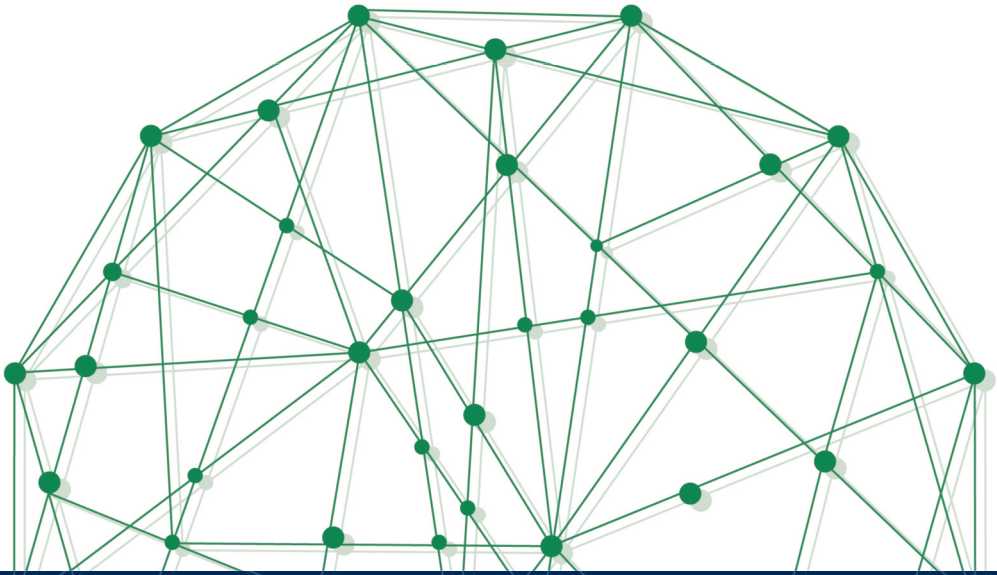Edited by Giuseppe Giordano,
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METHODS AND APPLICATIONS
IN SOCIAL NETWORKS ANALYSIS

Evidence from Collaborative,
Governance, Historical
and Mobility Networks

COMPUTATIONAL SOCIAL SCIENCE

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La collana accoglie contributi di carattere interdisciplinare relativi al dibattito sul campo derivate dall'applicazione di metodi innovativi di ricerca e pratiche di uso dei Big Data, con un'attenzione particolare alle tematiche epistemologiche, metodologiche e politiche di gestione dei contenuti digitali.

Secondo la letteratura internazionale è possibile definire la scienza sociale computazionale come una disciplina che sfrutta la capacità di vasti set di Big Data per analizzare le interazioni umane al fine di definire prospettive qualitativamente nuove sul comportamento collettivo, in un approccio interdisciplinare che comprende sociologia, statistica, informatica, psicologia, diritto, matematica e fisica teorica.

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All'interno di questa cornice e in considerazione della crescente consapevolezza della comunità scientifica internazionale di quanto la ricerca sociale debba passare necessariamente per un utilizzo attivo delle tecnologie dell'informazione, la collana ha quindi come obiettivo principale la costituzione di uno spazio di discussione epistemologica, ontologica e metodologica interdisciplinare nel quale poter raccogliere, valutare e catalogare i contributi specifici dell'analisi computazionale.

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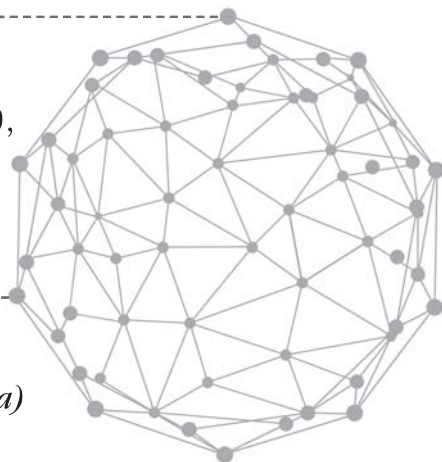
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5. *Social network analysis for welcome policies: an empirical study from small Italian municipalities*

by Ilaria Marotta[*], Carmela Bernardo[**], Angelo Moretti[***], Francesco Giangregorio[****], Francesco Vasca[*****]

1. Introduction

Interorganizational networks are characterized by interesting emerging behaviors which can be studied through the theoretical construct of the Social Network Analysis (SNA) (Ebers, 2015; Barabasi, 2016; Wasserman and Faust, 1994). In particular, SNA has been proposed in the literature for the analysis of interactions among organizations that share information and resources for counteracting certain social problems, or for promoting innovations in social, educational and environmental interventions (Raab and Kenis, 2009; Provan *et al.*, 2005; Salvini, 2011).

The strategy of analysis proposed in this work adopts the SNA approach for studying interorganizational networks aimed at the development of cooperatives dedicated to local welcome policies. The proposed network analysis derives from an empirical study carried out within the project entitled I Piccoli Comuni del Welcome (The small municipalities of welcome) activated in the provinces of Benevento and Avellino in Southern Italy and supported by the Italian foundation Fondazione CON IL SUD[1]. The main objective of

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[1] Fondazione CON IL SUD was launched in November 2006 as a result of the alliance between bank foundations and Italian third sector organizations to foster social infrastructure in Southern Italy, focusing on building up and qualifying the intangible structures to promote development. The project I Piccoli Comuni del Welcome was approved as part of an open

the project is to launch the constitution of so called Community Cooperatives (CoCo) – proposed by citizens – whose goal is to improve the quality of life in small municipalities where national Systems of PRotection for Asylum seekers and Refugees (SPRAR) have been previously activated. Building a CoCo is expected to contribute to the innovation of the social and economic dynamics of the territory thus promoting local development.

This study intends to analyze the networking actions emerging among the CoCo and other territorial entities involved in welcome policies and collaborating for the cooperative development. The whole-network strategy identifies the boundaries of the CoCo network by selecting all actors involved in the cooperative construction goal. Two attributes for each edge of the network are considered: mutual knowledge and trust. The values of the attributes are obtained by means of dedicated questionnaires submitted to the network nodes. The analysis of centralities and clusters provides useful indicators for monitoring and evaluating the governance of the network of interacting organizations and for identifying possible directions for improving their relationships.

2. Theoretical framework

In Italy, the integration policies for migrants have been traditionally characterized by strong territorial differentiations (Zincone, 2006). Parallel to migration policies, in the same country there exists the SPRAR reception system which focuses on the network of authorities for the development of territorial projects for the inclusion of asylum seekers and refugees in local communities. This type of interventions requires substantial investments and often provokes controversies among the population (Ambrosini, 2000). For this reason, the welcome perspective is a privileged observation point for highlighting the strategies of action of local actors in the face of dilemmas that are not easy to solve. Searching for possible solutions of the issues indicated above has reinforced in recent years the involvement of volunteering and third sector organizations in welcome projects.

Furthermore, in a scenario of redefinition of the relationship between "center" and "periphery" (Della Porta, 1999) and calibration of policies towards the territorial dimension, local authorities have started to seek integration through a system of partnerships with different subjects – including the local administration – to plan this type of policy. In this framework, the

call for proposals concerning immigrants, their socio-economic integration and related social emergencies proposed by third sector organizations with a maximum total of 2.5 million euros.

subsidiarity principle attributes to third sector organizations the role of co-agents in the definition and implementation of policies (Bifulco, 2005; Bifulco, 2008; Donolo, 2005; Paci, 2008) and provides the creation of a network between different actors and territories whose main objective is the management of the common good (Corbisiero, 2009).

The importance of the diffusion of territorial subsidiarity (Endo, 1994; Moreno, 2007) highlights how in specific territories the subjects of the third sector are mobilized and integrated according to heterogeneous logics, methods and practices. This action of bringing together institutional and third sector actors allows the construction of networks with public connections through a social and political coordination (Piselli, 2010). The result of these policies is no longer linked to the performance of each actor but to the synergistic action of several interdependent subjects included in the network.

In light of this, the image of the network has in recent years taken on a strong analytical value in describing the form that underlies the governance structures of social policies, since, in Italy, the Law for the reform of social services n. 328/00 promoted the transition to decentralized governance models (Fedele, 2005). This means that the system of social policies is based on a collaboration that brings together different levels of government, both public and private subjects (Pavolini, 2003). It is evident, based on what has been said so far, that the concept of interorganizational network represents a fundamental point of view for studying this phenomenon.

"Social network analysis views interorganizational networks as a set of linkages (e.g., resource, friendship, informational ties) among a set of actors (individuals, groups, or organizations)" (Ebers, 2015), in order to achieve a common result (output) or to jointly produce an expected emergent behaviour (outcome). The interorganizational network refers to a metaphor of the interdependent nature of organizations because interactions occur beyond the boundaries of the organization itself. An interesting classification of interorganizational networks considers two different classes (Raab & Kenis, 2009): the first type refers to a structure of relationships of informal interdependence between collective social actors that "emerges" from their dyadic interactions, without further specification of objectives, timing and ways of "being together"; the second type is more concerned with network governance, whereby the systems of interdependence between collective entities are intentionally created to achieve certain goals. The study of this work refers to the second type of networks because the organizations involved collaborate with the CoCo for local welcome policies.

A crucial question when dealing with interorganizational networks is how the effectiveness of the network governance can be assessed (Wang, 2016;

Robins, Bates & Pattison, 2011; Christopulos, 2008). This effectiveness can be defined as "the attainment of positive network-level outcomes that could not be achieved by individual organizational participants acting independently" (Provan & Kenis, 2008). The assessment of network effectiveness must necessarily take into consideration a plurality of aspects, such as the impact of network activities in the served community, the role of individual members and the nature of the interactions between them, the evaluation of the stakeholders, and, obviously, the characteristics of the structure of the interaction network (Provan & Milward, 1995).

The SNA methodological perspective has been shown to be appropriate and comprehensive for studying the effects of the network structure on governance and outcomes, as well as in supporting the management of these governance processes (Cross, Borgatti & Parker, 2002; Salvini, 2011; Salvini *et al.*, 2020). SNA makes available a set of methodological tools and techniques to verify if and how the structural configuration of those relationships generates effects both on the governance of the network and on its outcomes (Provan *et al.*, 2005; Provan, Fish & Sydow, 2007). This could encourage the involvement and empowerment of collective actors operating at the level of local communities (Wang *et al.*, 2016; Neal, 2014): the intuition on the importance of working together and sharing resources can be anchored through SNA into a solid and validated conceptual and theoretical framework.

3. Network definition and analysis

The analysis of the interorganizational network of the local actors involved in the CoCo development is based on the SNA theoretical framework. In this section, the procedures for the identification of the territorial actors (the nodes of the digraph), the definition of the mutual knowledge and trust relationships among the organizations (the attributes of each edge) and the evaluation of the intensity of these relationships (the weights of the edges) are described.

The nodes of the digraph are selected by considering the organizations (not individual people) involved in the CoCo development, i.e. the goal of the network. A preliminary list of actors has been suggested by a privileged witness. Specific interviews to these nodes allowed the identification of more actors of interest for the analysis, by using a snowball sampling approach, so that the network was representative not only of the actors strictly related to the CoCo but of the whole territorial relational system related to the welcome policies.

In order to understand in depth, the structure and functioning of these welcome networks in the specific territorial contest, two types of relationships between pairs of nodes have been considered: mutual knowledge and trust. The resulting multiplex network can be represented as a digraph where the weights of each edge are the measurements of the two types of relationships between the connected nodes (Dickison, Rossi & Magnani, 2016).

The mutual knowledge reflects the current configuration of the familiarity between the actors; on the other hand, the trust, intended as a propensity for collaboration, helps to understand the role that the different actors can assume within the network and possible obstacles for future collaborations.

A questionnaire was submitted to each actor identified as participating in the welcome policies in the specific territory considered. Some preliminary information on the characteristics of the organization and comments on the problematic aspects for the creation of a network in the territory were firstly recorded through the interview. In order to identify the relationships of mutual knowledge, the question of the questionnaire was: "How much do you know the other organization?", by listing the other nodes of the network. Each answer could be chosen as one of the following four levels of intensity:
– 0: I do not know the entity;
– 1: I know little about the entity (for example, I know just the name);
– 2: I know the entity (for example, I know its seat, I had sporadic contact with some of its members, I follow its social networks);
– 3: I know the entity very well (for example, I interact very frequently with it).

The question regarding the relationship of trust was: "How much would you collaborate with the entity?" and the possible options for the answer were:
– 0: I do not trust the entity, or I do not know;
– 1: I have little inclination to collaborate with the entity;
– 2: I have a sufficient propensity for collaborating with the entity;
– 3: I have a good propensity for collaborating with the entity.

The mutual knowledge and trust attributes were combined with two different selections of the nodes thus generating the local network and the territorial network. The local network is made by all organizations which operate in (and only in) the specific area of the CoCo. The territorial network includes all entities that collaborate with the CoCo, regardless of their geographic location and area where the activities are carried out. The comparison between the territorial and the local networks allows one to identify the most strategic entities for inducing the cooperation among the actors as well as the local entities on which one should invest to increase the resilience potentialities of the network itself.

The network has been analyzed under the perspective of local welcome policies. The global digraph indices (density, reciprocity and diameter) provide information with respect to the diffusion of the local interactions. The indices calculated on the individual nodes (in-degree, betweenness, hub and authority centralities) allow one to identify the network hubs (Kleinberg, 1999).

4. Data collection

The case study considered is the CoCo called Tralci di Vite which was established in 2017 in the small municipality of Chianche under the activities of the project I Piccoli Comuni del Welcome.

The principal investigator of the project is the social cooperative Il Melograno which submitted the project by responding to a call published by the Italian foundation Fondazione CON IL SUD in 2017. Il Melograno is part of a network of cooperatives and associations that share a systemic action for the development of the territory with the diocesan Caritas of Benevento starting from the promotion of well-being and youth and female entrepreneurship, with particular attention to social disadvantage. The main goal of the project is to launch the constitution of 10 community cooperatives in some municipalities in the provinces of Benevento and Avellino in Sothern Italy, in particular where SPRARs were already activated. These two provinces are experiencing a profound social crisis due to negative migratory balances with an extraordinary emptying of the territories and an increasingly pervasive abandonment of the usable agricultural area (Bock, 2016; Svimez, 2019).

The project pursues the general objective of establishing low-profit and non-profit business practices with high repercussions in terms of improving the quality of life for beneficiary immigrants and unemployed natives and with an intention to return to the native communities, through the establishment of these mixed cooperatives and their network coordinated by the social cooperative Il Melograno. The main activities of the cooperatives are social agriculture, wine and oil market, tourism, handicraft, installation and maintenance of photovoltaic systems. These activities are expected to lead to stable job positions for 160 people, including 100 immigrants, in 5 years.

The characteristics of the project make it replicable in other Italian rural areas at risk of depopulation that intend to promote welcome experiences based on the SPRAR model. Considering the number of municipalities at risk of abandonment, the repeatable potentialities of the project are widespread.

In Italy, the small municipalities – under 5 thousand inhabitants – are 73% of the total, and insist on 54% of the territory, with a population that stands at 26% on the national average (De Blasio, Giorgione & Moretti, 2018).

The CoCo Tralci di Vite was the first cooperative created under the project I Piccoli Comuni del Welcome. It was born on 25 September 2017 in the municipality of Chianche with 7 founders, including operators and beneficiaries of the SPRAR. The cooperative is currently based on agricultural activities, social and health services, recovery of abandoned land, training courses in agriculture, maintenance of public and private green areas and management of a local market.

The network of the CoCo is composed of 42 organizations, including the cooperative itself, which have been classified in 10 different categories. The distribution among the categories and the answers to the questionnaire received are shown in Tab. 1.

Tab. 1 – Entities which answered to questionnaire, by types of organization

Acronym	Category	Total	Answers
AS	Association	3	3
CN	Consortium	1	1
CO	Committee	3	3
CP	Cooperative	11	11
RB	Religious body	4	3
TB	Training body	2	2
CM	Company	7	1
IS	Institution	5	1
SU	School/University	3	3
OT	Others	3	0
	Total	42	28

The questionnaires survey was done from July 2018 till March 2019, by obtaining 67% of the total expected responses from territorial entities and 46% of responses from local entities.

Among the 28 actors who participated in the survey, most of them represent organizations already rooted in the territory. In fact, 10 organizations have been operating for more than 20 years in the area, while 5 organizations have been present from 11 to 20 years. The other entities have a more recent presence in the territory: 4 subjects work in the area from 6 to 10 years, 6 from 2 to 5 years. Finally, 3 are recent organizations, born in the last reference year.

Most respondents deal with the protection of civil rights, citizenship, immigrants, minors and women, to follow socio-health services such as care

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for the elderly, disabled, destitute and cultural services such as protection of cultural heritage, training and research.

As regards the number of resources (volunteers, operators, employees) committed in the last year of the organization activities, 11 of the respondent subjects indicated more than 20 resources. Following this, 6 organizations indicated between 2 and 5 resources; while only 2 subjects indicated 0 or just 1 resource.

Finally, each respondent was asked to indicate the level of problematicity for some critical aspects in creating a network within the reference territory. Tab. 2 shows the corresponding responses. The most problematic aspects of creating a network within the area of competence are, in order of importance: the lack of awareness of the importance of the network; the difficulty in putting together tangible and intangible resources; the fragmentation of interorganizational activities and self-reference/individuality.

Tab. 2 – Number of responses from the organizations for each problematic aspect in the creation of a network in the area of competence (rows) and for each level (columns)

	Not at all problematic	Unproblematic	Neutral	Quite problematic	Highly problematic
Coordination of activities	5	6	7	7	3
Diversity of aims/ objectives	5	10	4	4	5
Lack of confidence	7	10	6	3	2
Difficulties in combining tangible and intangible resources	7	5	6	9	1
Self-referentiality and individuality	5	6	6	8	3
Fragmentation of inter-organizational relations	3	6	5	10	4
Inability to exchange information	4	8	5	8	3
Lack of awareness of the importance of the network	3	3	7	13	2
Inability to assume responsibility	4	5	9	8	2

5. Main findings for the territorial and local networks

In this section, the territorial network consisting of all identified actors and its sub-network including only the organizations established in Chianche, which is called local network, are analyzed. The weights of the edges outgoing from the nodes corresponding to entities which did not answer the questionnaire are set to zero. Moreover, the analysis reserved only for the entities that responded to the questionnaire is also carried out. The results show the centrality of the cooperative Tralci di Vite which can be considered as a bridging actor between local and territorial entities.

5.1. The territorial network

The territorial network consists of all actors involved in the CoCo constitution, directly and indirectly. The answers of all entities have determined the adjacency matrices of the two weighted digraphs obtained by considering all 42 nodes and two different attributes (mutual knowledge and trust) for the edges. The corresponding network diagrams are shown in Fig. 1 and Fig. 2. The gray intensity of each node is proportional to the in-degree centrality, i.e. the number of connections entering that node by taking into account the weights of the edges.

The subnetwork obtained by considering the only 28 nodes corresponding to the actors who responded to the questionnaire has been extracted. The global measures of this subnetwork together with those of the whole territorial network are reported in Tab. 3.

The number of edges and, consequently, the density in the case of the trust attribute is greater than the case of the mutual knowledge attribute. Then, one could say that there is a propensity to collaboration even if some entities do not know each other. Obviously, the density has higher values for the network consisting of 28 nodes, since in its construction the entities which did not provide answers, i.e. those nodes without outgoing edges in the network consisting of all 42 nodes, are excluded.

As regards the reciprocity (percentage of reciprocal connections), its value is similar for both mutual knowledge and trust attributes. The values assumed by reciprocity are quite high, so perceptions are sufficiently reciprocated among the nodes.

Fig. 1 – *Diagram of the territorial network obtained by considering the mutual knowledge attribute. The darker the gray tone of the node, the greater its in-degree centrality*

Fig. 2 – *Diagram of the territorial network obtained by considering the trust attribute. The darker the gray tone of the node, the greater its in-degree centrality*

Tab. 3 – Global measures of the territorial networks with 42 nodes (second and third columns) and the only 28 nodes who responded to the questionnaire (fourth and fifth columns)

	Network with 42 nodes		Network with 28 nodes	
Measures	*Mutual knowledge*	*Trust*	*Mutual knowledge*	*Trust*
Edges	604	689	423	480
Density	0.35	0.40	0.56	0.63
Reciprocity	0.46	0.45	0.71	0.69
Diameter	1.33	0.83	1.33	0.83

In order to analyse the relationships among the nodes in terms of their distances, two more edges attributes have been considered: knowledge distance and trust distance. The edges weights are obtained as the reciprocal of the level indicated in the corresponding answer. For example, if the node A knows the node B with a level equal to 2, the edge attribute corresponding to the knowledge distance from A to B has a weight equal to 0.5. In particular, for the null entries of the original adjacency matrices, no edges have been considered in the corresponding distance attribute too. The resulting diameter for the trust distance (0.83 in Tab. 3) is smaller than that for the mutual knowledge distance (1.33 in Tab. 3), which is coherent with the density results.

The relevant and strategic nodes in the networks can be identified by evaluating the distribution of the network centralities among the nodes.

The in-degree distribution for the mutual knowledge attribute in the territorial network is shown in Fig. 3. The nodes RB03 (religious body) and CP11 (cooperative) are those with the highest in-degree centrality (70 and 59, respectively), i.e., they are the most known entities in the network. All the other nodes have an in-degree centrality within the interval [11, 53].

By computing the betweenness centrality, the nodes RB03 (betweenness equal to 230) and CP11 (betweenness equal to 193) are also the most strategic in the network with respect to the connectivity features, allowing the shortest path connections between actors who do not know much about each other (all the other nodes have a betweenness less than 100). The nodes RB03 and CP11, together with CP02, are also the most strategic in terms of hub and authority centrality for the territorial network.

Nodes clustering obtained by considering the in-degree and the betweenness centralities for the mutual knowledge attribute can be deduced from the dendrograms shown in Fig. 4. As regards the in-degree, when the distance level is equal to 11, the agents group in 3 clusters with 15, 25 and 2 members, respectively. Note that the cluster with 2 elements (those furthest to the

right in the dendrogram) consists of the nodes RB03 and CP11 which have the highest in-degree centrality. At a distance level around 20, the two most numerous clusters merge in a single one. Finally, at a distance level of 36 all nodes of the network are grouped in a single cluster. The betweenness dendrogram on the right of Fig. 4 clearly shows that most nodes connect into a cluster at a very low distance level because of the low values of betweenness for almost all nodes of the network.

Fig. 3 – In-degree distribution in the territorial network by considering the mutual knowledge attribute
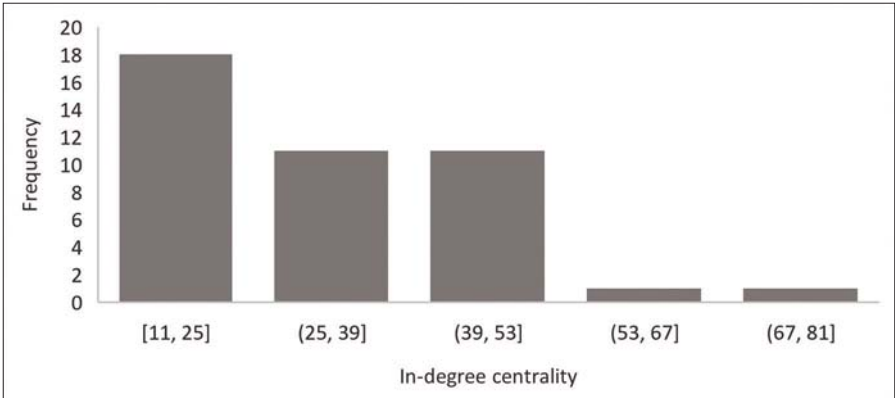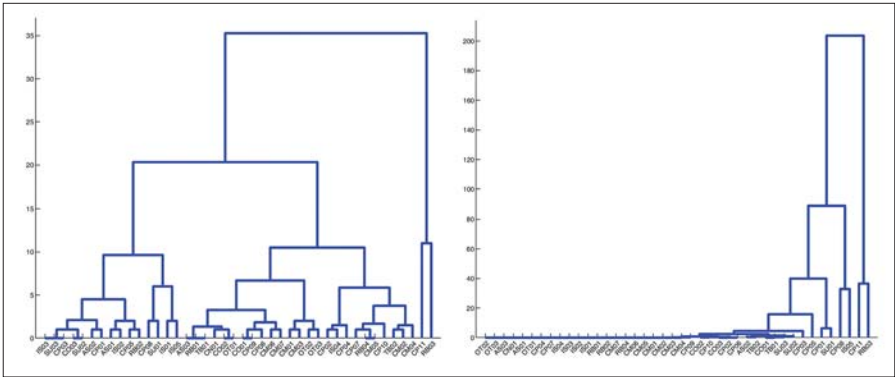

Fig. 4 – Dendrograms of the in-degree (left) and betweenness (right) measures for the territorial network with the mutual knowledge attribute

In synthesis, the network analysis shows that the two nodes which play a strategic role in terms of in-degree and betweenness centralities are the territorial entities which are the principal promoters of the CoCo.

The same conclusions about the most strategic nodes of the network are obtained by considering the trust attribute and by restricting the analysis to the 28 entities which responded to the questionnaire.

5.2. The local network

The local network is obtained by selecting the 13 nodes belonging to the municipal territory of Chianche and the edges among the corresponding nodes. Note that this local network cannot be obtained as an ego-centered network extracted from the territorial network by choosing any of its nodes as the ego. The evaluation of the in-degree and betweenness centralities identifies an important local actor which represents a bridge between the local entities and the others.

The digraphs generate by considering the two edges attributes (mutual knowledge and trust) in the local network are shown in Fig. 5.

Fig. 5 – Diagram of the local network obtained by considering the mutual knowledge (left) and the trust (right) attributes. The darker the gray tone of the node, the greater its in-degree centrality
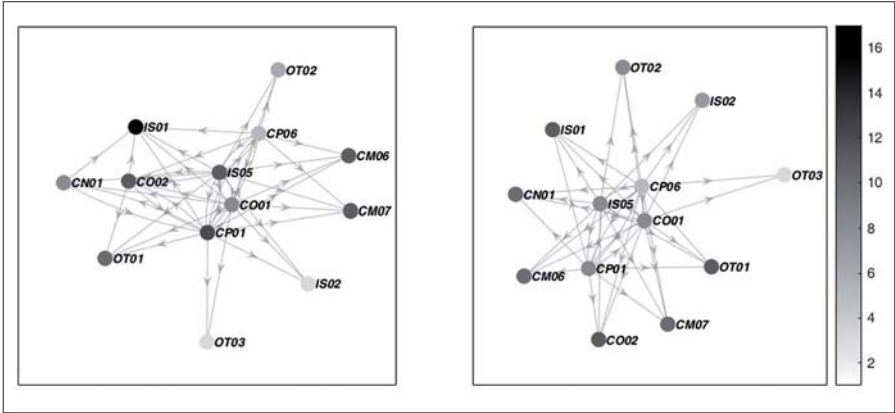
The local networks global measures reported in Tab. 4 show that the density for the mutual knowledge attribute is greater than that for the trust attribute. A possible interpretation is that a high level of mutual knowledge brings a reduction of trust.

The computation of the betweenness centrality in the local network shows that the node CP01 has a central role for the mutual knowledge. Moreover, the entities CO02 and IS01 represent the authorities, while CO01, CP01 and

IS05 are the hubs of the local network. These considerations are valid for both networks consisting of 13 and 6 nodes.

Tab. 4 – Global measures for the two local networks consisting of the 13 local nodes (second and third columns) and the only 6 nodes of them who responded to the questionnaire (fourth and fifth columns)

	Network with 13 nodes		Network with 6 nodes	
Measures	*Mutual knowledge*	*Trust*	*Mutual knowledge*	*Trust*
Edges	47	43	21	19
Density	0.30	0.28	0.70	0.63
Reciprocity	0.34	0.23	0.76	0.53
Diameter	2	1	1.5	0.67

In synthesis, the analysis of the networks has shown that the node CP01, which is the recently founded CoCo in the territory of Chianche, has an important connecting position for the nodes of the local network and has centralities measures sufficiently high in the territorial network. Then, the node CP01 can be considered as a bridging actor between local and non local entities.

6. Conclusions

In this work, SNA has been used for studying the collaborations among organizations involved in the construction of a community cooperative. The analysis is supported by an empirical study carried out in a small municipality in Southern Italy. The connections among the nodes, based on mutual knowledge and trust, have been evaluated through the submission of questionnaires which determined the adjacency matrices for the weighted digraphs representing the interorganizational networks. A local sub-network constructed by considering the actors which operate only on the territory of interest has been considered too. The analysis of the networks leads to the interpretation that in the small municipality trust seems to be reduced by the high mutual knowledge. The higher reciprocity indicates a marked propensity for collaboration, which is based on a sharing of common objectives. Moreover, the centralities measures for the node representing the local cooperative demonstrate the importance of that entity as a bridging actor between local and non local entities.

Future work will concern a dynamic assessment of the networks involved in the establishment of community cooperatives aimed at highlighting the variation in the characteristics of the network generated over time as a result of the collaborations among the organizations involved.

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