Social networks and public service: influences of formal and informal networks in the organizational environment of a Federal University

Redes sociais e serviço público: influências das redes formais e informais no ambiente organizacional de uma Universidade Federal

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ABSTRACT
Research on intraorganizational relationship networks stems from the difficulties that organizations encounter in dealing with complex situations of their informal social structure over the formal one and how these networks coexist in the structure of a public organization. The aim of this article is to analyze the social environment of relationships in a public organization, from the point of view of intraorganizational networks on the institutional structure with the support of theories of social network analysis. The data for the research were extracted through 53 valid questionnaires. The results demonstrate that the formal and informal intraorganizational social networks have a profile similar to the administrative structure. In the formal network, the exchange of information linked to work is considered, while in the informal network, individuals exchange information on various subjects with their colleagues, forming networks based on affinities and trust. It can be considered that a formal or informal relationship is a necessary condition to establish greater meaning to the organizational structure and that, if well used, contributes to a greater flow of information and knowledge. As for the informal networks, these favor the bond between the actors, as they involve empathy and trust.
Keywords: social network analysis, formal network, informal network, intraorganizational social network.

RESUMO
As pesquisas em redes de relacionamentos intraorganizacionais decorrem das dificuldades que as organizações encontram para lidar com situações complexas de sua estrutura social informal sobre a formal e como essas redes coexistem na estrutura de uma organização pública. O objetivo deste artigo é analisar o meio social de relacionamentos em uma organização pública, sob o aspecto das redes intraorganizacionais sobre a estrutura institucional com apoio das teorias de análise de redes sociais. Os dados para a pesquisa foram extraídos por meio de 53 questionários válidos. Os resultados demonstram que as redes sociais intraorganizacionais formal e informal têm um recorte similar à estrutura administrativa. Na rede formal são consideradas troca de informações atreladas ao trabalho, enquanto na rede informal os indivíduos trocam informações sobre diversos assuntos com seus colegas, formando redes por afinidades e confiança. Pode-se considerar que relacionamento formal ou informal é uma condição necessária para estabelecer maior significado à estrutura organizacional e que, se bem aproveitado, contribui para um maior fluxo de informação e conhecimento. Quanto às redes informais, essas favorecem o vínculo entre os atores, por ter o envolvimento de empatia e confiança.

Palavras-chave: análise de redes sociais, rede formal, rede informal, rede social intraorganizacional.

1 INTRODUCTION
Organizational networks and social relationships are constantly being discussed in organizations for their contributions to the development of the organizational environment and the understanding of the flow of social operational processes, as they are essential for the transfer of values that shape and develop partnerships between organizations and people (PERIM, 2010).

Within the organizational context, strategic networks influence the gains that can be achieved by collaboration between parties. These parties are represented by companies or organizations, which, through interaction or the formation of ties between them, allows them to achieve their goals within the competition of the market, called interorganizational networks (FRANCO; BARBEIRA, 2009).

On the other hand, the parties can represent employees of an organization, which, by joining, can provide gains and dissemination in terms of knowledge, impacting on the
operational performance of the company, forming the so-called intra-organizational networks (FRANCO; BARBEIRA, 2009).

In this sense, the understanding and the need for research on networks of intra-organizational relationships at both employee and departmental level, stems from the difficulties that organizations encounter to deal with the complex situations of their informal social structure over the formal structure, because many of them are not possible to be solved in isolation, being necessary the action of other means that extrapolate the fragmentations of the administrative division (MACAMBIRA; BASTOS; ROSSONI, 2015).

Forms of social networks, both formal and informal, are established from the social interaction of the groups or organizations in which individuals are inserted. In another aspect, in relation to the formal social network, employees behave according to the legal structure of the organization, mainly in a bureaucratic way and influenced by the organization, while in the aspect of informal social networks dominate and strengthen the interactions of membership of the group, and the bonds that unite the employees, creating empathy and trust, contributing in the accomplishment of tasks, assignments and professional performance (ZOU; INGRAM; HIGGINS, 2015).

It is important to study how the intra-organizational social networks (formal network and informal network) coexist in the structure of a public organization, mainly in the interpersonal professional and personal aspects and whether such networks have similarities and connections between them, since these are crucial factors for a good organizational flow related to the performance and results of the organization, since it facilitates more conscious decision making, contributes to the analysis of the data of interpersonal relationships of employees, creating a knowledge base and recommendation on the information captured for the managers of the researched organization (MIRANDA; LIBOREIRO; BORGES, 2017).

2 THEORETICAL FRAME

This part of the study will be developed as part of the necessary theoretical foundation providing concept on social networks with a contextualization of the structure of the intra-organizational social network, and ultimately its analysis.
Zancan, Santos and Campos (2012) indicate that social networks are interpreted as structures resulting from collective relationships, where they behave dynamically in their organizational or social structure, thus reconfiguring and enabling adaptation of individuals and organization to the internal and external environments of transformation to which they are inserted. This social network dynamic is a process between the emergence and disappearance of networks through connections and actors (MARTINS, 2012) and its constitution would be consequences of a dynamic flow, where changes occur over time and in the social scenario (NEWMAN; BARABÁSI; WATTS, 2006).

The networks can be formal and informal, besides being described as constructions of nodes and lines, in which the node represents the parts that integrate the network (people, friends, collaborators); and the lines are bonds or bonds that form the social structure (TOMAÉL; MARTELETO, 2006).

In the case of intra-organizational networks, these are based on networks connecting social individuals in their organizations (TORRES; LOPES; HILAL, 2017). Zou, Ingram, and Higgins (2015) report that intra-organizational social networks bring their members closer together, as they are dedicated to a grouping of correlated expectations, preserve a certain dominance over the reputation of their members, and ensure a more lasting stability and a higher level of security. The intra-organizational social network is an organization that focuses on the internal structure and collaborators, unlike the inter-organizational social network, where the focus is the search for understanding the functioning of the inter-organizational structures, having a cross-cutting between organizations (MORAES; VIANNA; PETROLA; MARTINS; SANTOS, 2015).

Seeking a better understanding of the various types of intra-organizational networks, Marcon and Moinet (2000) elaborate a graph, such as a "conceptual orientation map" representation, from four quadrants, as shown in Figure 1.
For Balestrin and Arbage (2007), networks are conceptualized as:

a) vertical networks: represent the hierarchical structure, indicating each of the links and the different levels of positioning by the degree of influence;

b) Horizontal networks: represent cooperative links between the participants, which, while remaining independent, decide to join forces for the achievement of a given objective or task;

c) formal networks: represent the contracts - relate to the formal agreement between the parties, which may include contracts and consortia between the actors, such as franchises or joint-venture, for the formation of strategic networks.

d) Informais networks: they represent coexistence - These networks refer to informal relationships that represent companionship or sharing, which are spontaneous. Meetings provide an exchange of knowledge through information or even experience shared between the parties.

The organizational structure is a multi-link architecture, both formally designed and informally emerging, with information, knowledge and resource channels for actors, requiring the complex joining of formal and informal elements and their joint impact on outcomes and performance to understand how the effects of formal and informal social networks on the organizational structure really work. The more attempts to separate the formal social structure from the informal social structure to understand its unique effects,
the less understanding will be achieved about how they actually work (MCEVILY; SODA; TORTORIELLO, 2014)

Social network analysis (ARS) is an analysis modeling tool that demonstrates the connections between individuals, starting preferably with the preference for qualitative data that are organized quantitatively so that they can be presented in graphs or networks (PEDRO; RAZERA, 2018). Freeman (2004, p. 3) defines "Social Network Analysis (ARS) as the establishment of a structural set (network) supported by links (connections) that interconnects social collaborators (nodes) supported by systematic empirical data in graphic images (sociograms) and mathematical and/or computational models". For Pucinelli and Giordan (2017) ARS relies on software (Ucinet, Pajek, ORA, Gephi, NetDraw, among others) to identify, represent, analyze, visualize, or simulate nodes and connections of the various inputs of data, through mathematical modeling of social networks.

Carter, Ellram and Tate (2007) explain the growing interest in the study of intra-organizational ARS by the current situation of interest of organizations in mapping the formal and informal networks of the organizational structure to their organizational goals. Totterdel, Wall, Holman, Diamond and Epitropaki (2004), point out that the increased interest and need for intra-organizational ARS have started from the gaps to be understood by researchers in the management area, where it is expected that structural analysis of social networks will be feasible and useful, suggesting that the effect of the individual permeates and is shaped by a wider intra-organizational network than individuals, dyads and teams.

3 METHODOLOGICAL PROCEDURES

This study used the descriptive-exploratory research model, with the main purpose of providing an overview of the environment and the relationship of the servers in a Research Pro-Rectory of a Federal Public University (SP).

A questionnaire consisting of 12 (twelve) items was used for this study, divided into two blocks, and the first part of the questionnaire aimed to identify characteristics of the profile of the respondents. The second part is composed of questions for identification of formal and informal social networks about the organizational structure of a Pro-
Rectory, considering as a basis for formulating the questions that the informal network is composed of actors who relate, exchange information and talk about personal matters and the formal network by actors who relate and exchange information about professional matters, related to the work, based on the concepts of the authors Marcon and Moinet (2000), McEvily, Soda and Tortoriello (2014).

The choice of delimiting the population was a sample for convenience, due to the easy access of the researchers to the Pro-Rectory of the Federal University (SP) (HAIR; BLACK; BABIN; ANDERSON, 2010), considering that they are technical-administrative servers of the sector. The population for the research was made up of collaborators from the research pro-rectory of a public teaching institution. This Pro-Rectory has a total of 62 employees, being 39 technical-administrative (TA), 18 faculty (DO) and 5 trainees (ES) and consists of the following divisions: Office, Administrative and Support Division for the Researcher, Division of Scientific Initiation Programs, Multi-user Experimental Centers, Bioterias, Herbarium, Vegetation House, Scientific Computation and Strategic Nuclei.

Respondents were assigned acronyms in order to maintain their anonymity, only identifying what designation the collaborator has within the University (technical-administrative, faculty or trainee) and in the end there was a return of approximately 85% of responses, corresponding to 53 respondents.

Social networks have some characteristics, as well as the actors that participate in the network, such as transactional content (which is exchanged by people, groups or organizations) and structural characteristics (particularities of the network structure). Among the various measures pointed out by Tichy, Tushman and Fombrun, (1979), were chosen measures that relate to the network actors and measures that are connected to the network as a whole, as described in figure 2, for application in this research.
The data analysis was carried out in three phases: descriptive, documentary and sociometric:

- Descriptive: the data of the sample population profile, collecting data such as length of service, time that the employee occupies the current position, age and gender.
- Documentary: the documentary part involves consultation on websites about decrees, laws for understanding about the operationality of the institution, as development plans for the understanding of its objectives. The sum of this data makes it possible to understand the Pro-Rectory of Research.
- Sociometric: the choice was made to work the data with measurements of density, reciprocity and degree with UCINET, which is an elaborate program for Social Network Analysis, where it is possible to perform group analysis, study of graphs, data and matrices, with this the software was used to interpret and understand the data of this research, enabling the analysis of the metrics necessary for this study (Borgatti; Everett; Freeman, 2002). NetDraw, which is part of UCINET, was also used, which makes it possible to visualize graphs, having as a characteristic the visualization of several relations in the same node (actor), or
even to identify the strong ties or weak ties (BORGATTI; EVERETT; FREEMAN, 2002).

3.1 RESEARCH PRO-RECTORY STRUCTURE

The structure of the Pro-Rector has 8 divisions and 62 servers, allocated, according to Table 1, along with the description of each department:

<table>
<thead>
<tr>
<th>Division</th>
<th>Servers</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office</td>
<td>3.</td>
<td>The Cabinet is responsible for the most extensive management, for the fulfillment of its directives of the institution, where are crowded the Pro-Recto r, the Deputy Pro-Recto r and the Executive Secretary</td>
</tr>
<tr>
<td>Administrative and Research Support Division - DAAP</td>
<td>9</td>
<td>The Administrative and Support Division of the Researcher is responsible for the budget, personnel management, institutional research projects, institutional research infrastructure projects, provides support to the researcher in the interaction with development agencies, in the constitution of research groups and in the dissemination of the university's research.</td>
</tr>
<tr>
<td>Division of Scientific Initiation Programs - CI</td>
<td>4.</td>
<td>The Scientific Initiation Division administers the programs aimed at the university's scientific initiation.</td>
</tr>
<tr>
<td>Multi-User Experimental Center - CEM</td>
<td>19</td>
<td>The Multi-User Experimental Centers are a complex of multi-user laboratories equipped with large and medium sized equipment for carrying out experiments in the areas of Physics, Chemistry, Biology and Engineering.</td>
</tr>
<tr>
<td>Biotheres</td>
<td>11</td>
<td>The Biotheres are characterized by the breeding and maintenance of animals and have a network of laboratories divided into breeding and experimentation on mice, breeding rats and experimentation on rodents.</td>
</tr>
<tr>
<td>Herbarium/Vegetation House</td>
<td>3.</td>
<td>The Herbarium consists of collections of dehydrated plants organized with the aim of documenting plant diversity. The Vegetation House is a covered structure, where several types of plants for research are housed.</td>
</tr>
<tr>
<td>Scientific Computing</td>
<td>2.</td>
<td>In Scientific Computing, the high-performance computing park reaches several areas of knowledge, such as materials engineering, physics, chemistry and biology.</td>
</tr>
<tr>
<td>Strategic Cores</td>
<td>11</td>
<td>The Strategic Centers constitute working groups with an interdisciplinary approach, aim at promoting production and disseminate knowledge in innovative areas.</td>
</tr>
</tbody>
</table>

Source: Drawn up by the authors from the General Rules of Procedure (2019)

According to the university's management report, the Pro-Rectory's mission is to support and stimulate research at the university, acting on the proposition, implementation and improvement of research policies that contribute to Excellence, Inclusion and Interdisciplinarity. The Pro-Rectory has as its mission to generate an academic universe for the development of innovative, interdisciplinary, inclusive and
high level research, possible to compete with research developed in the best universities. To this end, all the areas share research classified as: basic, technological and teaching.

4 ANALYSIS AND RESULTS

The survey was applied to the servers of the Pro-Rectory of Research and shows a slight male preponderance, with 58% of the respondents, while the female participation was 42%.

With regard to the age group, it was observed that there is a slight supremacy between 30 and 39 years of age, with 36%, and, as a consequence, the concentration in the age group between 20 and 29 years of age, with 26%, not far below the range between 40 and 49 years of age, with 25%. The group over 50 years of age proved to be very present, like the others (13%), since they were dealing with professors and senior researchers.

As it is a Research Pro-Rectory, where the administrative sector is integrated with research laboratories and research centers, there is a diversity of positions in this area. The majority of the respondents are made up of laboratory technicians, 27% of the respondents, followed by 21% of administrative assistants and professors who make up 20% of the area, the other respondents are varied positions such as that of biologist, administrator, veterinary doctor, executive secretary, researcher, trainee, among others.

The following are the formal and informal networks with the measures used for the proper analyzes (degree, density and reciprocity) of the Pro-Rectory of Research. In these networks, the notes that each respondent attributed to himself were also collected, through his vision of the level regarding his professional relationship and his friendly relations with the other collaborators.

The formal and informal networks formed by the professionals of the Pro-Rectory were composed of 53 actors, 31 male and 22 female, with an average age of 37 years (minimum of 21 years and maximum of 77 years).

The first measure to be worked on is the degree (degree), which according to Leonardo et al. (2019, p.407), its purpose would be: "[...] to identify the quantity of direct contacts that an actor has within the network [...]", or its search relationships for others as the demand for the other members of the network and complement that this measure is
classified in "[...] the second represents actors seeking relationships with other network components." (LEONARDO; FARINA; ANDREOLI; LIMA, 2019, p.407). The following are the formal and informal networks, with emphasis on the degree centrality measure for both (Figures 4 and 5).

Of all the departments, the three that stand out in terms of direct contacts are: the Office, the CEM and the DAAP. It is these three departments that have the most links within the formal and informal networks. Figure 4 shows the Formal Network, that is, these departments have the most prominent employees within the groups and networks. Table 2 shows the total number of connections these employees have and comments are made below.
Table 2. Formal grade network

<table>
<thead>
<tr>
<th>Contributor</th>
<th>Indegree</th>
<th>Outdegree</th>
<th>Manning unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>TA25</td>
<td>40</td>
<td>32</td>
<td>DAAP</td>
</tr>
<tr>
<td>DO16</td>
<td>38</td>
<td>32</td>
<td>Office</td>
</tr>
<tr>
<td>TA02</td>
<td>34</td>
<td>24</td>
<td>ONE HUNDRED</td>
</tr>
<tr>
<td>TA05</td>
<td>23</td>
<td>28</td>
<td>ONE HUNDRED</td>
</tr>
</tbody>
</table>

Source: authors from research data (2021)

In the formal network, the most sought-after collaborator is TA25, as it has the highest number of requests (40 indegrees) from other collaborators, as well as DO16 that has almost the same number of requests from other collaborators (38th-indegrees), indicating that for matters involving work, these two collaborators are highly solicited by the others. The first employee belongs to DAAP and the second employee is packed into the Cabinet.

Conversely, those who seek the most for the others (Outdegree), have the same employees who have the most links, with TA25 presenting a total of 32 mailings (indegree) and DO16 also looking for 32 other employees to resolve doubts related to professional tasks.

In comparison with those who share more information with the others, the two named collaborators (TA25 and DO16) have an intense participation in the network, since at the other end there are collaborators who are not sought (DO01) or who look very little for the others (DO03). With this comparison, it is not suggested that there are problems of interaction between people, but rather, that the network has some members that, due to their hierarchical position, end up having (or not) greater ease for sharing among collaborators (BALESTRIN; VERSCHOORE, 2016).

In reality, the result is compatible, since the TA25 collaborator is crowded in the DAAP, the department that handles the budgets and everything that is related to the research projects. Generally, professionals in this area need a lot of information from the others and are in great demand to provide clarification about information related to the research groups of the institution. In the case of DO16, it is also not surprising that it is very much requested and contact several other collaborators for its position of leadership, since the collaborator makes up the Office, which is the highest level area in the Pro-Rectory hierarchy.
As the research was applied to the collaborators of the Pro-Rectory of Research, it is also forecast that the collaborators crowded in the CEM would appear among those who are most in search and/or most in demand (TA02 and TA05). This center is responsible for authorizing the use of the equipment necessary for the researches carried out by the institution. Therefore, it is forecast that the professionals responsible for the technological apparatus for the development of research will be in great demand or will request a lot of information from the other collaborators.

The next network explored is the informal network (Figure 5), seeking to verify if, among the participants of the survey, there is another network formed to deal with subjects unrelated to the work, as proposed in the question formulated. In the informal network, the investigation focuses on which collaborators seek or are most sought after to deal with matters that are not related to organizational tasks, to verify if there is also a network based on friendship or trust, which according to Sampaio, Monteiro and Lacerda (2017), with the formation of these networks, often invisible, there is a contribution to the exchange of information between peers.

Figure 5. Informal grade network

Source: NetDraw from survey data (2021)
As for the informal network, there is a small change compared to the formal network. In this network the DO16 collaborator is the most sought after and in second place is the TA25 collaborator. Again the two collaborators are featured, as well as verified in the formal network. This finding can also be made by the comparison between the two figures of the formal and informal networks (Figures 4 and 5) for being very similar.

In this informal network, in addition to TA25 being the one that most requests information or searches for other employees with 23 degrees, TA01 also has the same result of searching for the others (Table 3).

<table>
<thead>
<tr>
<th>Contributor</th>
<th>Indegree</th>
<th>Outdegree</th>
<th>Manning unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>TA01</td>
<td>15</td>
<td>23</td>
<td>ONE HUNDRED</td>
</tr>
<tr>
<td>TA25</td>
<td>21</td>
<td>23</td>
<td>DAAP</td>
</tr>
<tr>
<td>DO16</td>
<td>23</td>
<td>16</td>
<td>Office</td>
</tr>
</tbody>
</table>

Source: authors from research data (2021)

DO16 and TA25 collaborators are members that have a certain prominence within the institution's networks, since they are among the first with a greater number of links with the others. This can be considered a position of power within the network, because, as Hanneman (2001) states, power is tied to the bond of relationships that the actor has within the network, influencing the other actors so that they contribute to the desired objective, avoiding the rejection of the others (TICHY; TUSHMAN; FOMBRUN, 1979).

Another interesting characteristic linked to the TA25 collaborator, is that visually, besides a large number of relationships, it is noticeable that this happens between the various departments than within the group in which it is inserted. For this event, the name Gatekeeper is given, in which a given actor interacts with members of other groups existing within a network (TICHY, TUSHMAN AND FOMBRUN, 1979), demonstrating ease of formalizing ties and contributing with the exchange of information and knowledge between the groups (CÂNDIDO; ABREU, 2000), or, in this case, between the departments involved.

The collaborator named DO16 is the most sought after, with 23 collaborators linking to him to deal with diverse subjects, not work. This indicates that the DO16 collaborator, besides being very necessary in the formal network, because it is part of the
group that makes up the Cabinet, is also a person that others consider reliable to deal with personal matters and this generates a favorable context for exchange of knowledge, because it facilitates understanding between all (MIRANDA; LIBOEIRO; BORGES, 2017).

In spite of some particularities found, the figures can see that the formal and informal networks do not have great differences between them, indicating that the hierarchy between collaborators ends up strengthening the informal ties between them.

The next measure to be presented is the density of the network. The density (density) measure evaluates the overall relationship of the actors within the organization by calculating the connectivity ratio of the nodes in the network. This measure expresses the proportion between the verified relationships and the total of possible connections in the network (HANNEMAN, 2001, TEIXEIRA, 2011).

The formal structure presented a density of 25.83% and 712 links, while the informal structure manifested 17.89% index and 493 connections.

The calculation is carried out by dividing the number of connections by the number of possible pairs in the network (HANNEMAN, 2001; TEIXEIRA, 2011). A dense network is one in which there are a large number of connections; on the other hand, a sparse network is a network defined by small numbers of connections. So if there is a large density, you can say that the network is cohesive. In the case of the Pro-Rectory analyzed, the formal structure is more cohesive when compared to the informal structure. This shows that the density of the informal structure is lower when compared to the formal structure. Network actors do not exchange information with everyone else, which can represent a deficiency in relationships and information exchange.

Another measure analyzed deals with reciprocity, which can be understood as an indication of the stability of the structures, since they suggest connections, in their majority, stable. Thus, the measure of reciprocity demonstrates the intensity of dyads that exist in bidirectional bonds (HANNEMAN, 2001, PETTERSON; CASTRO, 2016).

In an analysis carried out in the formal structure, it was found that, of the connections coming from all the pairs of actors, 53.78% of the pairs have a reciprocal connection. This is neither high nor low, but suggests a considerable degree of institutionalized horizontal connections within the organizational population. These horizontal connections...
refer to the cooperation within the group of collaborators, indicating the level that the parties decide to participate jointly for a given objective (MARCON; MOINET, 2000), contributing in a satisfactory manner to the tasks to be performed by the collaborators for the benefit of the institution.

The informal structure presented a higher measure of reciprocity compared to the formal structure, being 57.51%. Therefore, it indicates greater stability of the structure, as they indicate greater proximity between the members of the network, contributing with confidence among the participants (ZOU; HIGGINS, 2015).

For the best performance of a public or private organization, it is verified that reciprocity must be present in the structure, because with this there is a greater exchange of knowledge and information between the employees of the various departments (members of the team) (HANNEMAN, 2001, PETTERSON; CASTRO, 2016). In the light of the two structures evaluated, reciprocity in the informal network indicates a greater exchange and mutual interaction between the servers in the work they carry out.

Another proposed search was to investigate how the collaborators saw themselves within these networks, in relation to the ease of dealing with relationships between the members of the Pro-Rectory and for this reason they were asked to assign a score from 0 (zero) to 10 (ten).

By assigning a grade of 0 to 10 with respect to their own level of personal relationship, that is, how much the person talks or relates to colleagues about non-work matters, 0 being "has no relationship" and 10 "has full relationship". For the assigned banknotes, the grades ranged from 7 to 9 in both nets. The only exception was the TA01 collaborator who assigned a grade of 3 for the personal relationship (informal network) and a grade of 6 for the professional relationship (formal network), indicating that the employee may not realistically evaluate the relationships he has with the other members of the institution.

Table 4 shows the correlation between each employee's self-attributed grade in and out, for the verification of whether there is a positive correlation, i.e. higher grade with higher employee's link with the others and vice versa.
Table 4 - Result of Formal Network Correlations

<table>
<thead>
<tr>
<th>Correlations</th>
<th>Note</th>
<th>Outdegree</th>
<th>Indegree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Note</td>
<td>Pearson's correlation</td>
<td>1</td>
<td>.327*</td>
</tr>
<tr>
<td></td>
<td>Sig. (2 ends)</td>
<td></td>
<td>.017</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>53</td>
<td>53</td>
</tr>
<tr>
<td>Outdegree</td>
<td>Pearson's correlation</td>
<td>.327</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Sig. (2 ends)</td>
<td>.017</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>53</td>
<td>53</td>
</tr>
<tr>
<td>Indegree</td>
<td>Pearson's correlation</td>
<td>.210</td>
<td>.777**</td>
</tr>
<tr>
<td></td>
<td>Sig. (2 ends)</td>
<td>.131</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>53</td>
<td>53</td>
</tr>
</tbody>
</table>

*. The correlation is significant at level 0.05 (2 extremities).
**. The correlation is significant at level 0.01 (2 extremities).

Source: extracted by SPSS from survey data

For those who gave themselves a higher grade, it was noted that these really had a greater participation in the network. This is consistent with the purpose of the question, since it is considered that the attribution of a high grade by the respondent himself on his participation in the network indicates that he considers himself a collaborator who interacts very much with the other colleagues, being the inverse relationship true. Correlation was also used for this part of the research, which seeks to verify if a variable has a relationship with another when or if they are associated (FIGUEIREDO FILHO; SILVA JUNIOR, 2009), to explore more information about the notes and the links. The results that presented significance (p-value <0.5) between Indegree and Outdegree and the notes were highlighted in the table.

By means of the Pearson Correlation Coefficient (ranging between +1 and -1) the results indicated that only the Outdegree (search for the others) has a positive relation with the score (0.327), that is, those collaborators who have been awarded a higher grade have a slightly higher interaction with the others due to the search they perform in search of information about the work they perform in the institution.

With regard to the association of the Indegree and Outdegree variables, they also have a positive Correlation Coefficient (0.777), suggesting that those collaborators who are most sought to provide information about the work, also those who most search for the others. This follows according to the findings in the network analysis, where it was
found that TA25 and DO16 collaborators are the most sought after for information exchange and are also the ones who most search for others for work subjects.

Table 5 - Result of Informal Network Correlations

<table>
<thead>
<tr>
<th>Correlations</th>
<th>Note</th>
<th>Outdegree</th>
<th>Indegree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Note</td>
<td>1.</td>
<td>.248</td>
<td>.195</td>
</tr>
<tr>
<td>Sig. (2 ends)</td>
<td></td>
<td>.074</td>
<td>.162</td>
</tr>
<tr>
<td>N</td>
<td>53</td>
<td>53</td>
<td>53</td>
</tr>
<tr>
<td>Outdegree</td>
<td>.248</td>
<td>1.</td>
<td>.777**</td>
</tr>
<tr>
<td>Sig. (2 ends)</td>
<td>.074</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>53</td>
<td>53</td>
<td>53</td>
</tr>
<tr>
<td>Indegree</td>
<td>.195</td>
<td>.777**</td>
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<td>.162</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>53</td>
<td>53</td>
<td>53</td>
</tr>
</tbody>
</table>

**. The correlation is significant at level 0.01 (2 extremities).
Source: extracted by SPSS from survey data

Unlike the formal network, the results found in the informal network did not point to a relationship between the grades awarded and the degree of participation within the network (Table 5).

The result that indicates a positive correlation is associated with the search for sharing non-work subjects, such as the search for others to share non-work related subjects. This result indicates that there is a reciprocal relationship between the collaborators who share non-work-related matters, creating bonds of trust and friendship between the parties that relate (ZOU; HIGGINS, 2015).

When comparing the mean of the notes between the formal (7.77) and informal (6.30) networks, it is noted that for the formal network the mean is higher and with a standard deviation (SD) lower (1.450) than that verified in the informal network. It can be understood that the collaborators consider that they have a greater sharing among the colleagues within the formal network, even by virtue of the very assignments of labor tasks to which they are subordinate. And this is even presented as a consensus among the respondents by DP minor, that is, the majority of respondents were attributed almost similar notes for this question.

For the informal network, the average grade is lower and with a higher SD (2.342). For this network, the vision transmitted by the respondents represents less interaction.
between the collaborators when it comes to issues that are not connected with the work. However, because it presents a higher PD, the views of how they evaluate themselves in relation to companionship are not so similar. Some contributors may consider that they are more friendly with some colleagues than others.

5 FINAL CONSIDERATIONS

The work aimed to analyze the social environment of relationships in a public organization, under the aspect of formal and informal networks on institutional structure and this goal was achieved through the mapping of formal and informal networks.

The degree (degree), density (density) and reciprocity measures helped to understand the interactions between employees and how active the formal and informal networks are in the exchange of information.

The study demonstrated that there is a certain equality between the formal and informal networks when compared with the Pro-Rectory of Research. This similarity involves characteristics of relationships between employees and implies a necessary vision for an environment that needs interaction to share information, so that there is an improvement in the service delivery to citizens and to the peers themselves.

The search on possible similarities between the network models was the focus of analysis of this study, being fundamental for the development of cooperation or interaction within the network, since it is inserted within an organizational context, where the sharing of information useful for the performance of functions affects the performance of the institution.

The interaction between the players influences the sharing of information and leverages structural changes in the flow of knowledge. These interactions between the collaborators and the position in which they are inserted in the networks are confirmed in the organizational context, defining structures and guiding actions. Relationships are established as they share knowledge from practical actions and experiences in the organization.

It was found that the relations of reciprocity between the peers become determinant factors that influence the relationship of the actors in the organization. The
relationship, both formal and informal, can be considered as a necessary condition to establish greater meaning to the organizational structure.

The understanding of the relationships between the actors inserted in the organizational structure of an institution provides the delineation of actions that foster cooperative and planning behaviors, adjusting to the values of the organization. For managers, it is fundamental to understand how the intra-organizational networks and the place that each individual exercises within this structure are represented, thus being able to promote greater contact between the actors of the network and increasing socialization between them, expanding their perception of the role that they perform.

As the results showed similarities between the networks, the institution could use the ties that certain employees have, both for their position and for their friendship or trust, and establish goals for increasing information sharing, as a way of positively impacting the performance of all the groups. These more influential collaborators can serve as a bridge to a more intense knowledge flow, and can shorten the normal information transfer time required for these involved collaborators.

For future studies, it is recommended to use statistical analysis techniques to help understand the results and to better detail the characteristics of the relationship network of the servers and its importance to obtain information and knowledge. The application of questionnaires associated with in-depth interviews is considered to be in depth, in order to increase the understanding of the results found.
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