

# Relationship between micro entrepreneurs of a residential condominium at the time of Covid-19: an analysis under the approach of social network

## Relacionamentos entre microempreendedores de um condomínio residencial em momento de Covid-19: uma análise sob o enfoque das redes sociais

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### Abstract

The objective of this research is to analyze the network of interactions of a group of microentrepreneurs of a residential condominium in São Paulo in times of Covid-19. It is a descriptive study with in-depth analysis using social network analysis techniques, complemented by correlation analysis. It is possible to identify that there is a very strong relationship between the actors of the network, with few actors like hub and intense exchange of information within the network. The study demonstrated that the business time correlates positively with the degree centrality and centrality of intermediation in the network.

**Keywords:** Analysis of social networks. Network. Microentrepreneur. Covid-19.

### Resumo

O objetivo desta pesquisa é analisar a rede de interações de um grupo de microempreendedores de um condomínio residencial paulistano em tempos de Covid-19. É um estudo descritivo com análise em profundidade pelo uso de técnicas de análise de redes sociais, complementada pela análise de correlação. É possível identificar que há um relacionamento muito forte entre os atores da rede, com poucos atores tipo *hub* e intensa troca de informações dentro da rede. O estudo demonstrou que o tempo de negócio se correlaciona positivamente com a centralidade de grau e de intermediação na rede.

**Palavras-chave:** Análise de redes sociais. Rede. Microempreendedor. Covid-19.

## 1 Introduction

With the sudden emergence of the Covid-19 pandemic, due to coronavirus, and the consequent blockage in business (OPAS BRASIL, 2020), several initiatives of small business entrepreneurs were developed to safeguard companies (DIÁRIO DO NORDESTE, 2020; G1, 2020; MIRAGAIA, 2020; PEREIRA, 2020).

In a residential condominium, located in the south of São Paulo, residents formed, in 2019, a group of microentrepreneurs for marketing and provision of services: clothing objects,

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cosmetics, household items, food and services. This type of initiative has been a new trend in residential condominiums, aiming at exploring opportunities for the development of local businesses and obtaining extra income based on greater integration and practicality (FIBERSALS, 2019; MESQUITA, 2019).

This group of microentrepreneurs met monthly in the condominium facilities, but due to the measures of social isolation to avoid agglomerations imposed by the Municipality of São Paulo, the group of microentrepreneurs (PMS, 2020) had to discontinue meetings and their businesses from March 2020. The same discontinuity occurred in commercial condominiums, including the abrupt stop in various business and service segments (G1, 2020; SOUZA e FELLET, 2020).

Small businesses are considered microenterprises and usually start their activities informally and, when they work, are encouraged to formalize. Obtaining an annual gross revenue of up to R\$ 81,000.00 (Brazilian Real), the entrepreneur can become a formalized individual microentrepreneur (PORTAL DO EMPREENDEDOR, 2020; MINISTÉRIO DA ECONOMIA, 2018), and after the emergence of this regime, in July 2008, there was a significant expansion of registered businesses in this modality, reaching approximately 9.7 million formal microenterprises in 2018 (ALVARENGA, 2019).

The trend of WhatsApp, Instagram and Facebook had already been adopted in business, although gradually and unstructured (BELFORT, 2017; GP PILLAR, 2018; POLTRONIERI, 2018; SINDICONET, 2018; SCHNEIDER, 2020; MEDRADO, 2018). In this sense, a portal on the Internet exists, since 2019, for the dissemination of WhatsApp groups and the 28 existing categories, there is the business and entrepreneurship, which has more than 300 groups of contacts registered (GRUPOSWHATS.APP, 2019).

In this scenario, Social Network Analysis (SNA) can be used as a tool for understanding relationships and connections (MARTELETO, 2001), and on the realization of exchanges between offerors and buyers that are part of the groups of microentrepreneurs.

The analysis of social networks has been used in several social studies of companies and the application of techniques in groups of entrepreneurs has still been incipient, a field still to grow, given the expressive number of small businesses existing. The literature presents the concepts of actors and their interactions through nodes and edges enabling the analysis of dependence, flow, and exchange of information within the network.

Given the above, the following research problem is proposed: In the light of social networks, how do relationships between microentrepreneurs of a residential condominium occur in times of Covid-19? This research aims to analyze the network of interactions of a group of microentrepreneurs of a residential condominium in São Paulo in times of Covid-19, with support in the theoretical approach of social network analysis.

To achieve the proposed objective, the article was divided into the following sections: theoretical reference, which deals with micro entrepreneurship, digital communication, and analysis of social networks; methodology and the application of the analysis of social networks in the group of microentrepreneurs of the condominium; analysis of the results found in the research, and the final considerations.

## 2 Theoretical Framework

This section is divided into the definition of micro entrepreneurship, where the activities found in the group of entrepreneurs of the condominium, digital communication, among them, including the existing digital tools, and, finally, the analysis of social networks, their types and metrics, are fit to understand how to analyze the network of cooperation and interaction of the group of microentrepreneurs of the condominium.

The theme of entrepreneurship has been addressed in studies and research since the 1960s. In research on the term "entrepreneurship", in the Web of Science database there are more than 25,000 articles published in business areas, management, economics, social sciences, engineering, among others (WEB OF SCIENCE, 2020). Those who seek to undertake live together in the challenge of exploring ideas and investing in resources and materials in a different way, enhancing gains and generating new business (TELLES; ROCHA; *et al.*, 2016).

Regarding the coverage of the theme and the multiple objective and subjective aspects, small businesses have no consensual definition, but some characteristics are size, billing, level of autonomy, strength and weaknesses in negotiations, operative effort, and rapid market entry. In Brazil, out of approximately 19.02 million companies, 9.7 million are individual microentrepreneurs (MEI), 6.5 million are microentrepreneurs (intellectual services), 0.89 million are small businesses (EPP) and 1.93 million are classified as other sizes, which includes medium and large companies in 2020 (DATA SEBRAE, 2020).

If it is considered that only 390 publicly traded companies listed on B3 in 2020, 99.0% of the production units are micro and small enterprises (B3, 2020).

This article focuses on micro entrepreneurship and how media and social media communication is used to impact the increase in small businesses, thus, these themes will be dealt with in the theoretical framework.

## 2.1 Micro entrepreneurship

The term microentrepreneur is already known and the individual microentrepreneur (MEI) is a legal entity in Brazil (MINISTÉRIO DA ECONOMIA, 2018).

This, arose with promulgation of the Statute of Microenterprise and Small Business No. 128/2008, also known as The General Law of Micro Enterprise, to formalize the person who identifies an opportunity in small businesses (COLBARI, 2015; TELLES; ROCHA; *et al.*, 2016).

In the Entrepreneur Portal, are listed 476 occupations framed as MEI, and among them are: artisans, embroiderers, merchants of sporting goods, clothing items, cosmetics, and perfumery items, sweets, popcorns, event promoters, cheeses, sewing, ice cream parlors, weavers, street vendors, among others (PORTAL DO EMPREENDEDOR, 2020).

Although there are approximately 41.0% of microentrepreneurs in informality (IBGE, 2020), it is not appropriate here to identify whether the microentrepreneurs of the residential condominium act formally or informally but consider that they have identified "opportunities and businesses" (TELLES; ROCHA; *et al.*, 2016). Because being formal or informal does not change the characteristics of micro entrepreneurship. The point of sale used by a microentrepreneur is usually: the housing itself (48.6%); commercial establishments (30.2%); neighbors' points (10.7%); street (8.9%); fair or popular shopping (1.5%) (COLBARI, 2015). Colbari (2015) and Telles *et al.* (2016) affirm that, in Brazil, among the entrepreneurs who, due to the opportunity, started their businesses, the microentrepreneurs who decided to undertake motivated by the dismissal of employment or because they aimed to increase their incomes stand out.

In condominiums, there is a trend of using traditional marketing, such as word of mouth disclosure, to help to promote the capture of new customers (BELLO; ROJAS e ZANNI, 2014). The increased popularity and influence of social media and chat apps have led many organizations to strategically explore these tools to create brand awareness, establish and maintain customer relationships, just as it is with digital and traditional *marketing* (JOSE, 2018).

In this sense, to find customers and offer their products and services, microentrepreneurs can use communication and digital marketing tools for sharing the knowledge and exchanging

the information constructed through interaction (BELLO; ROJAS e ZANNI, 2014; GOULART, 2014).

The next section deals with digital communication, and more specifically the use of social media and networks, one of the tools used for cooperation and interaction between the members of the group of entrepreneurs of the condominium.

## 2.2 Communication: Media and Social Networks

Interaction between people and organizations can be done on social media and network platforms (websites and applications on Internet). Increasingly, the participation, interaction and control of users were being expanded through websites, blogs, wikis, sharing sites, among others (HADDAD; MARANGONI e KUAZAQUI, 2019).

The use of mobile devices, known as smartphones, and the emergence of apps have further expanded interaction with social media and networks with instant messaging apps. They are known as instant messaging tools, media, and social networks: Facebook, Twitter, WhatsApp, Instagram, LinkedIn, YouTube, Google, Snapchat, Skype, Wikipedia, and Telegram, among others (GOULART, 2014; KOTLER; KARTAJAYA e SETIAWAN, 2017). Through these tools, someone can maintain and make virtual friendship connections (GIL, 2016).

In addition to using communication among microentrepreneurs, social media and networking tools can be used to meet the needs of consumers who are increasingly connected, which is one of the trends that is shaping marketing. They are online interaction tools that contribute to offline consumer interactions, making it a way to differentiate and offer the best customer experience, not least because they offer social practices that bring different user experiences, especially when used by small and medium enterprises (KOTLER; KARTAJAYA e SETIAWAN, 2017; KARAPANOS; TEIXEIRA e GOUVEIA, 2016; KARAPANOS; TEIXEIRA e GOUVEIA, 2016; JOSE, 2018).

Choosing to shape outreach strategies for consumers, it is likely that various media and social networking tools will be used, as they have large user bases, which surpass the populations of various countries (Facebook 2.4 billion, YouTube 2.0 billion, WhatsApp 2.0 billion, Facebook Messenger 1.3 billion, WeChat 1.1 billion and Instagram 1.0 billion) (STATISTICA, 2020). WhatsApp emerges as one of the most widely used mobile social media tools for instant messaging, as it is a practical tool for group relationships, promoting effectiveness and virtual collaboration (ZHANG; SUN; *et al.*, 2018).

Undertaking in residential condominiums can be an option to promote products and services, with low-cost dissemination tools, whether through traditional or digital means. Thus, it is an opportunity to *use* word-of-mouth marketing, media tools and social networks. WhatsApp can be used in online actions for this type of promotion, mainly because people are spending more time daily interacting using social media (GOULART, 2014; BRITO e MALHEIROS, 2013). In WhatsApp it is possible to create groups for posts and exchange of information and transmission lists (KOTLER; KARTAJAYA e SETIAWAN, 2017), which makes it viable as a communication tool between microentrepreneurs or for dissemination between microentrepreneurs and residents of the condominium (JOSE, 2018).

The next section deals with the analysis of social networks, their use for the evaluation of interaction and cooperation among the members of the group of entrepreneurs of the condominium.

## 2.3 Social Network Analysis

The analysis of social networks is one of the studies of the theory of social networks, which seeks to understand and interpret the form of connection among the various types of entities: people, groups, companies, countries (GIL, 2016). A network has a shape of a tree,

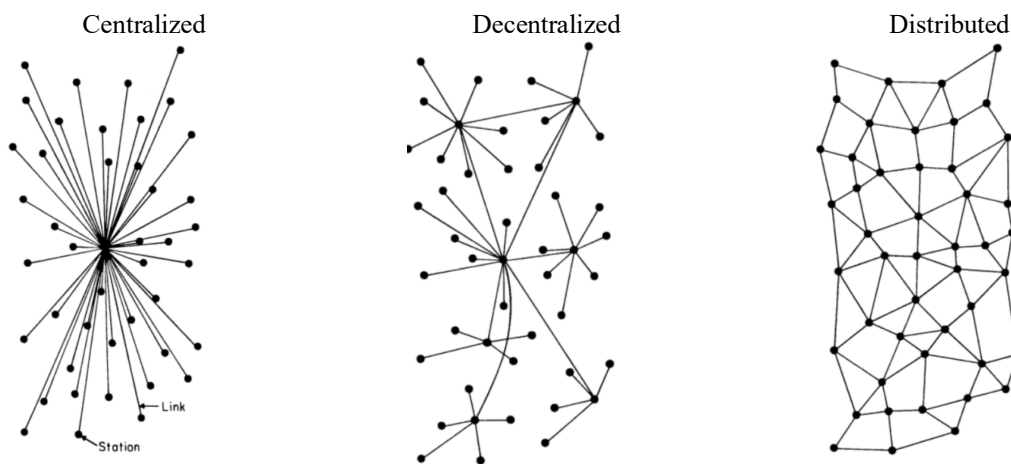
which branches in the formation of several branches to the leaves, in a finite shape in T or Y, its intersection is considered a node. It is clearer to understand the format of the network as a web, due to the number of connections having a collection of nodes and the connections among them. The larger this collection number of nodes, the denser the network (VELOSO; SANTOS; *et al.*, 1983; DROZDEK, 2016; LEONARDO; FARINA; *et al.*, 2019).

Relationships occur through nodes and bonds, nodes are social actors, who make up networks, and ties are interactions or bonds (GIL, 2016; ALEJANDRO e NORMAN, 2005). The formation of bonds and nodes occurs among those involved, directly or indirectly connected, enables the understanding of the flow of interaction (unidirectional or bidirectional) among the participants, who can cooperate jointly, interconnected simultaneously (LEONARDO; FARINA; *et al.*, 2019; SOUZA; FARINA; *et al.*, 2014). Granovetter (1973) reflects on strong bonds, which reflects relationships between each other with greater interaction, and that boost and sustain social networks, as opposed to weak ties. The absence of link, or flow, characterizes loose nodes within the network (ALEJANDRO e NORMAN, 2005).

The emergence of a network, such as the group of microentrepreneurs of the condominium to be analyzed, occurs due to the common interest among the actors in negotiating their products and services, in a non-hierarchical or structural way, without the mediation of any type of control, in a dynamic and self-adjusting way, where the exchange of information occurs in a non-linear way (SOUZA; FARINA; *et al.*, 2014).

Baran (1962, p. 4; 1964, p. 2) features three basic network structures, which are illustrated in Figure 1: centralized - all peripheral nodes connect to only one central node; decentralized - there is not a single central node, but several connector nodes; distributed- all nodes connect to each other, without having to go through a central node.

**Figure 1 - Network Types (Centralized, Decentralized, and Distributed)**



Source: Baran (1962, p. 4; 1964, p. 2)

With the use of social network analysis, it is possible to identify a relationship structure between its actors, groups, and the network of relationships, which can be in different ways and with various structural properties, a small or large network, providing information, resources, and commercial transactions. The social actors, included in this study, are the participants of the group of microentrepreneurs of the condominium (DONATO; PINHEIRO; *et al.*, 2015; LEONARDO; FARINA; *et al.*, 2019; PASCOTTO; FARINA; *et al.*, 2013; TUNU e FARINA, 2014).

The analysis of social networks, a technique known by the acronym Social Network Analysis, is a way to measure the network of relationships and can be useful in mapping these relationships (SOUZA; FARINA; *et al.*, 2014). Nodes, connections and their flows, and the

unit with their relevance that form the network can be investigated and analyzed, such as their different densities and their centralities of connections. The connections presented in the graphs are identified as arrows directed to social actors (in-degree) and arrows directed from the social actors (out-degree), being able to identify the main actors of the network (FARINA; SILVA; *et al.*, 2013; LEONARDO; FARINA; *et al.*, 2019).

Among the issues dealt with in Social Network Analysis is the theme of cooperation networks, according to Verschoore and Balestrin (2008), the cooperation networks constitute an alternative for reducing opportunistic actions without bureaucratic and contractual costs. They can be used between companies as a means of exchanging information and achieving common objectives. There is a distinction in three levels: individuals participating in groups, groups participating in companies; companies participating in networks. Thus, the process of interaction between people and companies belonging to the group is important (BRASS; GALASKIEWICZ; *et al.*, 2004).

This interaction process can occur directly (interaction between actor A and actor B) or indirect (interaction between actor A and actor B, through one or more actors). The chance of individuals moving in their own world depends on the restrictions between different areas of their field. The restrictions imposed determine the "power" of team knowledge. However, the entire social field is a field of power that acts on team members and shapes their behavior and experience, that is, it can be conceptualized as a small world (WATTS, 2004; BRAGA; GOMES e RUEDIGER, 2008; TRAVERS e MILGRAM, 1969).

When there are actions in a cooperative manner, each individual responsible for a given activity and counting on everyone working together in search of common objectives, one can consider a network. Companies that rely on actions cooperated by other companies can be more competitive, creating competitive advantage in their way of organizing themselves, so it can also be with groups that interact in the network, also cooperating, inside or outside the network (DONATO; PINHEIRO; *et al.*, 2015).

The competitive advantages sought by the cooperation networks also count on social relationships as a source of personal relationships, in the case of this study, it is important to understand the functioning of the cooperation network in the contribution of the individual to the group, aiming at actions that benefit the collectivity (VERSCHOORE e BALESTRIN, 2008).

Tunu and Farina (2014) point out that benefits can occur in this relationship network, such as "security, integrity, mutuality, flexibility, solidarity, articulation of conflicts and stability, providing the structuring of an appropriate environment for the exchange of information". Other gains may be learning and improving the effectiveness of solutions together, some of which are five competitive gains presented by Verschoore and Balestrin: access to solutions; cost reduction; risks and social relationships; learning and innovation; scale and market power (VERSCHOORE e BALESTRIN, 2008; FARINA; SILVA; *et al.*, 2013).

One of the effects of relationship strategies on cooperation networks is the encouragement and approximation between associates and short and consequently long-term collaborative actions (BALESTRIN; VERSCHOORE e REYES JUNIOR, 2010; ANTUNES; BALESTRIN e VERSCHOORE, 2010). The approximation of the group of microentrepreneurs of the condominium is different from a structured organization, because the collective commitment can occur while individuals remain inserted in the group, so collective and collaborative actions do not require so much improvement among the participants, do not require a contractual and bureaucratic cost, do not require accumulation of social capital, different from the approximation presented by Donato et al (2015) in the group of microentrepreneurs of a local and annual event (VERSCHOORE e BALESTRIN, 2008).

It is possible to carry out external relationships with the community, including the development of projects in partnership with other partners around the condominium

(ANTUNES; BALESTRIN e VERSCHOORE, 2010). The group of microentrepreneurs of the condominium is formed by residents, owners, or renters, who generally have relatively long terms of coexistence. One of the problems faced by groups of entrepreneurs in residential condominiums is the impediment of activities for commercial purposes in residential spaces, established in condominium standards, mainly for security reasons (BRASIL, 2002). Aiming to adapt to this new reality, it is recommended to seek approval by the assemblies and to conduct a test period for the use of spaces, fairs, rules, and operation documentation.

With the analysis of social networks, it is possible to present the interaction that exists between microentrepreneurs, in addition to comparing them and using the measures of the centrality of the actors, in this case. This interaction is one of the most important resources in cooperation networks (ANTUNES; BALESTRIN e VERSCHOORE, 2010).

The Table 1 presents the types of measures for social network analysis:

**Table 1** - Types of measures for social media analysis

Kind	Measure
Network Structure Measures	Density
	Reciprocity
Measures of Centrality of Social Actors	Degree (centrality) and standardized
	in-degree
	out-degree
	Intermediation (betweenness)
	Proximity (closeness)

Source: adapted from Leonardo et al. (2019)

As presented, density and reciprocity are measures of the network and intermediation, proximity and degree are measures of centrality of the actors, which in this case are microentrepreneurs.

To interpret the centrality network structure measures of the central actors, one should consider the values presented close to each other. In graphs, it is possible to identify that the social actors who have more central positions are those who have a greater number of bonds. Applying this concept to the group of microentrepreneurs analyzed here, the flows pointed to the central social actors indicate that these are the entrepreneurs who have the most negotiations (DONATO; PINHEIRO; *et al.*, 2015).

There is a relationship between network and social power, considering power as the degree of interaction within the network, and the greater the interaction, the greater the power according to the patterns of relationships. Therefore, a very simple measure of the centrality and power potential of an actor is its degree even more effective. Power can be exercised by negotiation and direct exchange.

Actors who reach other actors by smaller paths have favorable positions, others become the reference, because they become the center of attention or because they are heard by the largest number of actors (HANNEMAN e RIDDLE, 2005).

For an understanding of each measure, Table 2 is presented:

**Table 2 - Concept of the measures of centrality of social actors**

Measure	Concept
<b>Degree centrality</b>	The more ties an actor has, the more power he will have. Actors who have more ties have more opportunities because they have choices. This autonomy makes them less dependent on any other specific actor and therefore more powerful. The degrees are different when the network has a star, circular or LINE format. Centrality is the simplest way to define an actor within the network. In an interpretation of a microentrepreneur with a high degree of centrality, he is an actor with many connections, with a certain influence within the network of microentrepreneurs (FREEMAN, 1979)
	<b>in-degree</b> Represents actors who are sought after by other actors to relate to the network
	<b>out-degree</b> Represents actors looking for relationships with other network components
<b>Intermediation Centrality (betweenness)</b>	It represents that an actor concentrates control of communication, being an intermediary between his peers. The greater the intermediation of an actor, the greater his ability to influence.
<b>Proximity Centrality (closeness)</b>	Represents the distance between the various actors of the network, it is a measure of the degree of proximity that an actor is in relation to the other actors of the same network. The higher the proximity values, the smaller the distances between the actors of the network, which tend to increase their influences.

Source: adapted from Hanneman and Riddle (2005) and Leonardo et al. (2019)

Table 3 presents the concepts of some measures that can be used to measure a network, and in the present work these measures were evaluated from the perspective of interaction between the actors of the network of entrepreneurs.

**Table 3 - Concepts of measures of density, reciprocity, eccentricity, quality, and importance.**

Measure	Concept
<b>Density</b>	Displays the number of connections between all actors in a network, indicating their level of connectivity and sharing. The higher the number of connections in each network, the greater the relationship between its actors, consequently, the higher its density that can be presented in the form of percentage and characterized as high and low. Density aims to describe how much points are connected in a social network considering their level of connection and represents a variation between 0 and 1, in which the closer to 1, the denser the network and the more connected are the entrepreneurs.
<b>Eccentricity</b>	Eccentricity is the distance from an actor to the farthest actor (from him) on the network and the smaller, the better the relationship with the other actors.
<b>Importance (authority)</b>	It is a good way to understand how valuable the information stored in that node is.
<b>Quality (hub)</b>	It is a good way to improve the quality of the connections of this node. Used to analyze whether there are actors with several relationships in the network much higher than the others, the hubs would be actors highly connected to several other actors that contribute significantly to reducing the distance between groups and individuals in the network
<b>Modularity class</b>	It is the cluster detection algorithm. It can be seen the strength of splitting a network into groups, clusters, or communities

Source: adapted from Hanneman and Riddle (2005), Leonardo et al. (2019), Costa et al. (2018), Taveira (2019); Bez, Faraco and Angeloni (2010)

## 2.4 Social Networking Interaction

Granovetter (1985; 2005) presented ideas about the role and strength of social connections and based on the new economic sociology, perfected the concept of Embeddedness, in other words, there is a mutual connection between transactions. For the same author (1992), “economic or market transactions are rooted in social relations and vice versa and treating them as independent would be a serious mistake.” For him, economic interaction



is embedded in social relations, just as social connections are rooted in economic exchanges (GRANOVETTER, 2005).

The analysis of interactions presupposes exchanges of information and the relationships established between the actors, which contribute to the increase of permeability between the links of the network (LOTTA, 2018). It is believed that the interaction between actors is based on the use of styles, or the form of presentation in context social is specifics, and the ability to act is influenced by the choosing the interactive method. In addition, actors negotiate relationships that they use in their interactions. During the interaction, they express their thoughts about the relationship and determine who they are, where they are and where they want to go (WHITE, 1995). Therefore, it is important to analyze the interactions that occur and understand that they exhibit different mediation skills of the participants. (MISCHE, 2009; LOTTA, 2018).

The construction of social skills is directly related to experience in different fields of social skill, and social experience, in turn, contributes to the construction of specific trails and the ability of actors to use them in the interactive process (FLIGSTEIN, 2001).

The interactions inherent to society occur through the mutual actions of the individuals who make up the unit, and certain purposes should always be considered. Cooperation is related to collaboration and interaction. This is because only when individuals take actions that affect them so the interaction occurs due to an impulse or purpose. The importance of interaction lies in the fact of unity. The grouping of individuals across the company also includes the formation of social circles (SIMMEL, 1983).

Finally, the theoretical framework is closed here, and the next section is about the application of the analysis of social networks in the group of entrepreneurs of the condominium, aiming to identify the interaction among the members of this group of entrepreneurs.

### 3 Methodological Procedures

The descriptive research was developed with the objective of analyzing the network of interactions of the actors of the social network of commerce of the group of microentrepreneurs of a residential condominium in São Paulo in times of Covid-19, chosen by the convenience of the researchers. Descriptive studies allow them to be evidenced and described to the characteristics of a given group, company, organizations (GIL, 2018).

Data collection of this research was carried out on June 6, 2020, through a question addressed to the research subjects, or components of the network: "Because you are in the group of microentrepreneurs, with whom you interact more frequently in the conduct of your business?". The collection was performed through Google form platform, and the analysis had 11 respondents, who are the microentrepreneurs of the condominium.

To evaluate the relationship in the purchase and sale of products, among the members of the group of microentrepreneurs, two questions were asked that allow to highlight the relationships among microentrepreneurs. It is emphasized that the study did not aim to identify customer networks, but, as the entrepreneurs of a condominium group relate to each other, as product suppliers. Table 4 presents the question, its concept, and the objectives.

**Table 4 - Question used with the group of microentrepreneurs**

<b>Question</b>
Because you are in the group of microentrepreneurs, with whom do you interact most often in conducting your business?
<b>Theoretical Concept</b>
According to Verschoore and Balestrin (2008), to characterize a network, it is necessary to have some requirements, namely: existence of individual actors to provide the formation of nodes, the interconnection between these actors and the formation of a new set from this interaction. The exchange of information among actors whether individuals, companies, organizations, in which the objectives are shared by interest is direct or indirect; considers that the analysis of social networks with being a methodology that allows structuring to interconnections evidencing relationship patterns based on how information is established (MARTELETO, 2001; TOMAÉL, 2007).
<b>Goals</b>
Analyze the network of interactions of a group of microentrepreneurs of a residential condominium in São Paulo in times of Covid-19

Source: 2020 survey data

For the analysis of the social network, the *Gephi software* 0.9.2 was used for data analysis, considering: density, centrality, eccentricity, quality, and importance. In *this software* it is possible to visualize the nodes, flows and arrows directed, analyze a social group, their measurements, graphs, and matrices.

Given what characterizes a network, conceptualized by Verschoore and Balestrin (2008), what is expected is to analyze the exchange of information among the actors (interaction) through the indication of the products of the microentrepreneurs of the group. The 11 microentrepreneurs are residents of a residential condominium located in the south of São Paulo that organized and began to promote joint actions, making the individual business better known and fostering the increase in sales. Table 5 presents the codifications and attributes of the participants of this group, all of which are microentrepreneurs and residents of the analyzed condominium:

**Table 5 - Group of microentrepreneurs analyzed**

ID	Actor	Gender	Condominium time (years)	Business time (years)	Activity (Product Type)
1	APA	F	13	3	Children's hair ties
2	ELL	M	14	5	Shoes
3	GRA	F	15	8	Pasta and palmettos
4	GRI	F	2	2	Terrarium
5	LEL	F	7	2	Fabric crafts
6	SEA	F	13	10	Cosmetics, semi-jewelry, and Tupperware
7	MFA	F	16	5	Fabric crafts
8	NEA	F	15	3	Environment flavors
9	NEL	M	13	1	Breads
10	TAT	F	9	2	Costume jewelry
11	VAN	F	14	2	Cosmetics

Source: 2020 survey data

The group operates in activities in the following segments: clothing, cosmetics, household items, food and services and present variations between condominium time and business time.

Based on the attributes of the actors in the network, in which the condominium time and the time that the entrepreneur already acts in the business possibly influence the measures of the interaction network, hypotheses were established to confirm the correlations raised, according to Table 6.

**Table 6 - Hypotheses of correlations between measures and network attributes**

Correlations		Hypotheses
Attributes	Measures	
Centrality of Intermediation	Condominium Time	<b>H1</b>
Centrality of Intermediation	Business Time	<b>H2</b>
Degree centrality standardized	Condominium Time	<b>H3</b>
Degree centrality standardized	Business Time	<b>H4</b>
• Out-degree	Condominium Time	<b>H5</b>
• Out-degree	Business Time	<b>H6</b>
• In-degree	Condominium Time	<b>H7</b>
• In-degree	Business Time	<b>H8</b>
• Degree	Condominium Time	<b>H9</b>
• Degree	Business Time	<b>H10</b>

Source: the authors

To evaluate the correlation between the attributes and measurements of the network, Spearman correlation analysis was performed due to the small sample size and the non-normality of the data (HAIR; BLACK; *et al.*, 2009). The correlation analysis consisted of verifying the extent to which the attributes: Business Time and Condominium Time correlate with the indexes of Centrality of Intermediation, Degree Centrality, Out-degree, In-degree, and Degree. The measurements of the attributes were: Business Time (in years), and Condominium Time (in years).

#### 4 Analysis of Results

The condominium chosen is about Campo Grande in the southern region of the city of São Paulo, has 280 apartments distributed in four towers and approximately one thousand residents, among children and adults. In addition to the built areas and leisure spaces, the condominium has two open kiosks located in the passage of residents between the towers and the main and unique gatehouse.

When analyzing the formation of a network of interaction in the group of microentrepreneurs, it was possible to observe that some actors stand out in terms of interaction. Table 1 correlating with the attributes of Table 5 in relation to the answers obtained for the question: "Who do you interact most frequently in the performance of your business with?", some notes can be made.

It is observed that the actors who have as attribute activities of children's ties for hair (APA), food area with pasta and palmettos trees (GRA) and cosmetics, semi jewelry and household items (MAR), have a greater relationship among the actors who make up the network of microentrepreneurs.

On the other hand, actors associated with activities aimed at providing services such as events and parties, in this network, did not interact with the other members of the group. This fact may come from the restrictions imposed by the authorities due to Covid-19, which does not allow the holding of events to avoid crowding, thus leaving the sector of this branch of events without activities and possibly decreasing or not providing interaction at this current time.

Of the eleven microentrepreneurs analyzed, it should be noted that there was no interaction of the actor (CAT), because he did not answer the question.

Regarding the question: "Because you are in the group of microentrepreneurs, who do you interact most frequently in the performance of your business with?", presents the analysis of Degree Centrality, intermediation and proximity, eccentricity, importance, quality, cluster (modularity class) and important actors in each cluster (page ranks) and its coefficients (clustering coefficient).

**Table 2** - Measures of distance, quality and importance of interaction based on the group of microentrepreneurs

id	Actor	EC	GE	GS	GR	IC	PC	Exc	Imp	Whic			
										h	Mod	Pgrk	Clust
1	APA	0.338	3	9	12	7.616	0.909	2	0.200	0.542	1	0.044	0.416
2	ELL	0.350	3	6	9	2.366	0.666	3	0.225	0.403	1	0.045	0.547
3	GRA	0.593	5	8	13	35.333	0.833	2	0.284	0.450	0	0.124	0.361
4	GRI	0.340	2	2	4	0.000	0.555	2	0.150	0.143	0	0.074	0.833
5	LEL	0.151	1	3	4	0.000	0.588	2	0.087	0.209	0	0.026	0.833
5	SEA	1.000	8	4	12	23.950	0.625	2	0.455	0.234	0	0.268	0.392
7	MFA	0.426	4	3	7	1.700	0.526	3	0.305	0.173	1	0.049	0.533
8	NEA	0.365	3	3	6	1.000	0.555	3	0.258	0.185	1	0.041	0.550
9	NEL	0.482	5	5	10	6.616	0.666	2	0.343	0.343	1	0.058	0.444
10	TAT	0.669	5	2	7	0.916	0.416	3	0.328	0.175	1	0.105	0.533
11	VAN	0.975	7	1	8	0.500	0.400	3	0.451	0.088	1	0.160	0.547

Source: 2020 survey data

**Note:** EC: centrality; EG: degree of entry (in-degree); GS: degree of output (out-degree); GR: degree; IC: Centrality of Intermediation; PC: Proximity to Centrality; Exc: Eccentricity; Imp: Importance (authority); What: Quality (hub); Mod: Modularity; PgRk: Page Rank; Clust: Clustering Coefficient

Limited to the researched group, it can be inferred that Covid-19 is influencing social relationships and interactions in terms of business in two diametrically opposed directions, in the sense of greater integration to overcome this moment, with indications and partnerships to overcome this moment of difficulty, confirming what was recommended by Granovetter (1973) in relation to the interaction according to the strength of ties to dynamic social networks.

Thus, the following is a detailed analysis of the measure in a logic of presentation and discussion of the networks with the measurements individually. In this sense, it is observed that, within the network of microentrepreneurs, the greatest distance for members to connect is three actors, with a density of 41.8%, that is, the interactions that occur among the microentrepreneurs of the condominium. It is noted that this network interaction demonstrates mutual exchange among the members of the network (reciprocity), considering as very good, weighing on all possible connections, which demonstrates a great interaction of the network (HANNEMAN e RIDDLE, 2005; LEONARDO; FARINA; *et al.*, 2019; COSTA; BITANTE; *et al.*, 2018).

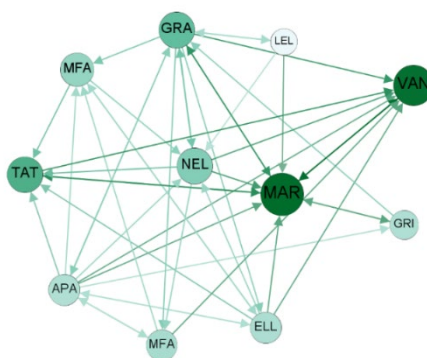
The measure of centrality is the importance of the node in the network based on its connections and, in the group of microentrepreneurs, presents the actor MAR (1,000) and VAN (0.975) as the central actors of the network and presenting themselves as strong ties. Strong ties are more than the degree of centrality, that is, they have greater interaction within the network (LEONARDO; FARINA; *et al.*, 2019; SOUZA; FARINA; *et al.*, 2014).

Because it is a relatively new group, which gained more momentum due to the Covid-19 pandemic that limited people from going out to market their products and led them to use social networks, it can therefore be considered a good density for this network in view of the context. Possibly with the permanence and maturation of the group, these relationships are strengthened and become denser. The higher degrees of these actors can be explained by the products sold to the people in the condominium. Like MAR, VAN and TAT that work with cosmetics and semi jewelry, bijouterie and GRA – food. The other products marketed have actors with products that can be little commercialized. It is observed that actors with a low degree of centrality are "connected" with the four mains: MAR; VAN; TAT; GRA.

In the group of microentrepreneurs, the actors GRA, APA and MAR have more ties (degree), having greater power among the other actors. Of these three, the MAR actor is more sought after by other actors (in-degree), while APA and GRA seek to relate more with other actors (out-degree). For this work, the actors with greater interaction are considered with power (HANNEMAN e RIDDLE, 2005).

It is observed that there is a formation of a distributed Baran (1962) network, which leads to the emergence of more than one power center, that is, more than one actor with great interaction within the network. Perhaps this highlight in terms of the search for the actor MAR is due to the diversification of the products he works with; these range from household accessories to individual products focused on care and beautification. Another aspect is that MAR has the longest time in which it works marketing products in relation to the other actors of the network. In relation to the interaction with the other actors, the fact of APA works with children's products and the actor GRA with food products, may have an influence on the greater interaction with the other members of the network.

**Figure 2 - Centrality Graph** (Question: Who do you interact most often in conducting your business with, being in the group of microentrepreneurs?)



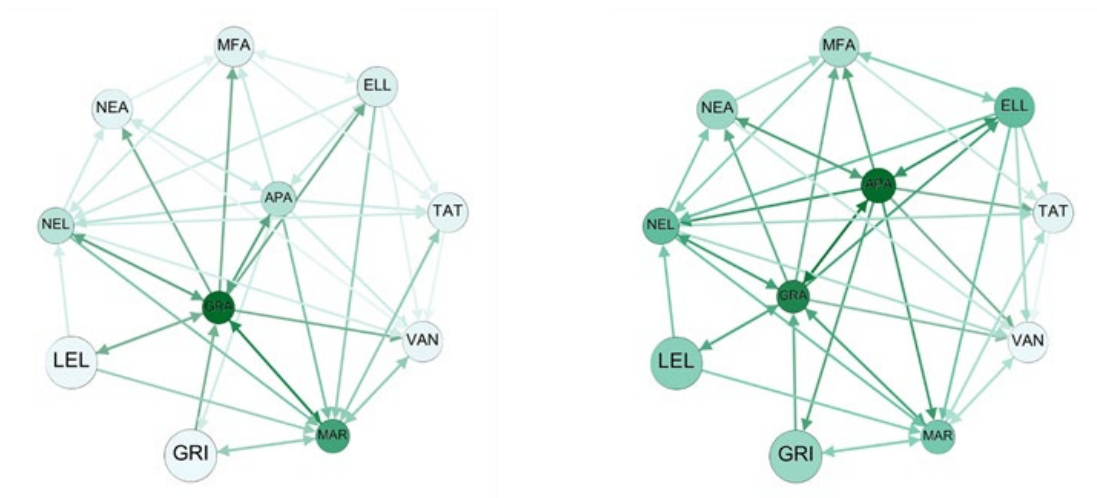
Source: 2020 survey data

From this analyzed network, it seems to emerge signs that when the network is associated with business interaction, the type of business influences the interaction in the network. Among the shortest paths, for the group members to connect, the actor GRA (with 35.33 times of intermediation frequency), obtaining the highest frequency acting as intermediary (betweenness) in the relationships among the other microentrepreneurs, followed by the actor MAR (with 23.95 times), these actors act as a link between the other pairs of actors to reach the entrepreneurs who have less interaction. The two actors together mediate 59.28% of all interactions on the network (HANNEMAN e RIDDLE, 2005).

The GRA actor participates in other groups of other condominiums, creates promotion for indications, uses social networks, and participates in courses organized by SEBRAE, interacting with other networks. This results in how much an actor concentrates the control of communication, being an intermediary (HANNEMAN e RIDDLE, 2005; LEONARDO; FARINA; *et al.*, 2019).

In relation to the average distance of a microentrepreneur from the other entrepreneurs of the network (closeness), in addition to the actor GRA (with 83.33% proximity), there is also the actor APA (with 90.90% proximity), possibly due to the type of product marketed (children's ties and footwear) that are not directly associated with products of prime need. However, these actors continued to use social networks for posting and disseminating their products, which provided a greater interaction with the actor GRA, according to Figure 3. In this case, there is a proximity and, possibly there is an influence on the two actors. GRA and APA, based on the higher values, are the actors closest to the others. Possibly because they have more time living in the condominium.

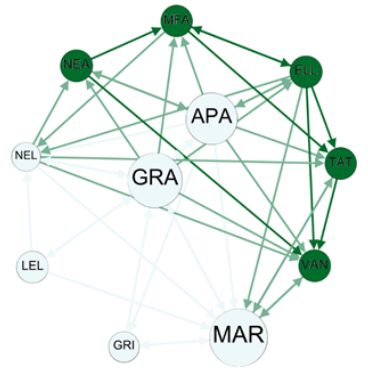
**Figure 3:** Graphs of centrality measures of the group of microentrepreneurs. (Question: Because you are in the group of microentrepreneurs, who do you interact most often in conducting your business with?)



Source: 2020 survey data

The eccentricity relating to the actors who interact with the actors more distant from the network by the shortest distance acting with an intermediation actor among the other actors of the network within each group, that is, with the actors who have less interaction in the network. As shown in Figure 3. Analyzing Figure 4 and Table 2, it is possible to identify that the actors APA, GRA, GRI, LEL, MAR and NEL have eccentricity 2 (light green), while ELL, MFA, NEA, TAT and VAN have the maximum eccentricity of the network, which is 3 (dark green). That is, they are distant from the others by three interactions among the actors.

**Figure 4:** Eccentricity graph based on the group of microentrepreneurs. (Question: Because you are in the group of microentrepreneurs, who do you interact most often in conducting your business with?)



Source: 2020 survey data

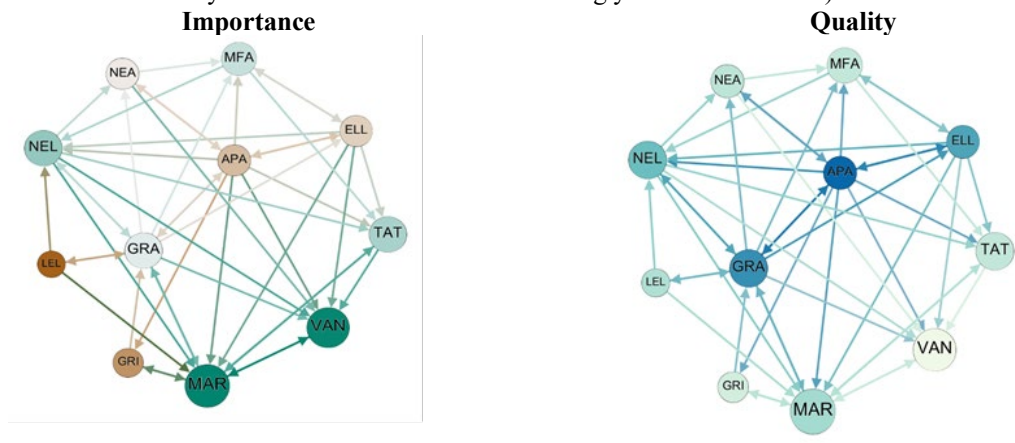
It is observed the formation of two groups in terms of distance from one microentrepreneur to another farther from the network, the first composed of the distance of two steps and the other with three steps (eccentricity), as shown in Figure 4. It is observed that the actors (APA, GRA and MAR) remain highlighted in the network, pointing once again to a possible connection between the type of business and the relationship of the influence and importance of the actor in the network. In this case, products linked to food and beauty provide prominence to the actors in the network. Because these actors are "more eccentric", that is, they interact more with others (closer) to conduct business.

Regarding the importance (authority) of each entrepreneur in terms of interaction, in terms of indication of the other actors in the network, it is observed in terms of information that

these offers, being MAR (45.5%) and VAN (45.1%) having greater weight. These two actors sell similar products, have made a lot of publicity until they greatly decrease the stock.

On the other hand, if we analyze the quality (hub) of the connections between the actors, there are three that stand out with higher quality in the interaction, being APA (54.2%), GRA (45.0%) and ELL (40.3%). These indicators seem to provide the point that actors who work with products associated with beauty and clothing, at this moment of Covid-19, have more influence and, therefore, greater interaction in the commercialization network of the condominium.

**Figure 5:** Graph of importance and quality (Question: Because being in the group of microentrepreneurs, who do you interact most often in conducting your business with?)



Source: 2020 survey data

The modularity class is the community detection algorithm, with a value of 7.4%. Values lower than 1.0 (100.0%) are recommended to generate even smaller communities. In modularity 0 (cluster 1) the actors GRA, GRI, LEL and MAR, and in modularity 1 (cluster 2) are the actors APA, ELL, MFA, NEA, NEL, TAT and VAN.

Cluster analysis is a set of exploratory techniques that can be applied when there is an intention to identify relationships in homogeneous groups. It is observed that (FÁVERO e BELFIORE, 2017) the cluster is formed by actors who have a longer business and condominium time together which possibly also explains how they associate.

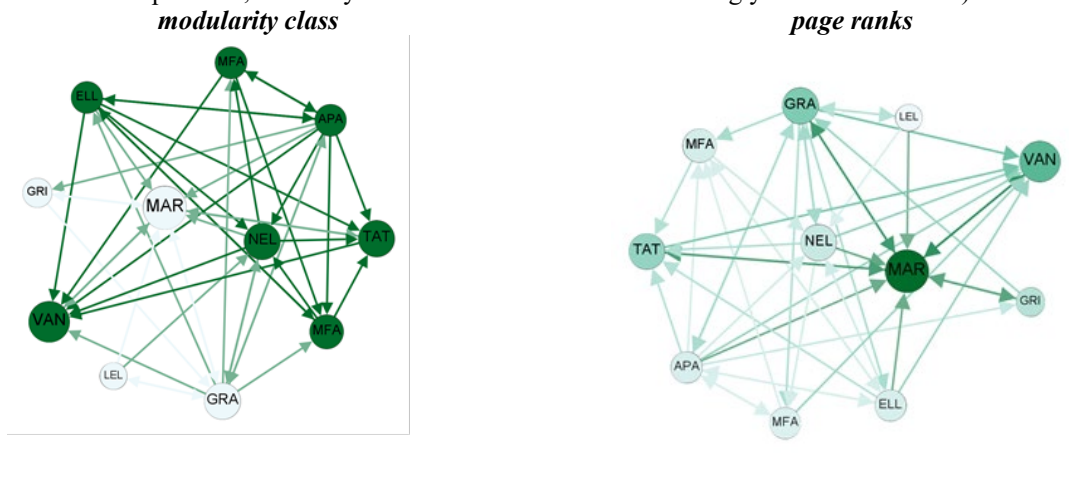
The measure of page ranks shows that the actor MAR (26.8%) is more often at the top of this ranking. This actor has greater connectivity to network members if connections are not considered random. It also has the largest number of product diversification, ranging from primary products to household products. Still, this actor frequently uses social networks, specifically WhatsApp groups, so note that there is an interaction in his posts.

The actor with the highest clustering coefficient is GRI (83.3%) and LEL (83.3%). This coefficient, along with the average value of the shortest path, may indicate a "small-world" effect, a small-world that indicates how nodes are inserted into your neighborhood and your power relations within the network.

It is observed that the type of product acts as a factor of determination of this power, and the greater the immediate need, the greater the interaction and the less restricted for the actor, which confirms the proposed. (WATTS, 2004; BRAGA; GOMES e RUEDIGER, 2008; TRAVERS e MILGRAM, 1969).

It is observed that the formation of two clusters in the group of entrepreneurs with the average coefficient of the grouping of 54.5%, answers the question "Because you are in the group of microentrepreneurs, who do you interact most often in conducting of your business with?"

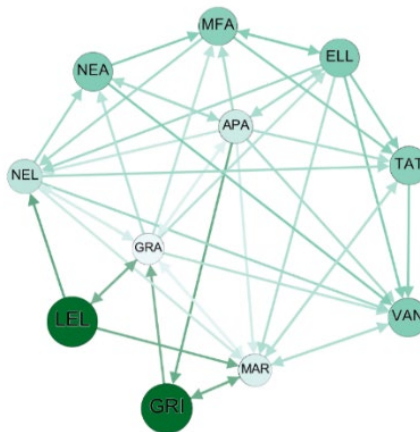
**Figure 6:** Modularity class graph (modularity\_class) and page ranks. (Question: Because you are in the group of microentrepreneurs, who do you interact most often in conducting your business with?)



Source: 2020 survey data

It is observed in Figure 6, that *the formation of clusters* seems to indicate that the type of products influences the interactions and associations of actors in the network, such as NEL and GRA, who work with food products.

**Figure 7 -** Clustering coefficient graph (Question: Because you are in the group of microentrepreneurs, who do you interact most often in conducting your business with?)



Source: 2020 survey data

The Figure 7, however, another relevant aspect is that the actors who have more business time are associated in the same cluster, such as MAR and GRA with an average time of 9 years of business; LEL and GRI with average time of 5 years of business.

#### 4.1 Correlation analysis

Table 3 presents the results of the correlations obtained between the attributes and the measurements of the network.

**Table 3 -** Spearman correlation analysis of centrality, centrality intermediation, out-degree, in-degree, degree with business time, condominium time and product type

	1	2	3	4	5	6	7
1 Centrality	1,000						
2 Intermediation Center	0.229	1,000					
3 Out-degree	-0.386	0.448	1,000				
4 In-degree	-0.046	0,000	-0.047	1,000			



5 Degree	-0.357	0.365	0.722**	0.615*	1,000	
6 Business Time	0.215 <sup>ns</sup>	<b>0.613*</b>	<b>0.551*</b>	-0.114 <sup>ns</sup>	0.297 <sup>ns</sup>	1,000
7 Condominium Time	0.281 <sup>ns</sup>	0.300 <sup>ns</sup>	0.438 <sup>ns</sup>	-0.174 <sup>ns</sup>	0.114 <sup>ns</sup>	0.547*

**Note:**\* The correlation is significant at the  $p < 0.05$ , \*\*. The correlation is significant at the level  $< 0.01$ , ns= non-significant ratio

The Attribute Business Time was positively and significantly correlated with the centrality of intermediation ( $R = 0.613$ ,  $p < 0.05$  (CI: 95%) with large strength of association ( $R^2 = 38.61\%$ )), which means that actors with more business time mediate interactions between network actors in the conduct of their business. The Attribute Business Time was positively and significantly correlated with the Out-Degree centrality measure ( $R = 0.551$ ,  $p < 0.05$ , (CI: 95%) with large strength of association ( $R^2 = 30.36\%$ )), which means that actors with more business time seek the other actors to interact in the realization of their business. It is observed that the variables business time and condominium time are correlated, which seems to indicate that the businesses were born within the condominium. The other correlations between the attributes and the measurements of the network were not statistically significant.

The H1 hypothesis that condominium time is correlated with the intermediation of actors in the network has not been confirmed. Indicating that the centrality of intermediation of actors GRA and MAR does not seem to be influenced by the condominium time they have which is on average 14 years.

The H2 hypothesis that the time that the actor acts in the business is correlated with the centrality of intermediation was confirmed. Corroborating the highlight of the actors GRA and MAR in the centrality of intermediation in the formed network. These actors have an average business time of 9 years, while the average overall acting time in the actors' business in the network is 3.9 years.

The H3 hypothesis that condominium time is correlated with the centrality of the actor in the network has not been confirmed. Indicating that possibly the fact that the actor has a longer condominium time does not necessarily give him a relationship with the high degree of connections with actors in a network.

The H4 hypothesis that the business time is correlated with the centrality of the actor in the network, that is, attributes greater influence on him is not confirmed. This explains, for example, that the actors VAN, TAT, and NEL who, although they are on average 1.6 years that work in the business, have a higher degree of centrality than other actors with longer business time.

Regarding the actors who seek other actors for relationships in the network, the hypothesis H5 regarding the condominium time was not confirmed. That is, not necessarily the actor who has more condominium time seeks relationships (interactions) with other actors in the network.

The H6 hypothesis in relation to condominium time was confirmed. Possibly indicating that actors who are longer in the business acquire experience and understand that seeking relationships with other actors can expand the possibility of marketing their products. Confirming the highlight of the out-degree measures of the actors GRA, MAR and APA who have an average time of 9 years that commercialize their products.

In relation to the actors who are most sought after in the network, (in-degree), correlated with their attributes of condominium time, product type and business time the hypothesis H7 and H8 that condominium time and business time can influence the demand of the actors in the network have not been confirmed, that is, they are not correlated.

In relation to the actors who have greater interaction, i.e., degrees, the H9 and H10 hypothesis that condominium time and business time are correlated with greater interaction of actors in the network were not confirmed.

From these hypotheses, it is observed that the entrepreneur's business time is correlated with the measures of the actor in the network, that is, by those who interact most with the other authors in the conduction of their business (possibly provide greater influence on the actor's measures in the network).

This fact seems to indicate that it is important the time in which the entrepreneur acts in the business. This may be due to the accumulation of experience as well as by the scale of need that people have in relation to the range of relationships built with the longer period acts in the business.

## 5 Final Considerations

This study aimed to analyze the network of interactions of a group of microentrepreneurs from a residential condominium in São Paulo in times of Covid-19, with support in the theoretical approach of social network analysis. According to the data obtained, in the group of microentrepreneurs it was possible to identify that there is a very strong relationship between the actors of the network, with few actors' hubs type, expanding the exchange of information within the network as expected in the objective of this article.

Another analysis performed is the density of the network, strongly identified, that is, there is a high interaction among the actors of the network. About the distance, few intermediate actors are observed, which implies greater agility in the exchange of information. In this article it was possible to identify that the technique of social network analysis reveals an importance for organizational studies.

The results also suggest that the experience in business provides the actor with a greater interaction, that is, he is sought both due to experience and time of commercialization, which allows him greater interaction, as well as the connections that this longer time in the business provide him.

The limitation of this study was the difficulty of reaching a greater number of people surveyed, which led to a low number of respondents due to the moment of the Covid-19 pandemic.

For future research, it is recommended to identify whether the members of the microentrepreneurs group of the condominium analyzed were able to maintain the business and if the interactions showed changes after the Covid-19 pandemic. It is also recommended to use the same methodology in other business groups to identify whether the entrepreneur's business time promotes greater influence and, consequently, impacts the actor's measures in the network.

Microenterprise in residential condominiums can be a business opportunity among neighbors in their own housing and can be stimulated in public policies of motivation and promotion to the enterprise and to the detriment of the high unemployment rate and decrease of formal jobs. The occupations framed by the General Law of the Micro-Company contribute to meeting the needs and promote the capture of new customers.

Although the study has achieved the proposed objectives, studies using cross-sectional data may compromise the generalization of the results. For this reason, it is suggested that future studies use longitudinal data or more from a group of microentrepreneurs.

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