# Analysis of Relational Social Capital in a Regional Cluster Using the ARS Technique

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**ABSTRACT**

From a recent perspective of social capital, it can be said that this is seen as a firm resource that contributes to improving performance and the formation of sustainable competitive advantages. Not surprisingly, in recent years the economic development of the regions has been driven to a great extent by the formation of clusters in different sectors as a competitive strategy due, in part, to the fact that the member companies have social capital that by making it available of its partners allows them to access or exchange resources of different kinds. The objective of this research is to analyze the relational dimension of social capital, considering that it is the one that affects most business performance. For which the study was carried out in a regional cluster, obtaining, and analyzing the relationships of the companies that comprise it through the Social Network Analysis (SNA) technique to later use the Ucinet 6 software to obtain quantitative network indicators. It was found that the greater the number and quality of social relationships developed by companies, the greater their relational social capital.

## 1. INTRODUCTION

In today's world, companies must face the financial, economic, political, social, and health crises imposed by environmental conditions. In addition, some factors such as trade and market opening have changed the way in which companies develop strategies and adopt new management and organization models to reach and maintain a competitive level while facing these conditions.

Due to the above, companies have resorted to the formation of clusters as a strategy to increase their competitiveness. The term cluster, popularized by Porter [1], has evolved over time [1-3], gaining a preponderant place, especially in the international arena [4] and refers to concentrations or groups of companies in the same sector that are geographically close to each other that by working together can have access to greater resources and facilities. In addition, the access and mobilization of these resources occur due to the social ties developed by the companies derived from their own interaction, as well as with the environment [5]. In this way, a fundamental characteristic of any cluster is that companies must have social capital, which can be said to be the set of material or financial resources, knowledge, information, contacts, influences, among others, that can be mobilized through the relationships established between individuals belonging to different groups [6-9], or in the case of clusters, between the several companies that comprise it.

Thus, to carry out this study, it was decided to select a regional cluster [10, 11] as the unit of analysis due to the large number of interindustrial relations that mobilize, physical proximity, the formation of networks and alliances, the demand and access to resources of different kinds, as well as the development of different capacities, including innovation. As a result, the Network Analysis (ARS) technique was applied to analyze these relationships and, later, these data were used to obtain some quantitative indicators of networks in a specialized software called Ucinet 6.

Therefore, and based on the content and theoretical meaning of the relational dimension of social capital, the following hypothesis was raised: "The higher the level of trust and friendship developed by the companies that are part of the cluster, the greater their social capital will be".

## 2. RELATIONAL SOCIAL CAPITAL IN A REGIONAL CLUSTER

In this section, an approach is made to the definitions and some theoretical aspects of social capital and relational social capital, as well as the concept of clusters.

### 2.1 Theoretical approaches to the concept of social capital

In the first instance, it should be said that the concept of social capital is broad and varied, which means, that it has been used for different purposes and in different social, economic, and political disciplines, but to date there is no consensus regarding its theoretical meaning.

To do this, we start from the classic conceptualizations taken from the works carried out by Bourdieu [12], Coleman [7] and Putnam [8], where they establish that social capital refers to the different resources (material, financial, or others such as knowledge, information, contacts) that can be mobilized through the ties that are established between individuals and between these with other individuals belonging to different groups, which facilitate and promote cooperation, generating benefits for the participants, within the

framework of a set of norms and other elements such as trust, friendship, shared values and objectives that regulate them.

In fact, in a more recent perspective under the approach of the Theory of Resources and Capabilities, social capital receives the treatment of resource, but not an ordinary resource that anyone can possess, but in a particular way that is possessed by the founders, directors and managers, which directly affects the performance of their companies [13-19]. In other words, social capital is an intangible resource that provides the company with social relationships, information, and knowledge that allows it to create competitive advantages [20].

From the foregoing it can be deduced not only that social capital is a complex concept to define, but also that it has a multidimensional character, that is, it is made up of different dimensions, factors, or forms, for which reason it cannot be measured directly, but rather that any measurement can only be made based on these dimensions [8, 21]. In this regard, the literature has commonly identified three dimensions of social capital: structural, relational, and resources [21-24].

## 2.2 Relational social capital

Therefore, and in keeping with the purpose of this research, the relational dimension of social capital is described as the characteristics and attributes of social relationships, such as the case of trust and other complex incentives that derive mainly from the history and reputation of the company [25].

In other words, the relational dimension comprises the resources created through the social relationships that occur between people, including trust, friendship, norms, obligations, and identity [26, 27]. As an example, researchers Gulati [28], Doz [29], Koka and Prescott [21] consider trust to be a critical factor for the generation and transfer of both tacit knowledge and other resources, as well as the basis for creating knowledge bonds of friendship.

Of these attributes or characteristics of social relationships, trust, and friendship are two of the main ones. First, trust among members of a social network is one of the factors that foster interpersonal coordination and collaboration [7]. For this reason, it has been considered as an antecedent and a driver of cooperation [30], as well because of it [21]. Furthermore, trust plays a key role in building and maintaining strong social relationships, as well as good communication and commitment [31-33]. The second attribute refers to the friendly relations between the members of the network since it has been shown that informal friendly relations and the transmission of tacit knowledge represent an important source of innovation [22, 31, 32, 34, 35].

## 2.3 Concept and characteristics of clusters

The term cluster has its first approximation with the concept of agglomeration economies proposed by Weber [36] and with the concept of industrial district drawn by Marshall [37], as a concentration of companies of a specialized industry in a defined territory.

Currently, there is a variety of concepts and definitions of cluster, even more, specialists from different disciplines have been given the task of delimiting the concept of cluster. For example, from the field of innovation, from the approach of national, regional and sectoral innovation systems; of economic and industrial geography; of the traditional economy, of the new theories of economic growth and international trade; organizational economics, transaction cost theory, organization theory and resource-based approach [38-44].

Therefore, there is no consensus regarding a single definition of clusters, some authors agree that they are concentrations or groupings of companies in the same sector geographically close to each other, which by working together have access to greater resources and facilities and that aim to become more competitive and innovative [1-3, 10]. So, this is the conceptualization that is taken up for this research work.

In addition to the complexity of its concept, to understand how clusters work, certain characteristics must be considered, as proposed by Andersson et al. [45], who present some of them taken from the key elements commonly found in the literature and that can help to have a better understanding of what a cluster is and what it implies. These characteristics are: 1) geographic concentration, 2) specialization, 3) a multitude of actors, 4) competition and cooperation, 5) life cycle and 6) innovation.

## 3. MEASUREMENT OF RELATIONAL SOCIAL CAPITAL USING THE ARS TECHNIQUE

Due to the characteristics of this research, the decision was made to carry out the fieldwork in a regional cluster [10, 11], since it represents an ideal context to analyze the relational dimension of social capital due to the large number of inter-industrial relations that they mobilize, the location or physical proximity, the formation of networks and alliances, the demand for and access to resources of different kinds, as well as the development of capacities such as innovation.

It should be noted that to measure relational social capital, the same indicators proposed by Casanueva et al. [26] are trust and friendship. The first step consisted of collecting the data through a questionnaire that included information on the characteristics and relationships of the companies that make up the selected cluster. This instrument was validated with Cronbach's Alpha index, obtaining a coefficient of 0.80. Subsequently, the data obtained through the Social Network Analysis (ARS) technique was analyzed, which is appropriate when you want to study the links between the members of a network. The first step consisted of creating a matrix with the support of Excel, then the data was entered into a Ucinet 6 sheet to obtain another matrix (DL Editor) with which the network graph was generated using other software included in the same program called NetDraw. This graphical representation allowed us to analyze the behavior of the network and identify the relationships of trust and friendship between the actors based on the size and number of connections between them. Finally, the data was entered into the Ucinet 6 software to obtain some quantitative network indicators.

In this way, to find out the degree of trust of the interviewees in relation to the other companies, a dichotomous square matrix was generated in which 1 means that company i trusts company j and 0 otherwise. Likewise, to determine the degree of friendship, it was decided to cross-reference the responses of the interviewees in pairs, counting only those in which the two interviewees stated that they had this relationship. Once these values were obtained, the degree centrality of entry for the trust relationship and the degree centrality of the friendship relationship were used to obtain the quantitative indicators corresponding to the analyzed network.

## 4. CASE ANALYSIS

This section presents the results achieved to have an approach to the measurement of the relational dimension of the social capital of the companies that make up the cluster. It should be noted that these allowed the objective of estimating the quantity and quality of the ties present in the management of these companies to be fulfilled, in addition to providing support to the established hypothesis.

From the questions asked to the owners and managers of the seven shipyards to find out the quality of these relationships, the necessary information was obtained to previously prepare two matrices in Excel. In the first, the value of "1" was placed to the existence of the trust relationship and "0" to the absence of it, with which a dichotomous square matrix was generated, which is shown in Figure 1.
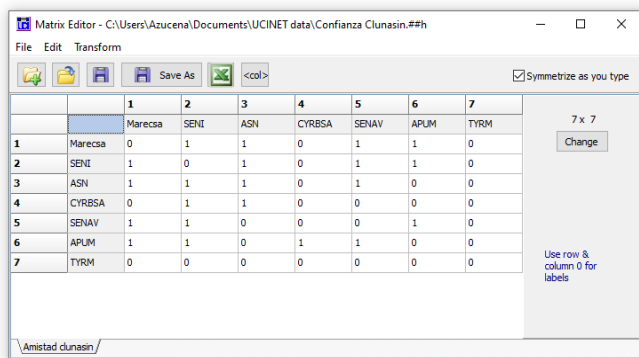


**Figure 1.** Capture of the Trust matrix in Ucinet 6

In the previous figure, Marecsa affirms that it has established relationships of trust with four actors, just as four actors say they maintain a relationship of trust with Marecsa, and so on. Next, we proceeded to obtain the graph of this matrix in the NetDraw program, which is presented in Figure 2.
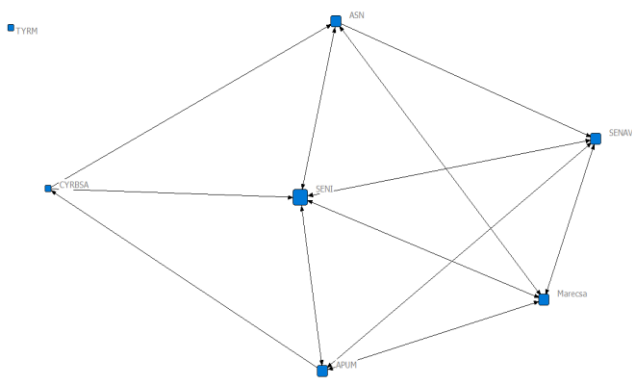


**Figure 2.** Trust network graph

In the graph of the trust network, it can be seen, due to the size of the nodes, that SENI is the actor with the greatest number of trust relationships, in this case, there are five companies that mention it as deserving of their trust; and CYRBSA is the actor with the fewest mentions. Thus, it is also observed that TYRM remained on the periphery of the network, since it did not receive any mention from any of the companies.

This finding reinforces the idea that SENI is the company that is considered the leader within the cluster, being the best connected, serving as a link between other companies, and having many valuable resources such as technology, workers, and processes that contribute to the innovation.

On the other hand, given the difficulty of making an exact measurement of when a friendship relationship occurs, the second matrix was generated from the combination of the opinions of the interviewees, that is, first a symmetric matrix was constructed in which that the friendship relationship was only counted with a "1" if the two interviewees had manifested it reciprocally, and a "0" was placed otherwise (Figure 3).
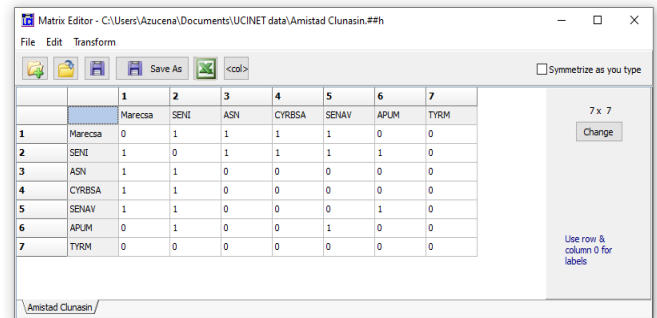


**Figure 3.** Capture of the Friendship matrix in Ucinet 6

As can be seen, the mentions given by an actor coincide in their entirety with the mentions received from the same actors, since as indicated before, only those friendship relationships were considered when this was reciprocal. Subsequently, the graphic representation of this network was obtained in the NetDraw program, which is shown in Figure 4.
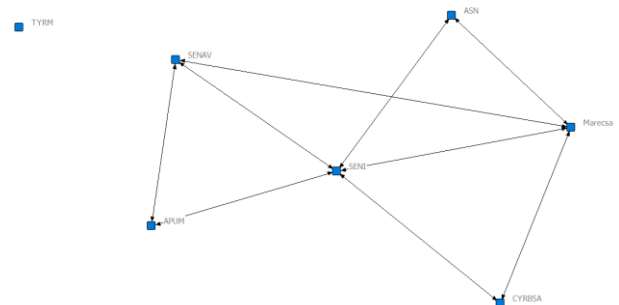


**Figure 4.** Friendship network graph

It can be seen in the graph above that SENI remains the actor with the highest number of mentions, in this case, there are five companies that consider having a friendly relationship with it and immediately Marecsa with four mentions. Once again, TYRM remained on the periphery of the network since it did not receive any mention from the rest of the companies.

### 4.1 Results of the calculation of the quantitative indicators of the networks of trust and friendship

To generate the trust indicator of the relational dimension, the degree centrality measure of each of the companies was used through Ucinet 6, the results of which are shown in Figure 5.

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FREEMAN DEGREE CENTRALITY

Input dataset:                    Confianza Clunasin (C:\Users\Azucena\Documents\UCINET data\Confianza Clunasin
Output degree dataset:            Confianza Clunasin-deg (C:\Users\Azucena\Documents\UCINET data\Confianza Clunasin-
deg
Output centralization dataset:    Confianza Clunasin-degcz (C:\Users\Azucena\Documents\UCINET data\Confianza
Clunasin-degcz
Treat data as:                    Auto-detect
Output raw totals:                YES
Output averages (normalized):     YES
Allow edge weights:               YES
Weighted normalization:           YES
Exclude diagonal:                 YES

Degree Measures

              1     2      3     4
            Outde Indeg nOutd nInde
              g           eg    g
            ----- ----- ----- -----
1 Marecsa  4.000 4.000 0.667 0.667
2    SENI  4.000 5.000 0.667 0.833
3     ASN  3.000 3.000 0.500 0.500
4  CYRBSA  2.000 1.000 0.333 0.167
5   SENAV  3.000 4.000 0.500 0.667
6    APUM  4.000 3.000 0.667 0.500
7    TYRM  0.000 0.000 0.000 0.000
```
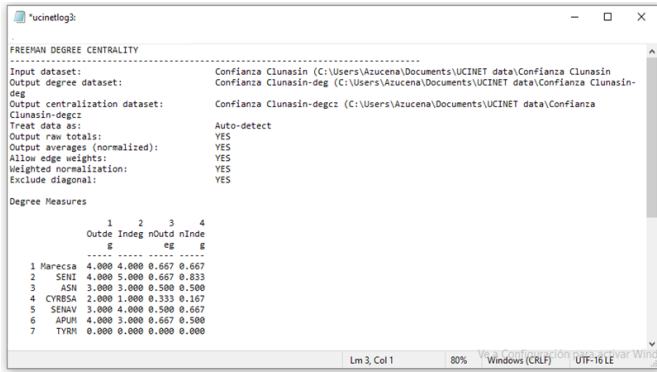
**Figure 5.** Centrality degree of the trusted network

Thus, the entry degree centrality (column 2) for the trust relationship indicates to what extent a company is trustworthy in the cluster. Therefore, it can be concluded that the actor with the highest number of mentions received is SENI, since it has an entry grade of 5 and a normalized entry grade of 83%, followed by Marecsa and SENAV, with an entry grade of 4 each; This means that, within the cluster, these three companies are considered to be the ones that inspire the greatest confidence in the opinion of the others.

Then, the degree centrality measure of each of the companies was used again through Ucinet 6 to generate the friendship indicator of the relational dimension, and its results are shown in Figure 6.

Therefore, when observing the previous figure, the degree centrality of the friendship relationship indicates the number of "friends" that the managers of the companies have within the cluster. Therefore, these results show that the actor with the highest number of friendship relationships within this network is SENI, since he has an entry-degree of 5 and a normalized entry degree of 83%.
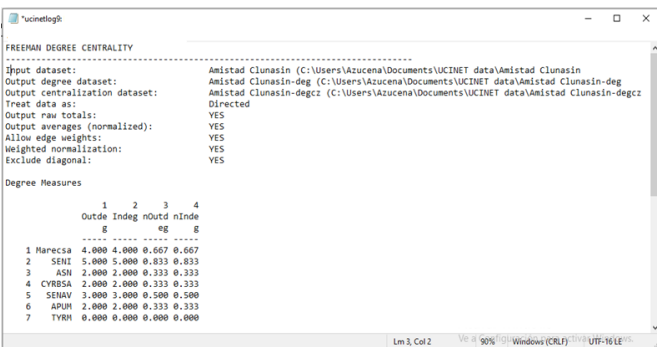
```
FREEMAN DEGREE CENTRALITY

Input dataset:                    Amistad Clunasin (C:\Users\Azucena\Documents\UCINET data\Amistad Clunasin
Output degree dataset:            Amistad Clunasin-deg (C:\Users\Azucena\Documents\UCINET data\Amistad Clunasin-deg
Output centralization dataset:    Amistad Clunasin-degcz (C:\Users\Azucena\Documents\UCINET data\Amistad Clunasin-degcz
Treat data as:                    Directed
Output raw totals:                YES
Output averages (normalized):     YES
Allow edge weights:               YES
Weighted normalization:           YES
Exclude diagonal:                 YES

Degree Measures

              1     2      3     4
            Outde Indeg nOutd nInde
              g           eg    g
            ----- ----- ----- -----
1 Marecsa  4.000 4.000 0.667 0.667
2    SENI  5.000 5.000 0.833 0.833
3     ASN  2.000 2.000 0.333 0.333
4  CYRBSA  2.000 2.000 0.333 0.333
5   SENAV  3.000 3.000 0.500 0.500
6    APUM  2.000 2.000 0.333 0.333
7    TYRM  0.000 0.000 0.000 0.000
```

**Figure 6.** Degree of centrality of the friendship network

## 5. DISCUSSION AND CONCLUSIONS

From the results obtained in the field, the concept of social capital is reinforced as a network of social relations that are established between individuals belonging to a company and that are related to others, which facilitate and promote the mobilization of resources [12], generating benefits for the participants through cooperation within the framework of a set of rules [7] and other elements that moderate said relationships such as trust [46].

Returning to the fact that SENI obtained an entry degree of 5 and a normalized entry degree of 83%, both in the relationship of trust and in that of friendship, which means that

there are five companies that inspire confidence and consider having a relationship of friendship with her, it is also concluded that trust is a critical factor for the generation and transfer of both tacit knowledge and other resources, as well as the basis for the creation of friendship ties, as pointed out by Gulati [28], Doz [29] as well as Koka and Prescott [21] who therefore consider that this trust generated and perceived within the cluster constitutes a basis for communication, information flow, risk-taking and also to promote a creative environment, which of course is linked to the development of some capacities such as innovation.

In general terms, the previous results show that there is a moderate relationship of trust and friendship between companies, that is, companies show distrust in social relations, for fear that others will know their specific strengths and weaknesses and, therefore, they can take advantage of it for unfair purposes. For this reason, companies need to develop a collaborative environment where trust, commitment and loyalty are fostered if they aspire to obtain the benefits of belonging to a cluster.

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