Strategic factors of network organisations and their influence on inter-organisational learning

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Abstract: The aim of this study was to evaluate the influence of strategic factors on inter-organisational learning in a local productive arrangement (LPA) network. Specifically, the apparel LPA located in the city of Santa Cruz do Capibaribe, Pernambuco-Brazil was studied, mainly composed of micro and small enterprises (MSEs). For this, the quantitative survey method was used, with a sample of 301 respondents, analysed through the modelling of structural equations of the PLS type. The results demonstrate a second-order model, due to the complexity of inter-organisational learning, with measurement and structural validation. This model shows inter-organisational learning in this type of network being influenced only by the trust factor and the spatial proximity existing between the participating MSEs.

Keywords: inter-organisational learning; Inlearning; inter-firm learning; network; clusters; industrial districts; local productive arrangement; LPA; micro and small business; SEM; second-order model; higher-order model.

1 Introduction

Organisational networks are pointed out in the literature as a way for companies to structure themselves in order to achieve competitive advantages that alone would not be able to achieve (Ai and Wu, 2016; Parida and Wincent, 2019; Pratono et al., 2019). Only being possible to acquire these advantages through the internal resources provided by the network itself. Thus, these resources are considered strategic and a source of competitiveness for the companies participating in the network (Parida and Wincent, 2019).

This competitive advantage is the result of knowledge flow between companies through cooperation emerged in the network (Leonidou et al., 2018). However, we emphasise that inter-organisational learning (IOL) of each participating company occurs differently (Presutti et al., 2019). Several types of research have presented (Le Pennec and Raufflet, 2018; Zhu et al., 2018) inter-organisational learning (IOL) as a positive factor for the growth of competitiveness of companies that are part of a network. In addition, IOL is seen as one of the main results of cooperation between companies participating in the network (Balestrin et al., 2010).

In this context, several characteristics of the network are pointed in the literature as factors of influence for the occurrence of IOL, we consider that these factors can be grouped in three levels:

1. the organisation external factors, which correspond to the characteristics that the network provides to all companies involved in it
2. organisational factors, which are related to the companies characteristics that constitute the network
3. individual factors, considered characteristics that each company contains.

Analysing the companies surveyed in this study and their relationship with external factors, we highlight the governance (Roehrich et al., 2020; Sudolska and Lis, 2014) and spatial proximity (Presutti et al., 2019). Regarding organisational factors, we found a relationship with organisational proximity (Presutti et al., 2019) and the kind of
knowledge on the network (Milagres and Burcharth, 2019). Already in the individual factors, we emphasise the opportunistic behaviour (Xu and Cavusgil, 2019), the trust (Peronard and Brix, 2019) and cognitive proximity (Davids and Frenken, 2018). In this scenario, some studies do not present in their results cognitive, organisational and spatial proximity as a positive factor for IOL (Messeni Petruzzelli, 2008; Presutti et al., 2019). Research is also inconclusive when considering the impact of knowledge types on IOL development (Hagedoorn and Wang, 2012). The sheer complexity of the element of trust and opportunistic behaviour calls for further study so that we can better understand the relationship of these factors to IOL (Bengoa and Kaufmann, 2016; Bojica et al., 2018). That said, we can deduce that studies on these factors are not unanimous in analysing the real influence on IOL, whether positive or negative. Rajala (2018) argues that researchers agree that the IOL requires information sharing, but there is still no consistent agreement on what factors contribute to the development of the IOL.

For these reasons, this study aims to further develop this field, leading us to ask some questions: What are the influences of these network strategic factors on the IOL of the Santa Cruz do Capibaribe Local Productive Arrangement (LPA)? We also emphasise the influence of the study of Mozzato and Bitencourt (2018) which already demonstrates the relationship of IOL with some factors inherent to the LPA network, such as trust, social proximity, susceptibility among others. However, we understand that this study is relevant because it seeks to analyse factors that have not yet been studied in relation to IOL, in a context of LPA, and because it seeks to analyse factors that have already been described in the study Mozzato and Bitencourt (2018) in another type of LPA.

We also emphasise that this study focuses on one type of network, the LPA, which is seen as an inter-organisational arrangement with the potential to incite local development (Alievi et al., 2019). Specifically, the Santa Cruz do Capibaribe LPA, which belongs to the Agreste Pernambucano LPA, showing great regional importance and also presents the network factors described above (SEBRAE, 2013).

The motivation for the development of this study was the search for an understanding of how the factors that naturally develop in the network may or may not contribute to the development of IOL. Thus aiming at a greater clarification for network managers that strategic network factors should be further developed to improve learning.

The results of this study will help entrepreneurs of micro and small sized companies which organise themselves in networks, to know the factors that help them to strengthen their capacity for inter-organisational learning, thus, allowing them to promote actions regarding this theme.

This research seeks to contribute to the development of the field of IOL, specifically, by deepening the understanding of the relationship of factors inherent to the LPA network.

2 Local productive arrangement – LPA

This type of network has been approached by scholars since the late 1990s and was initially addressed by the research network on local productive and innovative systems and arrangements (RedSist) (GTP APL, 2014). The concept of LPA is a territorial agglomeration, involving companies related to economic activity and other economic, social and political agents (SEBRAE, 2013). In this sense, the LPA seeks to provide cooperation, inter-organisational learning and increased competitiveness of actors
(GTP APL, 2014), which alone would not have this opportunity (da Costa et al., 2018). By inserting companies in the LPA, they have a greater possibility of acquiring knowledge of the sector in which they are inserted, know and explore the various forms of investments (Oliveira and Gohr, 2018). However, these advantages do not occur automatically.

According to Mozzato and Bitencourt (2018a), the way in which LPA actors interact and establish knowledge-sharing relationships between them, and with other support institutions, differ between different types of networks, i.e., each LPA presents a different context that influences the dissemination of information among the participating companies.

The LPA of Santa Cruz do Capibaribe, which we use as the object of this study, is located in rural Pernambuco and consists predominantly of micro and small sized enterprises (MSEs) in the textile sector, and has the support of several financial and educational institutions. It has the largest wholesale mall in Latin America with more than 9000 boxes, as well as the largest concentration of production units in rural Pernambuco (SEBRAE, 2013).

This LPA proves to be of great importance to the region. Since the city of Santa Cruz do Capibaribe grew 64% of Gross domestic product between 2000 and 2009, a fact explained by the activities developed and related to the LPA, as the other economic activities, namely, agricultural and livestock production were affected by the constant drought of the region (SEBRAE, 2013).

The LPA presents well-structured ties and information exchange among the entrepreneurs that make up the network (Oliveira and Gohr, 2018). These points are relevant to analyse how factors of this network influence IOL. In the next subsection, we will discuss IOL, a theme that is intrinsically related to the development of the LPA.

3 Inter-organisational learning – IOL

IOL can be defined in many ways as learning that happens in a network of companies that learns in their entirety. Also, it can be understood as a network whose main objective is learning between companies; or as learning among the companies that make up the network (Knight, 2002). In our study, we consider IOL as the last definition presented by Knight (2002) and also, as used in the work of Mozzato and Bitencourt (2018b), this study had as its object the Soledade city (RS – State-Brazil) known as gemstone LPA, although it is an LPA from another sector different from the one studied in this research, this study showed evidence of the relationship between IOL and the LPA.

In our review of the literature, we noticed that two processes are constantly cited when IOL is approached:

1. the interaction between the companies that make up the network
2. the absorptive capacity (AC).

Interaction between companies can be represented by the intention to cooperate in a space provided by the network. The intention to cooperate is seen as the attitude of each company to engage, the starting point for learning (Rajala, 2018; Sudolska and Lis, 2014). However, the network needs to provide spaces for cooperation to take place. The studies by Dorow et al. (2018) have used the concept developed by Nonaka et al. (2006),
called *ba*, to represent this space provided by the network, as a physical, virtual or mental space where knowledge can be created, shared or used. The research by Balestrin et al. (2008) transports this concept to the corporate network and decrees *ba* as the spaces that can emerge from workgroups, informal circles, temporary meetings, virtual spaces and other moments in which relationships occur in a shared time and space.

AC has been widely addressed when studies aim to analyse innovation and knowledge in business networks. This concept arose with Cohen and Levinthal (1990) who define it as the recognition, assimilation and use of external knowledge in a commercial context. Posteriorly, the authors Zahra and George (2002) reconceptualised the AC by adding the process of transformation and modifying the recognition by acquisition, so for these authors the AC would be the acquisition, assimilation, transformation and exploitation of external knowledge.

The authors Todorova and Durisin (2007) examined Cohen and Levinthal (1990) and Zahra and George (2002) definitions of AC based on learning theories and understood that it is necessary to recognise the importance of this knowledge by companies before acquire external knowledge, and thereby reintroduce the process of recognising the value of information in the AC. Moreover, for the authors cited, the processes of assimilation and transformation are not sequential, but an alternative, in which the external knowledge after-acquired will be assimilated by the companies or transformed, and may even go from one to the other. Then AC would be the recognition of the importance of information, acquisition, assimilation or transformation and exploitation of external knowledge for the above authors. We consider the conceptualisation that knowledge is shared and transferred at the relationship level, but the AC part occurs in organisations (Rajala, 2018), being ideal for our work that focuses on learning.

Given this scenario and considering the previous research carried out in the Santa Cruz do Capibaribe LPA, we consider IOL as a process in which enterprises that are part of a network intend to cooperate with each other through the interaction that takes place in the space. On the other hand, individuals belonging to participating companies share knowledge. Recognising this value, the individual will acquire it and pass it on to the organisation that will adapt to appropriate this knowledge, and then exploit it. However, this process is greatly influenced by factors widely debated in the network literature that we will delve in the next subsection.

4 Network factors and their relationship to IOL

The network provides several factors that favour or hinder the occurrence of IOL. As we reported earlier, we divided these factors into three groups: external to the organisation, organisational, and individual. The factors external to the organisation include governance and spatial proximity. Governance can be defined as the power that coordinates and controls the participants, and may favour the exchange of knowledge between them (Sudolska and Lis, 2014; Wegner et al., 2017), through the control of network mechanisms for IOL to occur (Roehrich et al., 2020; Verschoore et al., 2015).

Network governance is divided into two types: relational and formal. Relational governance comprises mechanisms that increase trust-building and social identification, while formal governance is linked to formal contracts and the legality of the system (Roehrich et al., 2020). Both types of governance can facilitate knowledge transfer and alliances. However, further studies on the role of governance in IOL are needed to clarify
its influence on dynamic learning processes (Roehrich et al., 2020). Our study focused on formal governance, because in uncertain environments such as developing countries, such as Brazil where the studied LPA is located, the formal mechanism has great relevance to the network (Long et al., 2014). With this we developed the following hypothesis:

H1 The better the governance in the LPA, the greater will be the inter organisation learning (IOL).

Proximity concepts have been widely used in studies about IOL. They point to different dimensions of proximity (geographic, social, cognitive, institutional, organisational, technological and cultural) as necessary factors for the relationships between network companies and for IOL. All of these proximity dimensions can be considered as communication resources that can be exploited by companies to connect to different sources of knowledge, thus increasing the effectiveness of external learning processes (Messeni Petruzzelli et al., 2007).

Geographic/spatial proximity is defined as the physical distance between companies (Terhorst et al., 2018). Geographic proximity allows interaction among individuals belonging to MSEs to occur, thereby enabling the process of IOL (Presutti et al., 2019). In this same context, the research by Terhorst et al. (2018) demonstrates that geographical proximity may favour the occurrence of IOL. However, other studies report a negative relationship between geographic proximity and knowledge acquisition and exploitation (Presutti et al., 2011), or as a non-determining factor for the exchange of knowledge between companies (Hervas-Oliver, 2012). As seen, the studies do not prove to be unanimous about the benefit of geographical proximity to the IOL process, so we built the following hypothesis:

H2 The closer the MSEs in the LPA, the larger will be the IOL.

Regarding the organisational factors, we consider the types of knowledge existing in LPA and organisational proximity. Knowledge transferred between companies can be divided into tacit (closely related to action, non-standard procedures, ideas, values and emotions) and explicit (formal routines, manuals, reports, etc.) (Nonaka and Takeuchi, 1995).

Studies have a consensus regarding explicit knowledge, which is easier to acquire and disseminate, since the transfer of tacit knowledge is not the same, and its internalisation and incorporation into management practices and innovations are difficult and poorly documented (Milagres and Burcharth, 2019). The study by González-Pernía et al. (2015) demonstrates that the type of knowledge influences innovation, the two types of knowledge being ideal for a better innovative process, but evidencing tacit knowledge as the most impactful in innovation.

In the context of knowledge exchange, tacit knowledge is best transferred through interaction between companies, whereas explicit knowledge is given through reports and documents (Iacono et al., 2012). In addition, there are still problems that companies have to absorb knowledge that is developed differently in other companies (Rolland, 2004). Based on this premise we developed the following hypotheses:

H3 The greater the amount of explicit knowledge in the LPA, the greater will be the IOL.

H4 The greater the amount of tacit knowledge in the LPA, the greater will be the IOL.
Organisational proximity can be defined as a measure between organisations, comparing their inherent structures or characteristics (Dorhout, 2020). In this context, we can assume that there are two extremes: low organisational proximity, i.e., no links between interdependent actors, and high organisational proximity, embedded in strong ties, such as hierarchically organised network or with structural similarities (Messeni Petruzzelli et al., 2007). The authors also emphasise that organisational proximity can bring two organisations closer even though they are physically far away.

Research also shows that organisational proximity is more important than geographic proximity to support IOL (Presutti et al., 2019). However, excessive organisational proximity can also negatively affect IOL (Messeni Petruzzelli, 2008). According to the author, there are two possible reasons: the risk of being locked into a specific exchange relationship, which would make it impossible for the network to advance, and excessive organisational proximity, which may not be able to provide the organisational flexibility required by IOL (Messeni Petruzzelli, 2008). Conversely, the study by Dorhout (2020) demonstrates that similarities in the organisational structure between companies contribute to the occurrence of IOL. With this we built the following hypothesis:

H5 The greater the organisational proximity between the network companies, the greater will be the IOL in the LPA.

The individual factors group consists of opportunistic behaviour, trust and cognitive proximity. Opportunistic behaviour is seen as one of the factors that hamper or hinder IOL (Larsson et al., 1998), because it can have a negative effect on business results (Bouncken and Kraus, 2013). Opportunistic behaviours occur relatively frequently in networks between MSEs, due to their market limitations (Bouncken and Kraus, 2013), especially in uncertain environments such as developing countries (Gaur et al., 2011). Opportunistic behaviour in IOL is defined as misappropriation of partner knowledge and strategic manipulation of partners (Walter et al., 2015). It is observed that opportunistic behaviour is much investigated and there are several indications in the literature that link it to transaction costs (Williamson, 1988), evidencing the forms of control between partners so that this behaviour does not appear. One way to reduce opportunistic behaviour in business-to-business transactions in emerging markets, widely debated in the organisational literature, is formal governance (You et al., 2018).

The results of the research by Shahzad et al. (2018) corroborate the fact that governance reduces the appearance of opportunistic behaviour among MSEs that make up the network, but does not eliminate it. However, the extensive formalisation of activities between partners can also increase opportunistic behaviour (Walter et al., 2015), thus, the appearance of this behaviour cannot be avoided when MSEs are organised in network format. Thus, further research in different contexts is still needed to better understand this relationship. Given this we developed the following hypothesis:

H6 The lower the incidence of opportunistic behaviour among the network companies, the greater will be the IOL in the LPA.

Trust can be defined as the belief in the good intent, competence and reliability of the trading partner when it comes to sharing their knowledge and reusing the knowledge shared by the focal company (Ke and Wei, 2007). Lewicki and Brinsfield (2012), emphasise the elements of trust, reciprocity, and beliefs about partners’ intentions as essential to collaborative arrangements. For Hardy, Phillips and Lawrence (2000) it defines trust in inter-organisational relationships as a process of construction of shared
meanings in a process of communication between all the participants involved in the network. Inter-organisational cooperation depends on trust rather than economic calculation, since sharing knowledge with a wrong partner can endanger the firm’s survival, becoming a key factor for effective knowledge exchange (Ke and Wei, 2007).

Studies such as those by Andersen and Medlin (2016) and Seaton et al. (2018), affirm and show that the commitment that is established through trust is a key factor in the establishment of collaborative relationships and determines the prospects for long-term relationships.

The IOL to be successful within a network, and will depend on the cooperative atmosphere based on trust and mutual dependence (Carrizo Moreira, 2009). The research by Cheng (2015) and Peronard and Brix (2019) also points to the positive relationship between trust and knowledge sharing. Murphy (2006) says that trust has been identified as a fundamental feature in business networks and can significantly influence the quality of information and knowledge flows between people in the network.

In this sense, the result of Şengün (2010) research shows a positive and significant association between trust and IOL. Similarly, the results of Yuan et al. (2018) corroborate the results of Şengün (2010), showing that trust shows a positive and significant relationship with IOL. Despite the positive results, we emphasise that trust is developed through repeated knowledge exchange and involvement in networks. The relationship between trust and IOL, as it turned out, is influenced by several factors and can therefore be considered complex (Şengün, 2010). For this reason, studies highlight the importance of further studies on this relationship (Bengoa and Kaufmann, 2016). We developed the hypothesis considering the trust that originates through relationships between companies, as can be seen in the following hypothesis:

H7 The greater the confidence among the network companies, the greater will be the IOL in the LPA.

Proximity also enters at the individual level, with cognitive proximity, which is usually defined in terms of knowledge base and expertise between similar people, not necessarily identical (Messeni Petruzzelli et al., 2007). In this situation, studies (Davids and Frenken, 2018; Presutti et al., 2019) have used it as a factor that influences the occurrence of IOL.

In this context, the research by Presutti et al. (2019) demonstrates that cognitive proximity is important for the acquisition of knowledge from partner companies, and this knowledge becomes an innovation. Corroborating Rolland (2004) states that a high degree of cognitive proximity within a relationship can reduce the knowledge gap between business partners, reinforcing the development of a common knowledge base and expertise.

However, a high degree of cognitive proximity may also not be effective in achieving learning and innovation, as the knowledge bases will be nearly identical and may lead to inertia in the network, i.e. extremes prove detrimental to IOL (Messeni Petruzzelli et al., 2007). In this sense, Enkel and Gassmann (2010) report that cognitive distance positively influences learning through interaction, but emphasise that a very large cognitive distance hinders learning, reiterating the problem of excessive proximity or cognitive distancing between individuals. As we can see, the studies do not make clear the ideal degree of cognitive proximity for the occurrence of IOL, so we present the following hypothesis:

H8 The greater the cognitive proximity between the network companies, the greater will be the IOL in the LPA.
Figure 1 presents our theoretical model along with the hypotheses that will be tested.

**Figure 1** Theoretical model and hypotheses

![Theoretical model and hypotheses diagram](image)

*Source: Prepared by the authors (2019)*

5 **Methodology**

This research is characterised as quantitative, using the survey method, which is commonly used in exploratory studies (Saunders et al., 2012). Our study fits these characteristics because it aims to explore how the IOL phenomenon is influenced by the existing factors in the network between MSE’s, more specifically in the Santa Cruz do Capibaribe LPA. The following is the methodological design of the research.

5.1 **Sample**

The sample of this study derives from the Santa Cruz do Capibaribe LPA, more specifically the Shopping Mall Moda Center, which concentrates most of the companies that belong to LPA. A meeting was held jointly with the directors of Shopping mall Moda Center in October 2018 to find out some details about LPA and the amount of formal and informal MSEs that work there, according to the mall manager, it has close to 7,000 MPE’s in the clothing industry.

For data collection, a research instrument was structured, specifically, a questionnaire to survey data, applied in ‘locus of control’ to obtain a higher rate of return (Saunders et al., 2012) and also due to the characteristic of the place, where most of the employees are of low education and had difficulty accessing the questionnaire applied in a network or sent by post. The questionnaire was developed based on other studies, as described below, and then made a pre-test to obtain higher reliability (Saunders et al., 2012). For sample calculation, in this study we used the gamma-exponential method described by the following inequality:
\[ |\beta|_{min} \sqrt{Ne} \frac{(1-\beta_{max})}{\sqrt{N}} > Z_{1-\alpha} + Z_{1-\beta} \]

\( |\beta|_{min} \) is the smallest path coefficient, \( N \) is the sample size, \( e \) is the neperian number, \( Z_{1-\alpha} \) is the normal distribution score associated with the confidence level and \( Z_{1-\beta} \) is the normal distribution score associated with the power of the test. Therefore, assuming 95% confidence and test power plus an approximate minimum path coefficient of 0.1765, approximately 301 respondents are required.

5.2 Variables

As this field does not yet have a validated and widely accepted questionnaire, the construction of each variable of the applied questionnaire was based on other studies. With the exception of only the questions related to the profile of the MSEs, the other questions were measured using a 5-point Likert scale, with 1 being the lowest intensity and 5 being the highest intensity possible for each question.

5.3 Dependent variable

The dependent variable is IOL. As previously presented, the concept we are considering of IOL in this research is based on the studies by Todorova and Durisin (2007), Balestrin et al. (2008) and Sudolska and Lis (2014). It is constituted of the sub-dimensions: intention to cooperate, \( ba \), value recognition, acquisition, transformation and utilisation. Because it is based on sub-dimensions (first-order variables), this variable is considered in statistics to be second-order (Becker et al., 2012). The sub-dimensions are reflective and were measured with items already developed and used in other empirical studies (Yli-Renko et al., 2001; Jansen et al., 2005; Flatten et al., 2011; Lau and Lo, 2015; Tzokas et al., 2015) and formed the 21 items used to measure IOL.

5.4 Independent variables

Independent variables were formed by network factors that influence IOL as previously seen. Based on the relevant literature, we found the following factors: trust, governance, types of knowledge, opportunistic behaviour, spatial proximity, organisational and cognitive. In each of these variables, measures already proposed in other studies were used.

In our research we consider trust to be good intent, competence and reliability among partners so that knowledge can be shared between them (Ke and Wei, 2007). The questions about trust were raised from the studies by Connell and Voola (2013a). Governance, on the other hand, was defined as the ability to control and coordinate the MSEs and the institutions that make up the network, with the objective of fostering interaction, trust, commitment between the MSEs and the institutions so that IOL occurs between them (Sudolska and Lis, 2014). The items were developed based on the Long et al. (2014) and Zhang and Zhou (2013) studies. The variable types of knowledge were divided into two: explicit and tacit knowledge. Explicit knowledge is understood as the knowledge that can be transferred by formal means such as reports, manuals, etc. (Milagres and Burcharth, 2019). Tacit knowledge is understood as the knowledge that is linked to an action, has its own context and is difficult to codify (Milagres and Burcharth,
Opportunistic behaviour is considered the misappropriation of partner knowledge companies (Walter et al., 2015), which occurs commonly in business networks. To measure this variable, we used the research of the authors previously mentioned. Finally, we have the proximity variable and the specialised literature presents this factor in three types: spatial, organisational and cognitive. Spatial proximity is the physical distance between the companies that make up the network (Presutti et al., 2019). Organisational proximity we consider to be the similarity (or not) between organisations, comparing to their inherent structures or characteristics (Dorhout, 2020). And cognitive proximity is seen as the cognitive (or not) cognitive similarity of network company entrepreneurs (Presutti et al., 2019). The questions we developed to measure these described proximities were adapted from the studies by Kim et al. (2015) and Kaygalak and Reid (2016).

6 Data analysis method

The method chosen for data analysis was the PLS structural equation model (SEM PLS) because it is feasible for analysis of research that is in the early stages of development on a given problem (Hernández-Perlines et al., 2016). To perform the structural equation approach based on the PLS-PM technique, the matrix plus package of the R software for analysis was used (Rönkkö, 2017). To decrease the complexity of the model, we will use the IOL as a second order variable (Becker et al., 2012). Thus, our model is characterised as being second-order reflective-reflective, because first-order variables have reflexive characteristics, but connect with the second-order variable in the reflective configuration. For the analysis of this model we used the dismembered two-stage approach (Becker et al., 2012). In the first stage are analysed the first-order variables of IOL and the independent variables to determine the measurement model. And in the second stage, the structural model with the second order variable is analysed (Sarstedt et al., 2019).

7 Empirical analysis and results

The first stage of the analysis is the verification of the assumptions of the measurement model, by means of the first-order variables of IOL and the independent ones that make up the model that are of the reflexive type. In a study developed only on IOL, we identified that in the context of the Santa Cruz do Capibaribe LPA the model found by SEM PLS does not contain the assimilation variable, i.e., there is no absorption of external knowledge by this type, for this reason. This first order variable was removed from the second-order IOL variable. According to Hair et al. (2017) the measurement model consists of the reliability of internal consistency, convergent validity and discriminant validity. The reliability of internal consistency is more accurately measured by composite reliability (CR) and variables should be > 0.5 in exploratory studies with reflective variables (Hair et al., 2017). Some measurement items of the first-order variables were removed, and all variables reached the required value (Table 1).
Table 1  
Measurement model assumptions (CR, AVE, HTMT)

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<th>Source: Prepared by the authors (2019)</th>
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<tr>
<td></td>
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<tr>
<td>acquisition</td>
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<td>trust</td>
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<td>explicit knowledge</td>
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<td>organisational proximity</td>
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<td>value recognition</td>
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<tr>
<td>transformation</td>
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<tr>
<td>use and storage</td>
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Figure 2  Structural model

Source: Prepared by the authors (2019)
Following, the convergent validity sought to understand if the items of each first-order variable convergent measure each variable, for this purpose two forms of evaluation are used: the external loads and the extracted mean variation (AVE) (Hair et al., 2017). Further, according to the authors, the external loads of each variable should be > 0.4 and AVE > 0.5. As can be seen in Table 1, in relation to AVE all variables exceed these values. Already the external loads are in Appendix.

Discriminant validity ensures that the measurement of each variable is empirically unique and represents a phenomenon of interest and that other variables in a structural equation model do not capture (Hair et al., 2014a). If discriminant validity is not established, then researchers cannot claim that the results confirmed by the structural model are correct (Farrell, 2010). According to the authors Henseler et al. (2015), studies that analyse using SEM PLS have used to examine the discriminant validity of the Fornell and Larcker criterion variables, however, this criterion has been shown to be ineffective in a given circumference, so the aforementioned authors suggest not using this criterion.

Also, according to Henseler et al. (2015), the criterion that presents the best performance for determining the discriminant validity of variables is the heterotrait-monotrait relationship (HTMT). The HTMT values should be below 0.85, otherwise, the variables show a lack of discriminant validity (Hair et al., 2014a). All variables reached the required value, as shown in Table 1:

In the second stage, after verifying that the variables are reliable and valid, the structural model estimates are analysed, which involves the analysis of the model’s predictive resources and the relationships between the variables (Hair et al., 2017). In stage two, the lower order IOL scores obtained in stage one are used to create and estimate the stage two model (Sarstedt et al., 2019) as can be seen in Figure 2.

The first analysis is the collinearity of the structural model (VIF < 5 < 0.2) to analyse the similarity of the model variables, and in our model all constructs show adequate VIF values, ranging from 1.08 to 1.97 among them (Hair et al., 2017). The second analysis, still according to the authors, is the trajectory coefficients of the structural model, in other words, the hypothesis test of the relations proposed in the model. This test requires a bootstrap with 5,000 replications. The result is shown in Table 2.

### Table 2: Hypothesis Test

<table>
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<tr>
<th>Hypothesis</th>
<th>Total Effects</th>
<th>P Values</th>
<th>Test</th>
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<tbody>
<tr>
<td>Opportunistic behaviour -&gt; IOL</td>
<td>-0.013</td>
<td>0.871</td>
<td>Not</td>
</tr>
<tr>
<td>Trust -&gt; IOL</td>
<td>0.159</td>
<td>0.037</td>
<td>Yes</td>
</tr>
<tr>
<td>Explicit knowledge -&gt; IOL</td>
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*Source:* Prepared by the authors (2019)

Table 2 shows that only two relationships can be confirmed, H2 and H7, demonstrating that there is a positive relationship between confidence and IOL and spatial proximity
Strategic factors of network organisations

and IOL. Therefore, greater the confidence and spatial proximity the greater the IOL. The other relationships (H1, H3, H4, H5, H6, H8) in this context cannot be confirmed.

The third analysis of the model is the coefficient of determination (R2), a predictive power measure of the model. In complex models such as ours, it is advisable to use the adjusted R2 value to analyse the predictive power of exogenous (independent) variables in the endogenous (dependent) variable. The value of our model had a significant value of 0.284, which corresponds to 28.4% of the variation of IOL in relation to the model independent variables, which is considered moderate (Hair et al., 2017). The fourth analysis of the model is the effect size of each latent variable in IOL. In this case, we only look at the size of the confidence effect and spatial proximity in IOL. The values of both were 0.02 and considered small (Hair et al., 2017).

Another model quality analysis is the prediction power (Q2) of the exogenous (independent) variables of the endogenous model (IOL) whose result was 0.103, thus demonstrating the existence of prediction (Hair et al., 2014a). The last analysis is how well the model fits the empirical data. As our model is reflective-reflective, the most suitable tests are the standardised root mean square residual (SRMR) and the exact fit test (EFT) (Hair et al., 2017). Our model has an SRMR of 0.06, considered a good fit. The EFT test based on Euclidean and geodetic distance also indicate that the model obtained a good fit.

8 Discussion

As can be seen, the model that we find based on the responses of the MSEs participating in the Santa Cruz do Capibaribe LPA, has concise assumptions and a good model quality adjustment, which allows us to have reliability in its result. Our model is characterised as complex because we seek to present IOL in detail, incorporating intent, ba, value recognition, acquisition, transformation and utilisation (Sudolska and Lis, 2014). Therefore, we developed a second order variable, IOL, which incorporates the other first order variables presented above, which supports what is described in the literature.

Based on these criteria, we can analyse the influence of network factors on IOL. Only two relationships can be statistically proven: the trust (H) and spatial proximity, the other factors in this context does not influence the IOL. Unlike what we found in the studies by Roehrich et al. (2020), our study could not find evidence that formal governance (H1) contributes to IOL, so in this context governance does not favour IOL. This result may occur due to shared type LPA governance, which according to Wegner et al. (2017) has less formalisation and registration of information, and therefore less effectiveness, and consequently not influencing IOL in this context.

Moreover, we saw in our model that spatial proximity (H2), which is widely discussed in the relevant literature (Presutti et al., 2011), positively influences IOL, that is, the closer the MSEs, greater is the opportunity for learn from partners. This result agrees with the study by Terhorst et al., (2018) that presents proximity as an existing benefit in the network that favours the exchange of information.

Studies such as those by Milagres and Burcharthy (2019) present tacit (H4) and explicit (H3) knowledge as factors that interfere with the exchange of knowledge between companies. More specifically, tacit knowledge is seen as more complex, being better transferred by interaction (Iacono et al., 2012), and the easiest explicit to transfer
(Milagres and Burcharth, 2019). However, in our research, the interference of types of knowledge in IOL cannot be proven.

Another proximity approached in the network literature is organisational proximity (H5) (Presutti et al., 2019), seen in the field, as both a positive and negative factor for IOL. Our results differ from the studies (Dorhout, 2020; Messeni Petruzzelli, 2008) since we did not find any relationship of organisational proximity with IOL. Another factor existing in the corporate network is the opportunistic behaviour (H6) and unlike the previously described factors, this factor is seen as having an inverse relationship with IOL (Xu and Cavusgil, 2019), the higher its incidence the lower the IOL. However, this relationship cannot be confirmed either in our research, diverging from the studies presented above.

Trust (H7) stands out in the literature as one of the most important factors for network development (Hardy et al., 2000) and is seen as an essential element for IOL (Peronard and Brix, 2019). In our result this hypothesis was confirmed, even with a considered low effect, has a relationship between confidence and positive IOL, is to say when one grows the other too. The occurrence and importance of trust for the IOL, may occur due to the context of economic risk present in developing countries, where the LPA that was researched is located, since when there is a risk there is a greater propensity for the occurrence and development of trust between network partners (Adobor, 2006).

This result corroborates several studies (Carrióz Moreira, 2009; Connell and Voola, 2013a; Yuan et al., 2018) and further highlights the role of trust in the LPA. Peronard and Brix (2019) study demonstrates, trust between cooperating companies encourages the exchange of knowledge between them that is necessary for their development, as well as being a vital factor for the network.

The latter hypothesis highlights the link between cognitive proximity (H8) and IOL. The studies by Davids and Frenken (2018) and Presutti et al. (2019) present a positive link between them, while other studies (Messeni Petruzzelli et al., 2007) prove to be a negative relationship, thus there is no consensus on the positive or negative influence, only the existence of the relationship between cognitive proximity and IOL. In our model it was not possible to find this link, contrasting with the studies presented above. Just as Wegner and Mozzato (2019) points out that the IOL is influenced by the context and elements inherent in the network, we emphasise these results tend to be characteristic of the type of network analysed.

7 Final considerations

This research aimed to analyse the influence of existing strategic factors on a network of LPA-type MSE’s in IOL. To this end, the Santa Cruz do Capibaribe LPA was chosen, seeking to understand this relationship, as it presents evidence of IOL and the presence of network factors that influence the LPA.

The result was obtained through data analysis using SEM PLS, thus we found a model that met the measurement assumptions and presents good quality in the estimates of the structural model based on the responses of the MSEs. In our research context, only two network factors can be confirmed as influencing IOL: spatial proximity and trust. The more confidence between the MSEs, the better the IOL will be, and the smaller the spatial proximity will be the better for IOL. It is emphasised that trust is an essential requirement in inter-organisational cooperation relationships. However, IOL is
Strategic factors of network organisations

fundamental for the development of MSE’s, as well as for the environment in which they are inserted. The other factors analysed were not related to IOL.

Considering the limitations of this study, the first refers to the fact that this research was conducted together with MSEs from a single LPA, i.e., the result may be specific to the context studied. The second limitation points out that the creation and development of the variable IOL was made based on the literature, but as no compendium was made, we may not have included any first-order variable belonging to IOL. Third, the weaknesses known from SEM as a method are a limitation to the study, as is the Likert scale used to evaluate items that may affect the measurement.

Future research could be to base our results and perform analysis in other LPA or other types of networks to verify as is the influence of the factors of each network when worked with IOL. Because learning is a complex problem, future research could use longitudinal data to gain insight into this relationship. Finally, it is suggested to conduct research that analyses the IOL and the performance of the MSE’s in LPA’s.

References


Strategic factors of network organisations


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