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Sociometric Study of Intragroup Relations in a Work Group

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Abstract

The aim of this study is to explore intragroup relations in retail. The article conduct a sociometric analysis that takes into account labor and affective criteria, using the probability theory method and the UCINET program. In so doing the paper observe that the group, despite having been formally established for more than five years, does not display any solid indicators of high cohesion. The article observe that formal authority and informal leadership do not coincide and that there are two group factions in both criteria, which supports the finding of low cohesion. But despite these deficiencies in terms of cohesion, paper do not find any completely ignored or solitary individuals; as such, the group has established relations that can be improved. To this end, group cohesion should be promoted through a work design that facilitates interaction between individuals and rewards group results, all of which will serve to enhance the performance of this group.

Keywords: Organizational behavior, groups, intragroup relations, sociometry.

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Introduction

Organizational behavior (OB) is comprised of three main elements: individuals, groups, and structure (Robbins & Judge, 2009). Studies of organizational behavior collect and analyze information related to these elements so that firms can work effectively and efficiently. The field is important since the development of an organization depends to a large extent on sound management of its human resources (Chiavenato, 2009; Chruden & Sherman, 2007; Dailey, 2012; Robbins & Judge, 2009; Werther & Davis, 2008).

But organizations that do not have a department dedicated to analyzing their human resources have difficulties with identifying organizational failings and problems at the level of individual employees. As far as staff are concerned, this can lead to a lack of motivation, high levels of absenteeism, low productivity, and even high levels of turnover, since employees who do not feel comfortable at the organization may seek opportunities at other firms that facilitate their development and provide a better working environment (Chiavenato, 2009; Werther & Davis, 2008). The optimal functioning of an organization depends largely on the effective performance of the members of its constituent groups (Dailey, 2012; Robbins & Judge, 2009)

As elements of interest in the study of groups, the structure and organization of personal and social relations require methods for their analysis, with particular emphasis on the role of human resources in the performance of any organization (Henttonen, 2010). This is based on the notion that individuals must be understood and investigated through their interpersonal relations (Lawless, 2015; Ruiz Berrio, 2014). Sociometric studies provide a clear and in-depth understanding of relations between group members. They are useful for addressing any issues affecting intragroup relations so that each group member can integrate and perform in a favorable working environment, and for creating strategies related to operations and achieving objectives. Ultimately, this favors individual evolution and internal cohesion for goal attainment and productivity improvements (Ballesteros-Pérez, González-Cruz, & Fernández-Diego, 2012; J. M. Bezanilla & Miranda, 2012; Gutiérrez, Astudillo, Ballesteros-Pérez, Mora-Melià, & Candia-Véjar, 2016; Henttonen, 2010; Orbach, Demko, Doyle, Waber, & Pentland, 2015). The sociometric method facilitates the study of interpersonal relations in small occupational groups in which the efficiency of each employee depends of the emotional comfort and well-being of all group members united by a common goal: the good performance of the organization (Zhukova, Lozhkin, & Guseva, 2016).

The goal of this paper is to carry out a sociometric study to identify the intragroup dynamics of a formally established work group, and thus improve its capacity to take corrective measures aimed at improving work and the working environment so that it can achieve its goals through the effective use of all its resources: economic, financial, and human (Chruden & Sherman, 2007; Forselledo, 2010; Lawless, 2015; Orbach, et al., 2015; Zhukova, et al., 2016). Most sociometric applications reviewed in the literature pertain to the field of education (Barrasa & Gil, 2004; Kuz & Falco, 2013; Kuz, Falco, Nahuel, & Giandini, 2015; Laet et al., 2014; Pineda et al., 2009; Sabin, Mihai, & Marcel, 2014; Soponaru, Tincu, & Iorga, 2014). But here we seek to apply this method to the business sector and demonstrate its effectiveness in identifying problems concerning intergroup relations in work groups, thus facilitating the improvement of these relations and, in turn, the performance of the group and the organization in which it operates.

Background

Organizational behavior (OB).

According to Robert Dailey (2012), OB is based on a range of concepts from the fields of individual psychology (personality and cognition), social psychology (interaction between individuals), industrial psychology (individuals at work), political science (power and influence), anthropology (cultural systems), economics (incentives and transactions), sociology (nature and behavior of groups of people) and theories of complex organizations (how these organizations are created, how they grow, and how their groups interact).

Several studies approach the concepts and objectives related to the field of OB (Chiavenato, 2009; Chruden & Sherman, 2007; Dailey, 2012; Robbins & Judge, 2009; Werther & Davis, 2008). It is generally agreed that OB explores the impact that individuals, groups, and structure have on behavior within organizations so that they can work more effectively (Dailey, 2012; Robbins & Judge, 2009; Werther & Davis, 2008). Previous studies related to OB include:

- Performance and the attitudes of the individuals at the heart of organizations (Dailey, 2012).
- Individuals, groups, and the structure of the organization; what individuals do and the influence of their behavior on the organization (Robbins & Judge, 2009).
- The continuous interaction and reciprocal influence between individuals and organizations (Chiavenato, 2009).

The most widespread model of OB proposes a structured analysis based on three levels classified as independent variables: the individual, the group, and the organizational system, whereby knowledge of the behavior of individuals within the organization increases systematically the closer one moves from the level of the individual to that of the organizational system (Robbins & Judge, 2009). The dependent variables of this model are productivity (Guzzo & Shea, 1992; Robbins & Judge, 2009; Shepperd, 1993), absenteeism (Chiavenato, 2009; Robbins & Judge, 2009); staff turnover (Chiavenato, 2009; Krackhardt & Porter, 1986; McCain, O'Reilly, & Pfeffer, 1983; Robbins & Judge, 2009; Wagner, Pfeffer, & O'Reilly III, 1984); and job satisfaction (Mullena, Symonsa, Hua, & Salasb, 1989; Robbins & Judge, 2009).

This study is particularly interested in the group variable which, according to Robbins & Judge (2009; p. 284), is defined as “two or more individuals, interacting and interdependent, who have come together to achieve particular objectives.” Groups are common across all organizations, and have a significant influence on the organization’s performance and its members. Administration is not confined to individual workers but is always distributed among work groups (Chiavenato, 2009; Chruden & Sherman, 2007), these groups may be homogeneous, when they are made up of similar needs and personalities; or heterogeneous, when the members do not possess similar characteristics (Goodman, Ravlin, & Schminke, 1987; Jackson et al., 1991).

The formation of these groups is delimited by two major conditions (Davis & Newstrom, 1999):

- First, those related to work (and created by the organization), concerning type of role, seniority within the organization, and physical proximity between employees.
- And second, those not related to work (arising essentially from the personal backgrounds of the individuals concerned), linked to culture, sentiments, ethnic factors, socioeconomic elements, sex, and race.

Groups possess characteristics that mold the behavior of their members, such as: roles (Dailey, 2012; Hackman, 1992; Robbins & Judge, 2009; Schein, 1980); rules (Dailey, 2012; Robbins & Judge, 2009), status (Dailey, 2012; Davis & Newstrom, 1999; Robbins & Judge, 2009); size (Dailey, 2012; Robbins & Judge, 2009; Thomas & Fink, 1963; Yetton & Bottger, 1983); and cohesion (Casales, 1990; Hackman, 1992; Robbins & Judge, 2009). Analysis of the interaction between these characteristics is necessary to ensure the group contributes effectively to attaining the organization's goals.

Sociometry:

The use of sociometry to study intragroup relations has been widely recognized (J. M. Bezanilla & Miranda, 2012; Gutiérrez, et al., 2016; Henttonen, 2010; Lawless, 2015; Sociedade Paranaense de Psicodrama, 2006; Zhukova, et al., 2016). Sociometry is based on the conception that individuals must be understood and studied through their social relations at group level (Forselledo, 2010; Pineda, et al., 2009; Ruiz Berrio, 2014), supported by the idea that it is possible to understand individual identity as a set of relations of belonging (Moreno, 1947, 1954).

In the view of various authors (Casales, 1990; Hart & Nath, 1979; Moreno, 1947, 1954; Orbach, et al., 2015; Pineda, et al., 2009; Robbins & Judge, 2009), it is possible to consider sociometry as an approach to measuring social groups in an organization with the aim of investigating the following areas:

- social structures as a whole (the law of sociodynamics): proposes that within each group, choices are unequally distributed between group members. The bigger the group, the more these differences are accentuated.
- The situation of each individual, focusing on the network of interrelations (the law of the social atom): proposes that as group members project their emotions onto one another, models of attraction and rejection arise which remain relatively constant within the group.
- The network of centrifugal relations (responses given by a subject) and centripetal interrelations (responses of others addressed to the subject), of which the aforementioned atom forms the core (the law of gravitation): proposes that human groups form a social and organic unit.

Sociometric studies use sociometric tests as their fundamental instrument. This instrument is used to analyze the group, its evolution, and the positions occupied by the individuals therein and their relationships, as well as assessing and promoting change to the social structures whenever necessary (Forselledo, 2010; Pineda, et al., 2009; Sabin, et al., 2014). The test allows for the statistical description of members' attractions and rejections in relation to one another (J. M. Bezanilla & Miranda, 2012; Ruiz Berrio, 2014).

In tun, sociograms provide a graphic understanding of relations between individuals in a group by exhibiting their dynamics and functioning; however, they cannot provide wholly precise explanations of (1) the reasons behind these relations; (2) their motivations; or (3) how long they will last (J. M. Bezanilla & Miranda, 2012; Forselledo, 2010; Gutiérrez, et al., 2016; Hoffman & Wilcox, 1992; Lawless, 2015; Pineda, et al., 2009; Zhukova, et al., 2016). Thus, the analysis of sociogram findings should be enriched by other techniques for studying groups. Moreover, these analyses should be repeated over time to establish how the behavior of group relations evolves.

Although studies have been conducted in a wide variety of contexts, sociometric applications have been no more prevalent than in the education sector (Barrasa & Gil, 2004; Kuz & Falco, 2013; Kuz, et al., 2015; Laet, et al., 2014; Pineda, et al., 2009; Sabin, et al., 2014; Soponaru, et al., 2014). In the literature reviewed, business is not a preferred domain for the application of sociometry; however, it has proven to be a powerful and effective tool for reducing conflicts and improving communication by promoting self-analysis of group dynamics (Ballesteros-Pérez, et al., 2012; Brass, 1984; Chancellor, Layous, & Lyubomirsky, 2015; Henttonen, 2010; Hoffman & Wilcox, 1992; Lawless, 2015; Orbach, et al., 2015; Tavares De Almeida et al., 2012; Tichy & Tushman, 1979; Zhukova, et al., 2016).

The sociometry literature concerning social relations within organizations presents interesting results. The results reflect a range of focuses. In the case of similarities in attitudes among group members, it has been found that strong relationship structures are characterized by comparable cognitive maps in terms of the means and ends required to obtain a successful output (Gutiérrez, et al., 2016; Walker, 1985). Likewise, other studies have found that cohesive groups encompass similar attitudes regarding the goals to be attained (Burkhardt, 1994; Shrader, Lincoln, & Hoffman, 1989).

Meanwhile, analyses of job satisfaction have found that peripheral group members with few choices are less satisfied that other members with more choices (Brass, 1981, 1984; Chancellor, et al., 2015; Mullena, et al., 1989; Roberts & O'Reilly, 1979).

In turn, studies of power in organizations have identified the role of more central group members through whom the relations of other members pass. These more powerful individuals are selected by most of their fellow members when they are asked who they would most like to follow as leader (Burkhardt & Brass, 1990). Along similar lines, studies on social relations in organizations have provided evidence that the more central group members are identified as leaders (Fernández, 1991; Leavitt, 1951; Mullena, et al., 1989; Sparrowe & Liden, 1997).

When it comes to the analysis of performance, the literature has noted that in small groups, centralized networks are efficient for simple tasks, while less centralized networks are more efficient for complex tasks with a high degree of uncertainty (Guzzo & Shea, 1992; Mizruchi & Galaskiewicz, 1993; Orbach, et al., 2015; Shrader, et al., 1989). Another finding of such studies is that group members with more relations perform better than those identified as isolated (Roberts & O'Reilly, 1979).

In the case of conflictive situations, studies have observed that organizations with strong social networks in their work groups tend to present lower levels of conflict, and are able to

detect them when they do arise (Ebers, 1997; Ghoshal & Bartlett, 1990; Labianca, Brass, & Gray, 1998; Nelson, 1989; Zhukova, et al., 2016).

A sociometric study furnishes an organization with: (1) a clearer, more in-depth outlook on relations between group members with which to tackle the problems affecting isolated subjects in order to integrate them; (2) the opportunity of allowing each member to perform in a working environment best suited to their nature; (3) perspectives for creating strategies for work and achieving objectives; and (4) information that favors individual and group evolution towards goal attainment.

Method

This study required the design and application of a sociometric test (measuring patterns of "attraction") to establish sociometric status; popular and isolated members; groups and subgroups; social patterns of gender; and sociometric leaders and their position in the group. To this end, we took the following steps (Casales, 1990; Cuesta Santos, 2005):

1. Characterization of the group: We conducted a survey to determine what motives the group members individually.

> This survey of individual motivation is based on those used in previous studies for similar purposes (Lussier, 1993; Robbins & Judge, 2009). It contains 15 items on a range of 1 (disagree strongly) to 5 (agree strongly), which can be broken down into three main motivational groups with five items each. These groups are: achievement or realization (impetus to stand out, to achieve something in relation to a set of norms, to struggle to obtain success); power (desire for others to adopt a behavior that they would not otherwise have adopted; and affiliation (desire to have close and friendly interpersonal relations). To determine the motivational orientation of the group members, we added together the scores for each of the items making up the groups. On this basis, the totals can range between 5 and 25 points. The column with the highest score denotes the dominant need.
>
> We investigate any possible association between individual motivational orientation and the length of service and sex of group members through a correlation test.

2. Formulation of questions: We formulate the questions for group members so that they can state their preferences in relation to two criteria: functional (sociogroup) and affective (psychogroup). Based on these results, we prepare the sociometric template using the following format (see Table 1).

Table 1 Sociometric template format

	Group members who receive choices				
Group members who choose	1st choice	2nd choice	3rd choice	…	n choice
1.					
2.					
⋮					
n.					

In no case is there a limitation on the number of choices that group members can make when selecting their workmates in relation to the above-mentioned criteria.

- The question related to the functional criteria (signaling the group members with whom the respondents would most like to work) corresponds to the fundamental activity in which the group engages.
- The question related to the affective criteria (signaling the group members with whom the respondents would most like to socialize after work) corresponds to group members' preferences regarding activities outside work.

3. Preparation of a sociometric matrix: using the survey answers, we prepared a matrix to serve as an information source for the sociometric analysis. For these purposes, we employed the following format (see Table 2):

Table 2 Sociometric matrix format

	Group members who are chosen				
Group members who choose	1	2	…	n	Total choices made (Hs) (Horizontal sums)
1.					Hs_1
2.					Hs_2
⋮					⋮
n					HS_n
Total choices received (Vs)					$Sh\sum_{1}^{n} Sh_n$
	Vertical sums (Vs)				

4. Sociogram construction We place the members who have received the largest number of choices in the center of the graph, with the other members at relative distances based on their choices, and take into account their interrelations by focusing on the position of the choices made between those involved .

5. Analysis and interpretation: To calculate the sociometric indicators, we use the theoretical probability method based on the elements set out in Table 3 (Casales, 1990; Cuesta Santos, 2005; Forselledo, 2010), with the aid of the UCINET 6 program for Windows Ver. 6.591 (Borgatti, Everett, & Freeman, 2002).

Table 3 Formulas for application of the theoretical probability method

Indicator	Formula	Interpretation
Probability that an individual A selects another B in choice *d*	$p = \frac{d}{N-1}$ (1)	Where: *d*: the number of choices that A can make. N: total group members. 1 is subtracted, as individuals do not select themselves.
Inverse probability; that is, A does not choose B in choice *d*	$q = 1 - p$ (2)	
Average of choices made by subjects when the number of choices is unlimited	$d = \frac{\sum Sh}{N}$ (3)	Where: Sp: set of choices received by each individual and obtained from the sociometric matrix.
Parameters that define the binomial function		
Average	$\mu = p(N-1)$ (4)	Where: μ: Average σ : Standard deviation α: Asymmetry of the sociometric value curve.
	$\sigma = \sqrt{(N-1)pq}$ (5)	
	$\alpha = \frac{q-p}{DS}$ (6)	
Sociometric value whose significance is sought.	$X = \mu \pm t\sigma$ (7)	Where: X: Sociometric value whose significance is sought. t: Index corresponding to the probability of a given symmetry*.
Upper limit (positive asymmetry)	$X = \mu + t\sigma$ (8)	Value on the basis of which an individual is considered popular.
Lower limit (Negative asymmetry)	$X = \mu - t\sigma$ (9)	Value on the basis of which an individual is considered isolated.

***The t value t is found in Salvosa's tables (Salvosa, 1935) for the confidence level selected by the researcher (along the horizontal); and the calculated value ofα (along the vertical).**

Using the above formulas, it is possible to identify popular individuals (those who receive the highest number of choices); isolated individuals (those who receive the lowest number of choices); the sociometric star (the individual who receives the highest number of choices of all group members); and the "eminence grise" (the first choice of the sociometric star). At this point, it is of interest to calculate sociometric expansiveness, for which we use the following formula:

$$CE = \frac{Sh}{N(N-1)}$$

Where:

CE: Index of correlation between the subjects for unlimited choices.
Sh: Total choices made (Hs) (Horizontal sums obtained from the dociometric matrix)
N: Number of group members.

This indicator is interpreted as follows:
0 to 0.3: low interrelation index
0.4 to 0.6: medium interrelation index
0.7 to 1.00: high interrelation index

Likewise, we calculate reciprocal choices using the following formula:

$$Irec = \frac{Er}{\frac{N(N-1)}{2}} =$$

Where:
Irec: Reciprocity index, which reflects the degree to which subjects mutually favor one other
Er: Number of reciprocal choices.
N: Number of group members.

This indicator is interpreted as follows:

0 to 0.45: low reciprocity index.
0.46 to 0.55: medium reciprocity index
0.56 to 1.00: high reciprocity index

Other indicators that need to be calculated are the network density, the degree centrality of group members, and betweenness centrality. We calculate these indicators using UCINET 6 for Windows Ver. 6.591 (Borgatti, et al., 2002).

Network density is the number of relations observed relative to the number of possible relations. This density is an expression of group cohesion (José Manuel Bezanilla, 2011; Borgatti, et al., 2002; Tichy & Tushman, 1979; Tichy, Tushman, & Fombrun, 1979; Zhukova, et al., 2016). Degree centrality measures an individual's contribution based on their position in the network, according to the number of links they have with others, whether in terms of importance, influence, relevance, or prominence (Bezanilla, 2011; Borgatti, et al., 2002; Zhukova, et al., 2016). A basic aspect of indirect relations lies in the importance of an individual, or the frequency with which they act as a broker (betweenness centrality) between another two individuals through the shortest or geodesic path. An individual's betweenness in their relations with others means that this individual may have some control over other individuals who are not directly related. The more an individual depends upon this to relate with others, the more power that individual will accumulate, rendering them a natural broker (José Manuel Bezanilla, 2011; Borgatti, et al., 2002; Zhukova, et al., 2016).

We use the abovementioned method to measure the sociometric factors of the group comprising a retail establishment in Santo Domingo de los Tsáchilas, Ecuador, in an attempt to determine their functional and affective relations. This establishment is a family business founded in 1995, occupying a small facility located in a major commercial zone in the province. Despite its small size, and operating out of a single premises, the establishment is considered a leader in the marketing of mass consumption goods, footwear, toys, plastic goods, and other high-quality products. The establishment caters for the community's needs and desires by seeking to provide an excellent service at affordable prices with the support of its human resources, the trust of its suppliers, and technological retail development in the interests of society's well-being.

Some of the establishment's sales are seasonal, so staff numbers are occasionally insufficient for serving customers adequately and displaying and reviewing products at the same time. Thus, at times of growth the owners are compelled to hire more employees to meet market demand. However, this gives rise to problems related to the onboarding of new members, given their lack of familiarity with the formally established intragroup dynamics. As such, the necessary measures are not taken to address changes in the group's social relations, in terms of: integrating new members; involving long-standing members in new members' engagement with the business philosophy; promoting group cohesion; and accepting new members and their approach to achieving company objectives. This situation causes occasional conflicts between workers, with consequences for the effective functioning of the organization, which requires the group to work in a cohesive manner.

It was in this context that we conducted our study, composed of 15 operational employees (73% male and 27% female) with an average length of service of 4.4 years. Given that sociometric studies are conducted especially for small groups and because the sample cannot be determined so as not to bias the results, we explore the establishment's human resources in their entirety (Cuesta Santos, 2005; Zhukova, et al., 2016).

Results

The results of the survey to determine the motivational orientation of each group member (α de Cronbach = 0.888) are shown in Table 4.

Table 4 Result of the individual motivation survey

		Motivational orientation			
Group member	**Sex**	**Sex**	**Affiliation**	**Power**	**Length of service in years**
Subject 1	M	25	25	13	3
Subject 2	M	24	21	**22**	2
Subject 3*	F	25	20	**27**	9
Subject 4	F	25	21	**21**	9
Subject 5	M	18	23	18	4
Subject 6	M	20	24	17	2
Subject 7	F	20	15	16	4
Subject 8	M	17	16	13	4
Subject 9	M	22	20	19	3
Subject 10**	M	23	21	19	5
Subject 11	M	25	15	**21**	2

Group member	Sex	Motivational orientation			Length of service in years
		Sex	Affiliation	Power	
Subject 12	M	23	19	18	7
Subject 13*	F	23	5	15	5
Subject 14	M	25	19	13	2
Subject 15	M	24	21	18	5
Average scores		22.6	19	18	4.4

* Second-line supervisors
** General supervisor

From the table above, and taking into account the findings from the abovementioned procedure, it can be concluded that a general achievement motivation exists in the group. In particular, Subject 3, who occupies a management role, stands out for their clear power motivation. In turn, subjects 2, 4 and 11 display a high power motivation, although this is not their predominant orientation.

To determine whether there is an association between power motivation, sex, and length of service, we conducted a correlation analysis (see Table 5).

Table 5 Associations between motivational orientation, sex, and length of service

			Sex	Affiliation	Power
Spearman's rho	Seniority	Correlation coefficient	-0.096	0.083	0.239
		Sig. (2-tailed)	0.734	0.769	0.39
		N	15	15	15
	Sex	Correlation coefficient	0.054	-0.248	0.158
		Sig. (2-tailed)	0.848	0.373	0.573
		N	15	15	15

*** The correlation will be significant at the level of 0.05 (2-tailed).**

The statistical test allows it to be affirmed that there is no association between the variables analyzed.

The information from the sociometric test allowed us to build the sociometric matrix and template for the criteria analyzed and to apply the theoretical probability method; the results are presented in Table 6.

Table 6 Results from application of the theoretical probability method

Functional criteria	Affective criteria
$p = 0.4328$	$p = 0.3664$
$q = 0.5671$	$q = 0.6335$
$d = 6.06$	$d = 5.13$
Parameters that define the binomial function	

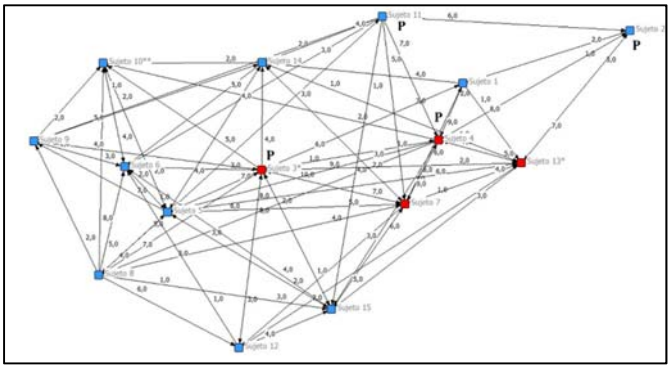
Functional criteria	Affective criteria
$\mu = 6.06$	$\mu = 5.13$
$\sigma = 1.85$	$\sigma = 1.80$
$\alpha = 0.0725$	$\alpha = 0.1484$
Upper limit (positive asymmetry) Value for rating a person as popular	
$X \approx 9$	$X \approx 8$
Lower limit (negative asymmetry) Value for rating a person as isolated	
$X \approx 3$	$X \approx 2$

Table 7 shows the results of the sociometric indicators.

Table 7 Results of the sociometric analysis

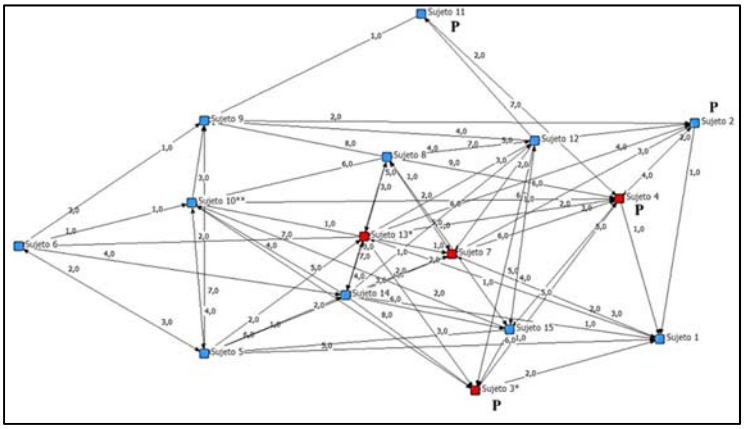
Indicators	Functional criteria	Affective criteria
Popular	Subjects 5 and 6	Subjects 7 and 13
Sociometric star	Subject 6	Subject 7
Eminence grise	Subject 10	Subject 13
Bonacich's power	Subject 5	Subject 4
Isolate	Subjects 2, 11 and 12	Subject 11
Sociometric expansiveness (CE: Index of interrelation between the subjects for unlimited choices)	$CE = 0.43$ Medium interrelation index	$CE = 0.36$ Low interrelation index
Reciprocal choices< Irec: Reciprocity index, which reflects the degree to which subjects mutually select one other)	$Irec = 0.2476$ Low reciprocity index	$Irec = 0.1904$ Low reciprocity index
Network density	0.424 Medium density (Tichy, et al., 1979)	0.367 Low density (Tichy, et al., 1979)

Figure 1: Sociometric network graph for the functional criteria



Degree centrality: Subject 3. Betweenness centrality: Subjects 5 and 3. Freeman betweenness centrality

Figure 2: Sociometric network graph for the affective criteria

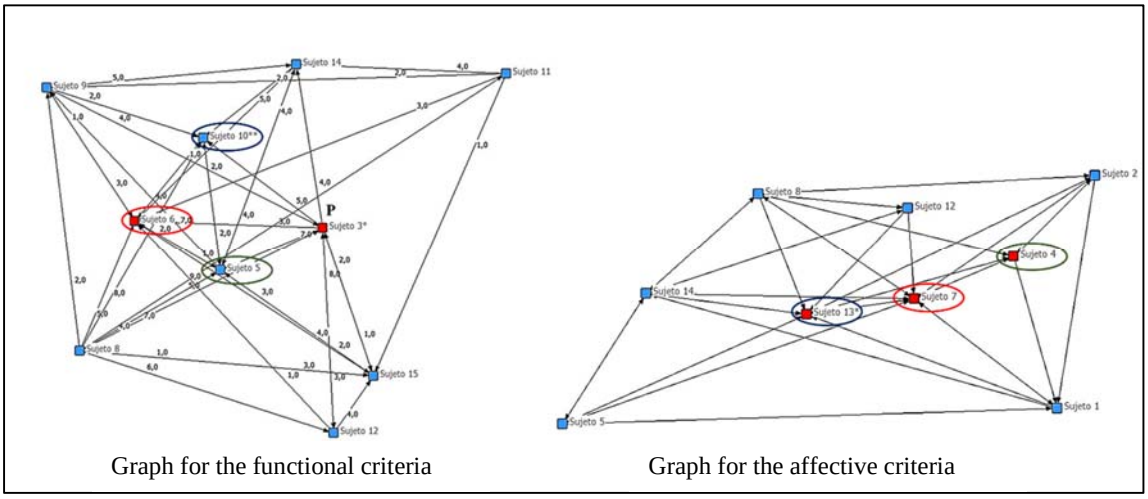


Degree centrality: Subject 14
Betweenness centrality: Subjects 14 and 4. Freeman betweenness centrality

The popular subjects, with a high level of choice in the functional criteria (5 and 6), are employees who display a clear affiliation motivation. These members do not occupy management positions, and so formally established authority is excluded from this category. In the affective criteria, one of the subjects (13) is a second-line supervisor, while the other (7) is a regular employee. Subject 13 is notable for not having an affiliation motivation; rather, their main motivation is achievement.

Figure 3 shows the EgoNet of the sociometric stars, the subjects with whom they connect (alters), and the reciprocal choices of these alters.

Figure 3. EgoNet of the sociometric stars



Graph for the functional criteria Graph for the affective criteria

Source: Compiled by authors

The interpretations presented below are taken from Figure 3. The sociometric star is the subject who receives the highest number of choices from the other subjects in each category: Subject 6 for the functional category, and Subject 7 for the affective category.

Both enjoy considerable prestige in the eyes of their workmates and are recognized for their altruism and sociability. These subjects are regarded as natural leaders, though neither are formally in charge of the group. Thus, formal authority and informal leadership do not coincide. As is to be expected, even if it is theoretically possible, the star of one category is not that of the other, indicating that the group's functional and affective spheres are well demarcated.

It can also be noted that although the eminence grise is the subject chosen by the sociometric star, on occasion they can be ignored or even rejected by other group members. For the functional criteria, Subject 10 is both the eminence grise and the maximum formal authority in the group, and their first choice is the sociometric star. This situation may represent a palliative to the divergence between authority and leadership, since there is a mutual attraction between both subjects that can be leveraged to achieve balance. In the affective criteria, Subject 13, who has a managerial position, is the eminence grise, and they and the sociometric star are reciprocal choices in fourth place.

Moreover, subjects 5 and 4 possess the most power for the functional and affective criteria, respectively; this is because some of the subjects with whom they relate do not have a high number of choices, allowing these two individuals to acquire power.

These subjects maintain a relationship of dependence to connect with the rest of the group. Subject 5 has relations with subjects 8 and 9, who have very few choices, while Subject 4 relates with subjects 1, 2, 8 and 11, all of whom have a low number of choices, while Subject 11 stands out as the isolate.

As to the functional criteria, subjects 2, 11 and 12 are isolates, 2 and 12 perform functions that do not require much interaction with the rest of the group, and Subject 11 carries out control and surveillance functions; this subject, despite occupying a role that keeps them isolated from the rest of the group, has a high level of expansiveness given the requirement to control others as part of the job. This characteristic means that Subject 11 is also an isolate, as despite making seven choices, they receive only two. In the affective criteria, Subject 11 is the only isolate, with very low expansiveness; that is, this individual likewise does not select many persons with whom to share time outside work. It is notable that none of the subjects are overlooked (no choices) or solitary (make no choices, but may receive them).

Following the method described, we obtain the results of the indicators of sociometric expansiveness, network density, reciprocal choices, degree centrality, and betweenness centrality.

Sociometric expansiveness has a medium index in the functional criteria and a low index in the affective criteria. These results occurred in a situation in which all possible choices were unlimited, which demonstrates the low level of interaction between group members. The medium level recorded in the functional criteria may be because of the necessary relations that must be established for work to be carried out. The reciprocity index is low for both criteria, reflecting a lack of mutual preferences between the subjects, with just 26 dyads in the functional criteria and 20 in the affective criteria out of a possible total of 105 in each case.

Network density is expressed as the percentage in which network connectivity -- the number of actual choices out of all possible choices -- takes place. Network density is medium in the functional criteria and low in the affective criteria; that is, there are more relations in the former than the latter.

The contribution of a subject, based on their location, is expressed by their degree centrality. For the functional criteria, Subject 3 is the most central and occupies this position because of their role as plant supervisor, uniting multiple subjects. For the affective criteria, Subject

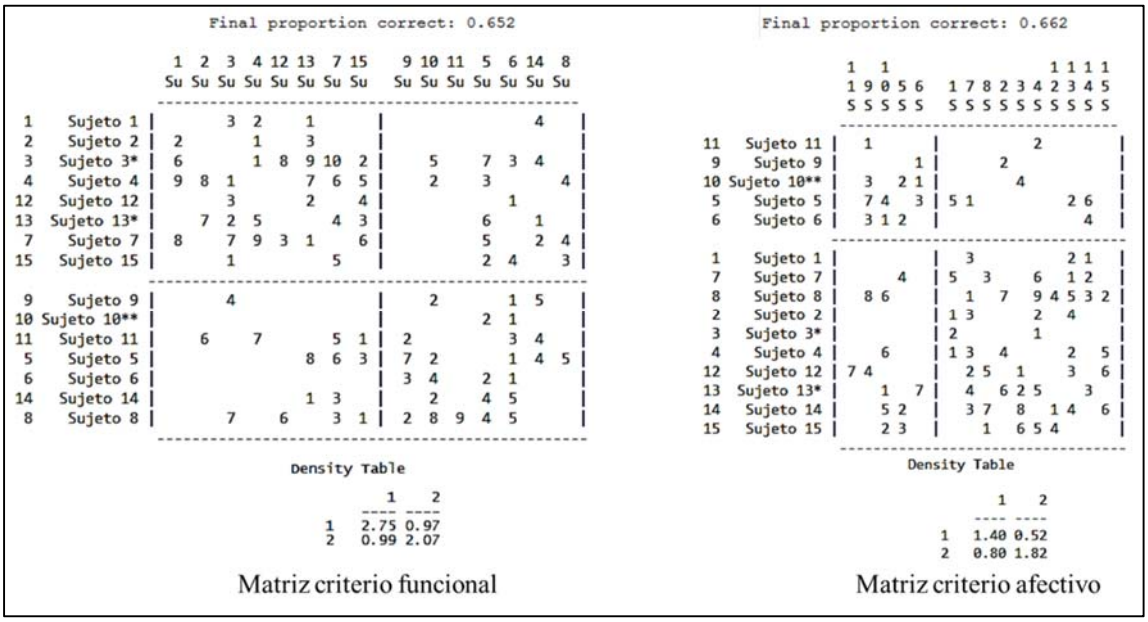
14 has the highest degree centrality. Centrality is corroborated by observing the place these subjects occupy on the graph.

A basic aspect in the consideration of indirect relations concerns the frequency with which one individual acts as a broker between another two through the shortest path, potentially giving them control over the relations between these two non-directly related individuals. The greater the number of individuals who depend on this broker to relate with others, the more power this central individual will acquire, rendering them a natural broker.

In the functional criteria, subjects 3 and 5 are those with the greatest degree of betweenness. Subject 3 has formal authority in the group, as well as power motivation. This level of betweenness facilitates both this subject's position and primary motivation, while giving them control over the flows of information. Subject 5 has a balanced motivational orientation, and is popular in the functional network. In the affective criteria, subjects 4 and 14 have the highest betweenness and both have a relatively balanced motivational orientation. Subject 4 is notable for being the longest-serving employee, having worked for the establishment for nine years, and receives a high number of choices without actually becoming popular.

To analyze reciprocal choices, we start with the low degree of reciprocity between both criteria. To better understand this, we conduct a group faction analysis for both. In the terminology of social network analysis, actor equivalence refers to a similar relationship profile with other actors. Using specific calculation routines, it is possible to look for partitions in a network of subgroups (factions) that maximize the similarity of patterns of connection between the actors in each group. Factions constitute groups of actors who are closely linked to one another, but very loosely connected to the members of other factions. The results of the adjacency matrices by subgroups identified in the work group studied is shown in Figure 4. These matrices show how the group members are distributed into each of the factions formed.

Figure 4: Two-factions model for the functional and affective criteria



The results of this analysis, presented in graphic form in Figure 4, provide different types of information: (1) number of factions found: for both criteria, two factions were formed within the work group; (2) final goodness of fit: 0.662 for the functional criteria, and 0.652 for the affective criteria, both displaying acceptable values (José Manuel Bezanilla, 2011; Borgatti, et al., 2002; Zhukova, et al., 2016); and (3) a table showing the density of the groups identified, which also reports on the goodness of fit for both criteria. The densities analyzed are considered different than the diagonal blocks. Both the final goodness of fit and the above-mentioned densities allow the composition of the factions to be assessed and characterized, taking into account the group members belonging to each one (see Table 8).

Table 8 Description of factions based on criteria studied

	Functional criteria		Affective criteria	
	Faction		Faction	
	1	2	1	2
Size	Balanced	Balanced	Small	Crowded
Density*	2.75	2.07	1.40	1.82
Number of subjects	Eight	Seven (lowest numbers of choices)	Five	Ten
Sex	Heterogeneous	Men	Men	Heterogeneous
Motivational orientation	Slight inclination towards power	Achievement and affiliation	Achievement and affiliation	Achievement, affiliation and power
Length of service in relation to group average (4.4 years)	Above (5.5)	Below (3.14)	Below (3.2)	Above (5)

***Considered high in all cases** (José Manuel Bezanilla, 2011; Borgatti, et al., 2002; Zhukova, et al., 2016)

The above analysis suggests that both the functional and the affective criteria constitute two separate spaces with largely differing subjects.

Discussion

Sociometric studies allow the discovery of intragroup relations which, on occasion, remain hidden. The results presented in this study are in keeping with those of similar studies (Hoffman & Wilcox, 1992; Lawless, 2015; Soponaru, et al., 2014; Zhukova, et al., 2016), shedding light on the points that should be addressed to improve intragroup relations in the respective groups studies. Determining the position of each of the group members and how they interrelate allows positive actions to be taken in favor of the organization.

For managers of the organization where the group operates, it is important to pay attention to the results obtained, since they contribute to improving group work and productivity levels, job satisfaction, potential and actual turnover, and absenteeism (Chiavenato, 2009; Dailey, 2012; Robbins & Judge, 2009; Werther & Davis, 2008). Improving group work fosters a better working environment and quality of life at work.

Although the nature of intergroup relations in each context is very particular, and sociometric studies can yield varying results based on the criteria assumed for their exploration, the results obtained allow for the pursuit of lines of work similar to other studies (Ballesteros-Pérez, et al., 2012; Chancellor, et al., 2015; Yamkovenko & Tavares, 2017) and the recommendations of theoretical works (José Manuel Bezanilla, 2011; J. M. Bezanilla & Miranda, 2012; Henttonen, 2010).

In general terms, these studies seek to identify popular and isolated individuals, determine whether formal and moral authority lay with the same members, and establish the behavior of interrelations, the most powerful member, and that member's preferred choice of collaborator (Cuesta Santos, 2005; Forselledo, 2010; Pineda, et al., 2009).

In particular, the results obtained in this study allow us to explore the reasons for the isolation of Subject 11; how to take advantage of the sociometric star and other popular subjects in both the functional and affective criteria so that they all work towards the group's objectives; what the subject with formal authority has to do to become group leader, and if this is not possible, how to enhance the role of the eminence grise as a bridge between the formal authority and the other group members; how to take advantage of the members based on the function they each perform; and what to do to facilitate the complete integration of new subjects into the group.

The results also show that the subject with the maximum formal authority needs to play a more prominent role in implementing improvement actions, both in functional and effective terms. This can foster group cohesion, cooperation, information sharing, collective acknowledgment of differences to find collective solutions, and the design of a reward system based on group more than individual results. If the above is achieved, the group will be better equipped to receive new members, when required.

As such, it can be stated that sociometry constitutes a useful tool for analyzing group interactions in the ways shown here, and in these terms our study coincides with other sociometric applications in different spheres (Lawless, 2015; Soponaru, et al., 2014; Tavares De Almeida, et al., 2012; Zhukova, et al., 2016)

Conclusions

Sociometry provides a theoretical and methodological basis for identifying the elements necessary to study intragroup relations (Gutiérrez, et al., 2016; Lawless, 2015; Zhukova, et al., 2016). The logic followed in this study facilitates understanding of the group's current performance, demonstrating that despite the lack of optimum indicators, the group is made up of members with defined relations that can be improved through actions to improve cohesion.

Despite the contributions of this research, one fundamental limitation is that it cannot readily be replicated and used for analysis of the group's evolution and the discovery of new, internal relations once improvement actions are applied; this is because work with human resources are restricted to the current payroll, and the management lacks the competencies to replicate the study. Thus, it would be worth seeking improvement measures for this case.

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