1016/j.ifacol.2016.10.609>
- Gilly, J.-P., Kechidi, M., & Talbot, D. (2014). Resilience of organisations and territories: The role of pivot firms. *European Management Journal*, 32(4), 596-602. <https://doi.org/10.1016/j.emj.2013.09.004>
- Hair, J. F., Jr., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2014). *A primer on partial least squares structural equation modeling (PLS-SEM)*. Sage Publishing.
- Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. The Guilford Press.
- Hambrick, D. C. (2003). On the staying power of defenders, analyzers, and prospectors. *The Academy of Management Executive*, 17(4), 115-118. <https://doi.org/10.5465/ame.2003.11851883>
- Heinicke, M. (2014). Implementation of resilient production systems by production control. *Procedia CIRP*, 19(1), 105-110. <https://doi.org/10.1016/j.procir.2014.05.001>
- Janssen, M., Elmqvist, T., Anderies, J. M., & Mcallister, R. R. (2006). Toward a network perspective of the study of resilience in social-ecological systems. *Ecology and Society*, 11(1), 15. <https://doi.org/10.5751/es-01462-110115>
- Keramati, A., Azadeh, M. A., & Mehran-Gohar, M. (2009). The impact of information technology investment on bank performance considering the role of moderator variables: Strategy and environmental dynamism. *International Conference on Information Management and Engineering*. IEEE. <https://doi.org/10.1109/ICIME.2009.89>
- Kozlowski, S. W. J., & Bell, B. S. (2008). Team learning, development, and adaptation. In V. I. Sessa & M. London (Eds.), *Work group learning* (pp. 15-44). Lawrence Erlbaum Associates.
- Latour, B. (1996). On actor-network theory: A few clarifications. *Soziale Welt*, 47(4), 369-381. <http://www.jstor.org/stable/40878163>
- Lee, A. V., Vargo, J., & Seville, E. (2013). Developing a tool to measure and compare organizations' resilience. *Natural Hazards Review*, 14(1), 29-41. [https://doi.org/10.1061/\(ASCE\)NH.1527-6996.0000075](https://doi.org/10.1061/(ASCE)NH.1527-6996.0000075)
- Lengnick-Hall, C. A., Beck, T. E. (2005). Adaptive fit versus robust transformation: How organizations respond to environmental change. *Journal of Management*, 31(5), 738-757. <https://doi.org/10.1177%2F0149206305279367>
- Lengnick-Hall, C. A., & Beck, T. E. (2009). Resilience capacity and strategic agility: Prerequisites for thriving in a dynamic environment. In C. Nemeth, E. Hollnagel & S. Dekker (Eds.), *Resilience engineering perspectives* (2nd ed., pp. 31-45). Ashgate Publishing.

- Lengnick-Hall, C. A., Beck, T. E., & Lengnick-Hall, M. L. (2011). Developing a capacity for organizational resilience through strategic human resource management. *Human Resource Management Review*, 21(3), 243-255. <https://doi.org/10.1016/j.hrmr.2010.07.001>
- Mallak, L. A. (1998). Measuring resilience in health care provider organizations. *Health Manpower Management*, 24(4), 148-152. <https://doi.org/10.1108/09552069810215755>
- Mendonça, D., & Wallace, W. A. (2015). Factors underlying organizational resilience: The case of electric power restoration in New York City after 11 September 2001. *Reliability Engineering & System Safety*, 141, 83-91. <https://doi.org/10.1016/j.res.2015.03.017>
- Miles, R. E., Snow, C. C., Meyer, A.D., & Coleman, H. J., Jr. (1978). Organizational strategy, structure, and process. *Academy of Management Review*, 3(3), 546-562. <https://doi.org/10.2307/257544>
- Mouritsen, J. & Thrane, S. (2006). Accounting, network complementarities and the development of inter-organisational relations. *Accounting, Organizations and Society*, 31(3), 241-275. <https://doi.org/10.1016/j.aos.2005.04.002>
- Oba, K., Yoshizawa, A., & Kitamura, M. (2016). Socially constructed resilience by multiple organizations: The case of Tokai No. 2 Power Station. *IFAC-PapersOnLine*, 49(19) 251-256. <https://doi.org/10.1016/j.ifacol.2016.10.538>
- Olave, M. E. L., & Amato, J., Neto. (2001). Redes de cooperação produtiva: Uma estratégia de competitividade e sobrevivência para pequenas e médias empresas. *Revista Gestão e Produção*, 8(3), 289-303. <https://doi.org/10.1590/S0104-530X2001000300006>
- Pazetto, C. F., Mannes, S., & Beuren, I. M. (2020). Influência dos sistemas de controle e da folga de tempo na inovação de processos. *Revista de Administração Mackenzie*, 21(3), eRAMR200147. <https://doi.org/10.1590/1678-6971/eRAMR200147>
- Raupp, F. M., & Beuren, I. M. (2006). O suporte das incubadoras brasileiras para potencializar as características empreendedoras nas empresas incubadas. *Revista de Administração -RAUSP*, 41(4), 419-430.
- Reghezza-Zitt, M., & Rufat, S. (2015). *Resilience imperative: uncertainty, risks and disasters*. Elsevier.
- Ruiz-Martin, C., Paredes, A.L., & Wainer, G.A. (2015). Applying complex network theory to the assessment of organizational resilience. *IFAC-PapersOnLine*, 48(3), 1224-1229. <http://www.spell.org.br/documentos/ver/16958/o-suporte-das-incubadoras-brasileiras-para-potencializar-as-caracteristicas-empreendedoras-nas-empresas-incubadas/i/pt-br>
- Scheaffer, R. L. Mendenhall, W., & Ott, R. L. (1996). *Elementary survey sampling* (5th ed.). Duxbury Press, New York.
- Villavicencio-Ayub, E., Jurado-Cárdenas, S., & Valencia-Cruz, A. (2014). Work engagement and occupational burnout: Its relation to organizational socialization and psychological resilience. *Journal of Behavior, Health & Social Issues*, 6(2), 45-55.

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest.

AUTHOR CONTRIBUTIONS

Author 1: Construction of the idea, follow-up and analysis of the research development at all stages. Author 2: Construction of the idea and development of the research at all stages.

Table 2. *Validity of the formative constructs*

Constructs	Items	Outer loadings	Path
Resilience			
Goal-oriented Solution Seeking → Resilience	RS3	0.864	0.264***
	RS13	0.806	
Source reliance → Resilience	RS6	0.869	0.393***
	RS7	0.872	
Critical understanding → Resilience	RS15	0.842	0.311***
	RS16	0.883	
Role dependence → Resilience	RS17	0.894	0.315 Ns
	RS18	0.900	
	RS19	0.717	
Resource access → Resilience	RS14	0.812	0.398**
	RS22	0.764	
	RS24	0.763	
Network formation			
Attraction of interest → Network formation	NF4	0.911	0.338***
	NF5	0.792	
Network formation process → Network formation	NF7	0.829	0.679***
	NF9	0.897	
	NF10	0.913	
Attachment to initial purposes → Network formation	NF12	0.945	0.327***
	NF13	0.880	
Strategic priority of innovation			
Prospector	SP2	0.733	
	SP3	0.805	
	SP4	0.800	
	SP6	0.787	
Defender	SP11	0.825	
	SP12	0.946	

Note: Significant at the level of * $p < 0.01$; ** $p < 0.05$; *** $p < 0.10$. Ns = Non-significant.

Source: Research data.