

<https://doi.org/10.23913/ride.v11i21.708>

*Artículos Científicos*

## **Dinámicas relacionales entre investigadores: una perspectiva desde el análisis de redes sociales**

***Relational Dynamics Between Researchers: A Social Network Analysis Perspective***

***Dinâmica relacional entre pesquisadores: uma perspectiva a partir da análise de redes sociais***

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### **Resumen**

El objetivo de este trabajo de investigación es entender el funcionamiento de una red social integrada por profesores-investigadores de un departamento de posgrado de una universidad mexicana. Los actores analizados participan en diversas actividades académicas y de investigación, tales como dirigir o ser sinodales de tesis de maestría. Este estudio comprende, en primera instancia, el análisis de las relaciones laborales que establecen los profesores con base en su participación en proyectos de tesis, y por otro lado, se analiza la fuerza de sus lazos sociales, así como las relaciones de ayuda y apoyo que se brindan entre ellos. La perspectiva teórico metodológica para analizar las relaciones entre los actores se basa en la teoría de redes sociales. Los resultados muestran que existe una fragmentación del grupo de investigadores y que, en consecuencia, existen varios grupos de estos que determinan una



estructura informal distinta a la formalmente establecida. Esta estructura informal también guía el desarrollo de las actividades de investigación en el departamento. Los hallazgos revelan que existen actores estratégicos o claves en la red y, por tanto, los miembros en general no participan de manera homogénea ni equitativa en la conducción de los trabajos de tesis de los alumnos.

**Palabras clave:** canales de comunicación, colaboración científica, relaciones laborales, transferencia de conocimiento científico, universidad.

### **Abstract**

The objective of this research is to analyze as well as to understand the performance of a social network integrated by researchers of a postgraduate department of a Mexican public university. The actors that are analyzed in this research actively participate in thesis projects (advisors and examiners). This study includes, on first place, the analysis of labor relationships established by professors based on their experiences as collaborators in thesis-projects. On second place, this study examines the strength of professors' social relationships (ties), as well as their mutual support and assistance relationships. This study is based on the social network analysis approach. Our findings show that there is a clusterization in the researchers' group and as a consequence exist several groups of researchers that determine an informal structure different from the defined formal structure. The results indicate strong support for the fact that the informal structure guides the development of the research activities of the department. Data reveals that strategic or key actors exist and, consequently, members do not participate in homogenous nor equitable way in the development of academic work.

**Keywords:** communication channels, scientific collaboration, labor relationships, scientific knowledge transfer, university.

## Resumo

O objetivo deste trabalho de pesquisa é compreender o funcionamento de uma rede social composta por professores-pesquisadores de um departamento de pós-graduação de uma universidade mexicana. Os atores analisados participam de diversas atividades acadêmicas e de pesquisa, como dirigir ou serem síndocos das teses de mestrado. Este estudo inclui, em um primeiro momento, a análise das relações de trabalho estabelecidas pelos professores com base em sua participação em projetos de tese e, por outro lado, a força de seus laços sociais, bem como as relações de ajuda e apoio. que se oferecem. A perspectiva metodológica teórica para analisar as relações entre os atores é baseada na teoria das redes sociais. Os resultados mostram que há uma fragmentação do grupo de pesquisadores e, conseqüentemente, existem vários grupos de pesquisadores que determinam uma estrutura informal diferente da formalmente estabelecida. Essa estrutura informal também orienta o desenvolvimento de atividades de pesquisa no departamento. Os resultados revelam que existem atores estratégicos ou chave na rede e, portanto, os membros em geral não participam de maneira homogênea ou equitativa na condução do trabalho de tese dos alunos.

**Palavras-chave:** canais de comunicação, colaboração científica, relações de trabalho, transferência de conhecimento científico, universidade.

**Fecha Recepción:** Febrero 2020

**Fecha Aceptación:** Julio 2020

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## Introduction

Interactions between individuals represent an essential element of social groups. Knowledge, on the other hand, is inherent in the human being. Then, the study and analysis of the transfer of knowledge and the implications that this transfer has on social groups takes on great relevance. In general terms, and for the study of organizations, knowledge is created through human interactions (De Long and Fahey, 2000; Nonaka and Takeuchi, 1995; Tasselli, Kilduff and Menges, 2015; Wuebker, Hampl and Wüstenhagen, 2015 ), is useful for action (Davenport & Prusak, 1998; De Long & Fahey, 2000; Hjorth, Holt & Steyaert, 2015; Probst, Raub & Romhardt 2000; Quinn, Anderson & Finkelstein, 1996) and is represented by a set of abilities, beliefs, experiences and intuition (Davenport and Prusak, 1998; De Long and Fahey, 2000; Kerssens, De Weerd and Fisscher, 1996; Sankar, Asokan and Satheesh, 2015).

A social network is defined as a collection of individuals that are interconnected by a set of relationships (Buchanan, 2002; Sankar et al., 2015) where there are negotiated and reinforced force structures and opportunities between the interacting individuals (Kilduff and Tsai , 2007). These social networks can also be made up of individuals or organizations that create effective communication channels through ties to transmit information and knowledge (Zhang and Liu, 2007). Without a doubt, the understanding of these structures of forces and opportunities represents the purpose of this study.

The analysis of social networks as a theoretical-methodological approach in the study of organizations and their members has been used frequently in recent years. The fundamental idea of using this approach is to achieve an understanding of the dynamics of information transfer (Dodds, Watts and Sabel, 2003; Sankar et al., 2015) and knowledge that exist between the actors of a given social network. Wasserman and Faust (1994) argue that, in the social media approach, there are two principles that are considered very important. In the first instance, they indicate that the relational ties between the actors are channels to transfer or transmit resources (material or non-material) and, second, they suggest that another key factor is the interdependence between the actors and their actions. . For their part, Kilduff and Tsai (2007) suggest that the study of social networks is useful to understand the processes of generating trust among the members of a social network and thereby achieve better decision-making.

In this sense, it is worth highlighting the contributions of Rosenthal (1997), who indicated that social networks are important for understanding the context of work teams, since when individuals interact in teams, the relationships generated between them are mutual coexistence. To explain and understand the dynamics of information and knowledge, some authors have argued the importance of macro and micro bridges in the analysis of social networks, as well as the relevance of the ties between the social actors involved in a defined network (Granovetter , 1973; Hansen, 1999). According to Krackhardt and Stern (1998) and Krackhardt (1993, 1988), the social network approach can also help to identify the existing alignment between the formal structures defined by the organization and the existence of informal structures within it. In this research work, the interactions that occur between the social actors, as well as the joint participation that takes place between them, involve the analysis of the actors' social network in order to analyze the collaboration that exists between the teachers ( members of the academic bodies) of a higher level educational institution.

Seonghee and Boryung (2008) argue that the desire to share knowledge of members of academic bodies tends to be weak because they act independently, individualistically, autonomously and focus on achieving individual goals rather than working on it. achievement of common goals. The academic bodies within their organizations are immersed in complex social structures and these structures, in many cases, involve the creation and development of institutional alliances that are reflected in the formation of organizational subcultures (Tierney, 1988). These university organizational subcultures are responsible for the generation and transfer of knowledge to a particular community (Clark, 1987, cited in Seonghee and Boryung, 2008; Salsai, Cheraghi and Ahmadi, 2009). This study uses the perspective of social network analysis to analyze and describe the ties of social actors regarding the transfer of knowledge in academic projects (collaboration in direction and synodalies of master's theses) and the membership of these social actors in different informal groups that are different from those formally established.

After having carried out an analysis of the literature, the research problem addressed in this work is explained. The analysis department has a base of 29 full-time professor-researchers. These teachers are distributed in the three master's degrees that are taught in said department. Since the department was founded in 1975, changes (hiring) of professor-researchers have been stable; until 1999, when by institutional directive there was a teacher training and education program that allowed new prospects to be part of the department. This program allowed the entry of new professor-researchers and, with it and ever since, a complementary point of view to the existing one. In addition to this, in 1998 three new teachers joined.

Most of the professors who were admitted as new to the department became national and international scholarships that allowed them to carry out master's and doctoral studies. Upon returning from their master's studies, 10 young new teachers joined, six of whom have a relationship with the department. With the arrival and integration of the new professors to the department, the structure of the facilities, as well as the assignment of the groups of the existing programs, changed. Until before 2004, there was a hegemony of a group in power, with some actors scattered among the members of the section. The six young people who had arrived did not intervene in decision-making and very little participated in the development of the thesis projects. In 2005, a young actor joined the department and in 2007 three new mature teachers joined, who have modified the activities of the section. Over time, the young

professors who joined the department gained experience and possibilities to participate in the development of the theses. In 2007, the identification of the hegemonic group was still clear, however, the group of young actors began their participation in activities at the same level as mature teachers. In this year, the hegemonic group has internal discussions and some of its key actors begin to separate, who form new informal groups. In 2009 there were four informal groups: the hegemonic group (already decreased in number, compared to 2007), a group that was beginning to gain strength (made up of members who left the hegemonic group together with actors who had always been dispersed, without any group) and the group of young people who were beginning to have more experience (this group is joined by two mature teachers). A fourth group was made up of dispersed actors who did not identify with any of the previous three groups.

In some collective meetings and tutorial committee meetings in the presence of the students, some members of the three existing groups show certain academic positions found, different points of view and different conceptions of work regarding the development of the theses. The youth group proposes new work alternatives and thesis supervision, however, the other groups disagree on many occasions, since there is an important work tradition in the department. Finally, an important part of the academic work of the teachers is the thesis supervision. Regarding this element, young teachers believe that it should be worked in a different way. In most cases these proposals are aligned with the learning that young people acquired during their master's and doctorate studies at both national and foreign universities. According to members of the hegemonic group, this section of postgraduate studies is for giving high-level classes and not for research. With the arrival of the new head of the department, some aspects of work have changed, for example, the National Program for Quality Graduate Studies (PNPC) of the National Council for Science and Technology (Conacyt) was entered, and there is talk in the corridors about research projects.

From this perspective, and from the researchers' point of view, the existing group of professors-researchers has created an informal organizational structure that is far from the formal structure defined by the institution. The professors of the analyzed department are formally integrated into three different work groups, which respond to the nature and formal structure of the department. Within the department there are three different graduate programs (called P-1, P-2, P-3) and the professor-researchers are assigned to one or more of



these academic programs depending on their areas of interest and professional experience. The actors of this network are distributed in two of the three floors of the department building.

## Materials and methods

In this research, ethnographic observations were made, participant surveys were applied, and secondary sources such as official documents and databases of the institution's internal information system were consulted. Part of the analysis carried out in this research work is based on ethnographic observations of two of the research professors who participate in the master's programs of the analyzed department.

In order to describe the relationships between the social actors in this study, the archival data was analyzed with respect to the degree thesis development projects within the department. The participation of professors in each of the thesis committees over a period of nine years (from 2000 to 2009) was analyzed. The data supporting this information was collected from the records (both electronically and in printed documents) of the institution. Additionally, a survey was applied to the social actors whose objective was to collect information that allows understanding the functioning of the social structure of the participants in the organization and the particular functions of the actors, as well as the strategies for the transfer and dissemination of knowledge. . For this, the relationships that exist between the professor-researchers, as well as the strengths of their collaborative ties, were analyzed. The survey was divided into two sections. In the first of these, questions were asked in order to obtain descriptive data of the sample (members of the social network), and in the second section, the questions were designed to obtain information regarding the relationships that exist between the members of the social network.

The surveys were applied personally to the participants of the social network in a period of two weeks. The total response rate was 68.96% (20/29). In order to guarantee the confidentiality of the responses and to promote their sincerity, it was deemed convenient that the name of the social actor that answered it was not included in the survey. For this, a consecutive number (1 to 29) was assigned to each of the surveys.

The social actors analyzed in this research work are 29 professor-researchers assigned to a department that has three different areas. Regarding the academic level, 44.82% of the social actors have doctoral studies and the rest have master's degrees. Regarding gender, 5 of the 29 teachers are women, which represents 17.24% of the sample. All the teachers are

distributed on two floors of a building and each one has its own office. The average age of the sample is 51 years, and the average seniority of the members of the department is 13 years.

The distribution of social actors within formal and informal groups is essential for the development of this research work. According to the secondary sources consulted and the ethnographic observations made, we classify the social actors into four subgroups fundamentally (Table 1). We identified the subgroups with the letters A, B, C and D. It is worth mentioning that in this work the Ucinet software was used for the analysis of social networks.



**Tabla 1.** Afiliaciones formales e informales de los actores sociales

|          |     | Actores (claves)  |
|----------|-----|---|
|          | P-1 | A-1, A-4, A-5, A-6, A-7, A-9, A-10, A-11, A-12, A-16, A-19, A-20. A-21, A-22, A-25. A-27, A-28, A-29.           |
| <b>A</b> | P-2 | A-6, A-9, A-12, A-13, A-14, A-15, A-17, A-18, A-20, A-21, A-22, A-23, A-24, A-26, A-28                          |
|          | P-3 | A-1, A-2, A-3, A-5, A-8, A-15, A-16, A-17, A-19, A-20, A-27, A-29   |
|          | P-1 | A-4, A-5, A-6, A-7, A-9, A-10, A-11, A-12, A-14, A-16, A-19, A-20, A-25, A-27, A-28, A-29                       |
| <b>C</b> | P-2 | A-6, A-9, A-11, A-12, A-13, A-15, A-17, A-18, A-20, A-21, A-22, A-23, A-24, A-26                                |
|          | P-3 | A-1, A-2, A-3, A-5, A-8, A-16, A-29   |
|          | G-1 | A-3, A-4, A-5, A-9, A-10, A-16, A-19, A-27  |
| <b>B</b> | G-2 | A-7, A-11, A-12, A-14, A-20, A-23, A-24, A-26, A-29   |
|          | G-3 | A-6, A-15, A-18, A-18, A-21, A-22, A-28   |
|          | G-4 | A-1, A-2, A-8, A-15, A-17, A-18, A-21, A-22, A-27, A-28   |
| <b>D</b> | G-a | A-1, A-2, A-4, A-5, A-7, A-8, A-9, A-10, A-11, A-12, A-13, A-14, A-16, A-19, A-20, A-23, A-24, A-25, A-26, A-29 |
|          | G-b | A-3, A-6, A-15, A-17, A-18, A-21, A-22, A-27, A-28  |

*A* = Distribución oficial; *C* = Real y tradición; *B* = Grupo de afiliación; *D* = Hegemónico y no hegemónico.

*P-1* = Programa 1; *P-2* = Programa 2; *P-3* = Programa 3; *G-1* = Grupo 1; *G-2* = Grupo 2; *G-3* = Grupo 3; *G-4* = Grupo 4.

*G-a* = Grupo hegemónico; *G-b* = Grupo no hegemónico.

Fuente: Elaboración propia

Components defined as *A* and *C* represent the formal structure of the organization. The first of these (*A*) represents the academic nuclei into which the social actors within the department are divided. It is important to mention that in this classification a social actor can belong to one or more of the three programs in which the department is divided. Component *C* refers to the way in which the actors carry out their formal activities with respect to attendance at meetings and decision-making in them. This component is the traditional way

of operating the department and to a large extent represents the current classification of its academic and administrative tasks.

Now, the classifications that correspond to elements B and D represent the informal structure of the department, and this structure is based on the ethnographic observations of the authors of this article. Component B refers to the detailed membership group of the social actors. From the authors' perspective, in the department there are three informal groups fully defined by actions and activities carried out jointly by the members, and there is a fourth group that considers those social actors that we have not been able to identify as members of a particular group. . Finally, component D refers to a more general classification of informal groups. This classification implies the division of the department into two subgroups. The first of them is represented by the social actors who have the longest seniority in the section (almost mostly) and the second group is represented by the least senior actors in the department (almost mostly).

For the analysis of social networks, various matrices of size  $N \times N$  were created. These matrices include: a) Age of the actors in the department analyzed, where each cell of the matrix represents the absolute difference in years of seniority between a actor  $i$  and an actor  $j$ ; b) Classes taught, where each cell represents the absolute difference in the number of classes taught by an actor  $i$  and an actor  $j$ ; c) Distance in meters, where each cell represents the absolute difference in the number of meters that exists between the offices of an actor  $i$  and an actor  $j$ ; d) Age, where each cell of the matrix represents the absolute difference in the number of years that exist between an actor  $i$  and an actor  $j$ ; e) Degree of studies, where each cell of the matrix represents the coincidence (1) or not (0) of the level or degree of study of an actor  $i$  compared to an actor  $j$ ; f) Affiliation group, where each cell of the matrix represents the coincidence or not of an actor  $i$  with an actor  $j$  in an affiliation group determined by ethnographic observation; g) Participation by social actor, where each cell of the matrix represents the absolute difference between the participations of an actor  $i$  with respect to one  $j$  in the development of a thesis as director or synod; h) Location floor, where each cell of the matrix represents the coincidence (1) or not (0) of the floor where the offices of actors  $i$  and  $j$  are located; i) Total synodalities by social actor, where each cell of the matrix represents the absolute difference between the participations of an actor  $i$  with respect to one  $j$  in the development of degree theses as a synod; j) Total theses by social actor, where each cell of the matrix represents the absolute difference between the shares of an actor  $i$  with respect to

one j in the development of a thesis as director; k) Total director percentage, where each cell of the matrix (dichotomized greater than 25% of joint participation) represents if an actor i had the same intervention as an actor j (greater than 25% of joint participation) in the thesis direction of degree; l) Total synodal director percentage, where each cell of the matrix (dichotomized - greater than 25% of joint participation) indicates whether an actor i had the same intervention as an actor j in the direction and synodalies of degree thesis; m) Hegemonic or non-hegemonic, where each cell of the matrix represents the coincidence or not of an actor i with an actor j in a hegemonic or non-hegemonic group determined by ethnographic observation; n) Official distribution, where each cell represents whether an actor i is in at least one academic nucleus formally defined by the department similar to that of actor j; ñ) Real and tradition, where each cell of the matrix represents if an actor i is in at least one program (P-1, P-2, P-3) formally defined by the department similar to that of actor j.

The information obtained from the secondary sources and the responses of the answered surveys were processed in Microsoft Office Excel tables to facilitate their management. Different tables and matrices were designed that contain the relevant information from the study. In the analysis of a large part of the information obtained in this research work, the social networks approach was used, since it offers a broad perspective of the relationships or ties established between the members of the department. To analyze the data statistically, we use correlations. Because the observations obtained through the analysis of social networks are not independent, they do not satisfy the assumptions of inferential statistics.

## Results

In the development of this section of the article, it was considered prudent to carry out our analysis based on two fundamental aspects that we distinguish in the interaction of the social actors under analysis:

- 1) The existence of an informal structure that is different from the formally established structure. This informal structure guides the development of research activities in the analyzed department.
- 2) The existence of key actors that guide the development of the academic activities of the department (development of research projects and direction of degree theses).

From our exploratory study we can argue the following general results regarding the correlations obtained in this investigation (Table 2).

**Tabla 2.** Correlaciones. Paradigma de asignación cuadrática (QAP). Generales

|   | A           | B          | C           | D           | E     | F          | G          | H          | I          | J         | K          | L         | M    |
|---|-------------|------------|-------------|-------------|-------|------------|------------|------------|------------|-----------|------------|-----------|------|
| A | 1.00        |            |             |             |       |            |            |            |            |           |            |           |      |
| B | 0.14        | 1.00       |             |             |       |            |            |            |            |           |            |           |      |
| C | 0.15<br>**  | -0.02      | 1.00        |             |       |            |            |            |            |           |            |           |      |
| D | 0.18<br>*   | 0.12<br>*  | 0.09<br>*   | 1.00        |       |            |            |            |            |           |            |           |      |
| E | -0.03       | 0.00       | 0.03        | -0.01       | 1.00  |            |            |            |            |           |            |           |      |
| F | -0.02       | -0.04      | -0.02       | -0.08       | -0.03 | 1.00       |            |            |            |           |            |           |      |
| G | 0.22<br>*   | 0.29<br>** | 0.06        | 0.17<br>*   | 0.00  | -0.04      | 1.00       |            |            |           |            |           |      |
| H | -0.17<br>** | 0.01       | -0.97<br>** | -0.08       | -0.03 | 0.03       | -0.09<br>* | 1.00       |            |           |            |           |      |
| I | 0.24<br>*   | 0.31<br>** | 0.05        | 0.17<br>*   | 0.00  | -0.05      | 0.99<br>** | -0.08<br>* | 1.00       |           |            |           |      |
| J | 0.16        | 0.19<br>*  | 0.09<br>*   | 0.12        | 0.01  | 0.00       | 0.87<br>** | -0.12<br>* | 0.81<br>** | 1.00      |            |           |      |
| K | -0.13<br>*  | -0.05      | -0.01       | -0.10<br>*  | -0.02 | 0.13<br>** | 0.09       | 0.00       | 0.10       | 0.05      | 1.00       |           |      |
| L | -0.10       | -0.03      | -0.07<br>*  | -0.01       | -0.03 | 0.09<br>*  | 0.28<br>** | 0.05       | 0.29<br>** | 0.22<br>* | 0.55<br>** | 1.00      |      |
| M | 0.00        | 0.05       | -0.13<br>*  | -0.31<br>** | -0.02 | 0.35<br>** | 0.03       | 0.11<br>*  | 0.03       | 0.04      | 0.18<br>** | 0.13<br>* | 1.00 |

\* =  $p < 0.05$ , \*\* =  $p < 0.01$

A = Antigüedad en departamento; B = Clases impartidas; C = Distancia en metros; D = Edad; E = Grado de estudios; F = Grupo de afiliación; G = Participación total por actor social; H = Piso de ubicación; I = Sinodalías totales por actor social; J = Tesis totales por

actor social;  $K$  = Total director porcentaje;  $L$  = Total director sinodal porcentaje;  $M$  =  
Hegemónico – No hegemónico

Fuente: Elaboración propia

The results show that there is a moderate correlation (0.13) between the percentage of theses directed by network actors ( $K$ ) and the affiliation group ( $F$ ) to which they belong. Similarly, if we consider the classification of two subgroups (hegemonic and non-hegemonic,  $M$ ), there is also a correlation (0.18) between the distribution of teachers in these groups and the percentage of theses directed by network actors ( $K$ ). From this perspective, it is prudent to point out that the participation of an actor  $i$  in the direction of a thesis responds in some way to the degree to which this actor  $i$  is linked to a certain group of teachers.

Another interesting correlation is the one established between the age ( $D$ ) of the social actors and belonging to the hegemonic or non-hegemonic group ( $M$ ) of the department. This comparison shows that there is a negative correlation of -0.31 ( $p < 0.01$ ). In this sense, our argument is that the greater the age difference between two given actors,  $i$  and  $j$ , these actors will belong to different groups established in the department. On the contrary, if the age of the social actors is similar, they will belong to the same group within the department.

From the table it can be deduced that the professors who most direct thesis ( $J$ ) are also those who participate the most as synods of other works ( $I$ ). The correlation in this case is 0.81 ( $p < 0.01$ ).

Regarding the integration of formal and informal working groups, we can argue the following. Table 3 shows the correlations that exist between four essential components.

**Tabla 3.** Correlaciones. QAP. Grupos formales e informales

|          | <b>A</b> | <b>B</b> | <b>C</b> | <b>D</b> |
|----------|----------|----------|----------|----------|
| <b>A</b> | 1.00     |          |          |          |
| <b>B</b> | 0.14 **  | 1.00     |          |          |
| <b>C</b> | 0.28 **  | 0.10 *   | 1.00     |          |
| <b>D</b> | 0.02     | 0.35 **  | 0.02     | 1.00     |

\* =  $p < 0.05$ , \*\* =  $p < 0.01$

$A$  = Distribución oficial;  $B$  = Grupo de afiliación;  $C$  = Real y tradición;  $D$  = Hegemónico y no hegemónico.

Fuente: Elaboración propia

Correlations suggest that formal structures (A and C) are significantly correlated ( $p < 0.01$ ) with an index of 0.28, while informal structures (B and D) are also significantly correlated ( $p < 0.01$ ) with an index of 0.35.

The correlation that exists between the formal and informal components (A and B; A and D; B and C; C and D) are less than those that exist in the analysis of formal structures between them and those that exist in the analysis of informal structures between them. Even in some cases these correlations are not significant. Due to the little or no correlation that exists between the formal and informal components, we can argue that the structures differ in their arrangements and elements, that is, although there is a definition of formal structures in the department, these structures are outweighed by the relationships that They are established by the members of the informal groups.

Table 4 shows the density values of the existing groups within the department. To calculate these densities, the matrix of the participation of social actors as thesis supervisors and their collaborations with other actors as synodical (greater than 25% joint participation) was dichotomized.

**Tabla 4.** Densidades de los grupos de afiliación

|                 | <b>General</b> | <b>G-1</b> | <b>G-2</b> | <b>G-3</b> | <b>G-4</b> | <b>Hegemónico</b> | <b>No<br/>hegemónico</b> |
|-----------------|----------------|------------|------------|------------|------------|-------------------|--------------------------|
| <b>Densidad</b> | 0.1096         | 0.2679     | 0.1389     | 0.0952     | 0.05       | 0.1684            | 0.0694                   |

Fuente: Elaboración propia

The results reveal that the density of G-1 is at least twice the density of the other existing groups in the department. This implies that the relationship between the members of this group (G-1) is much more frequent than that which occurs between the members within the other groups in the department.

To detect the key actors in the network, we use the values we obtained from the relationships between the participants in the thesis projects.



**Tabla 5.** Actores sociales. Directores y sinodales de tesis de grado

| Actor | Director de tesis | Sinodal de tesis | Total (director + sinodal) |  | Actor | Director de tesis | Sinodal de tesis | Total (director + sinodal) |
|-------|-------------------|------------------|----------------------------|--|-------|-------------------|------------------|----------------------------|
| A-1   | 0                 | 1                | 1                          |  | A-16  | 5                 | 35               | 40                         |
| A-2   | 3                 | 25               | 28                         |  | A-17  | 0                 | 2                | 2                          |
| A-3   | 2                 | 3                | 5                          |  | A-18  | 3                 | 7                | 10                         |
| A-4   | 0                 | 21               | 21                         |  | A-19  | 14                | 82               | 96                         |
| A-5   | 23                | 78               | 101                        |  | A-20  | 6                 | 12               | 18                         |
| A-6   | 12                | 15               | 27                         |  | A-21  | 0                 | 5                | 5                          |
| A-7   | 6                 | 11               | 17                         |  | A-22  | 0                 | 6                | 6                          |
| A-8   | 0                 | 0                | 0                          |  | A-23  | 2                 | 13               | 15                         |
| A-9   | 13                | 48               | 61                         |  | A-24  | 0                 | 2                | 2                          |
| A-10  | 16                | 50               | 66                         |  | A-25  | 7                 | 9                | 16                         |
| A-11  | 0                 | 0                | 0                          |  | A-26  | 4                 | 6                | 10                         |
| A-12  | 7                 | 34               | 41                         |  | A-27  | 0                 | 0                | 0                          |
| A-13  | 7                 | 22               | 29                         |  | A-28  | 0                 | 0                | 0                          |
| A-14  | 0                 | 9                | 9                          |  | A-29  | 22                | 81               | 103                        |
| A-15  | 1                 | 3                | 4                          |  |       |                   |                  |                            |

Promedio de tesis dirigidas x actor: 5; Promedio de sinodalías de tesis x actor: 20;

Promedio del total (director + sinodal) x actor: 25.

Fuente: Elaboración propia

From the analysis of the data in Table 5, it can be distinguished that 12 actors are above the average in terms of thesis work direction. Of these 12 actors, there are 6 that exceed in 10 the number of theses directed in the period analyzed (A-5, A-6, A-9, A-10, A-19, A-29). It is important to note that all these actors in the social network (except A-6) belong to the informal hegemonic group (G-a).

It is also important to analyze, on the other hand, the participation in synodals of degree theses. In this sense, the actors with the most participation in thesis synodals are A-2, A-4, A-5, A-9, A-10, A-12, A-13, A-16, A-19, A-29, all these social actors also belong to the informal hegemonic group (Ga). Of the 153 thesis papers analyzed during the 2000-2009

period, 65.35% (100/153) have been directed by 6 of 29 social actors in the network. According to Table 2, there is a moderate (-0.13) and significant ( $p < 0.05$ ) correlation that the social actors with the longest time in the department are the actors who direct the most theses.

The analyzed data reveals that the members of the social network do not participate in a homogeneous way in the development of thesis works, even when their participation is encouraged in the same way.

## Discussion

In the study carried out, we have confirmed the importance of the sociocultural practices of the social actors considered in the analysis network. Analysis of our data reveals that not all members of the network participate in a similar way. According to the analysis carried out, we can argue that communication within the network and the process for it to develop effectively depends on certain actors in particular. Neus (2001) calls this effect the vision of the communication tunnel.

Although the analyzed social network actors share a common knowledge domain or interest, it is evident that this interest is dependent on some factors that revolve around each element of the network. Alavi and Tiwana (2002) argue that among these factors are the organizational climate and culture, physical distribution, the type of work carried out, and access to information and technology.

The analysis reveals that the way in which the information is shared and distributed within the studied community is not symmetrical, this implies the existence of a network clusterization. Evidence of what is known as inflexibility in organizational ties was found in this work (Hite and Hesterly, 2001; Hjorth et al., 2015; Shipilov, Gulati, Kilduff, Li and Tsai, 2014). Teamwork ties are weak since interactions are infrequent (Hansen, 1999). It is important to mention that, according to the data obtained in this study, there is a significant difference between the participation of the members of the network, although in theory this participation is encouraged in a similar way in all the members. The strategic positions that some elements of the network occupy are a trigger that promotes and, in some cases, limits the active participation of all social actors. This effect implies the existence of a very low and even null correlation between the formal and informal components, and this implies that the structures differ in their arrangements and elements. The development of the academic

practices of the different social actors formally defined in the organization's structures are different from the practices that are developed in the day-to-day of the organizational activities.

Finally, it is important to highlight that in the conduct of this study, the existence of defensive habits and practices by some actors that prevent a complete analysis of the organization's (informal) social structure was identified.

## Conclusions

It is concluded that the article fulfilled its objective, which was the understanding of the operation of a social network made up of research professors from a section of postgraduate studies at a university in Mexico City. The implications for higher education institutions are diverse. In principle, an analysis of this type allows us to understand the dynamics that are generated in social networks that exist in academic organizations, these have their origin in formal groups or informal groups. In addition to the above, it allows to reason the dynamics of the relationships between the groups that are in departments that carry out research, in this case in the area of social sciences. However, it is a reality that there are groups that secure privileges within structures and networks and, therefore, obtain more benefits, as is the case of directing thesis work, just to mention one, so It is relevant to study the groups that are created to understand the way in which they dictate the forms of academic work.

The limitations that were had in the development of the investigation were the defensive practices that hinder the process of obtaining and subsequent analysis of the information, together with the scarce presence of variables that would have allowed to understand in depth the phenomenon as the discipline, the Academic prestige, scientific qualification, charisma, friendship, emotional ties and the political weight of the actors in decision-making circles in higher education institutions. The advantages of this type of research is that they support the understanding of the working groups and the way in which they establish mutual support agreements to achieve goals in the generation of knowledge.

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