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Analysis of Communication Network Patterns of Home Industries (A Case Study in Tambaksari, Rowosari, Kendal)

Puteri Anindya Maulan*, Danny Manongga, Irwan Sembiring
Master Study Program in Information Systems
Faculty of Information Technology
Universitas Kristen Satya Wacana
Salatiga, Indonesia
*Correspondence: puteriamaulan@gmail.com

Abstract-Tambaksari is a village in Kendal Regency that has home industries (*Industri Rumahan*, IR). The local government classifies these industrial activities of BUMDes (Village-Owned Enterprises) into three groups, namely IR-1, IR-2, and IR-3. Each group or class has its specific criteria. The significant local potentials in Tambaksari include fish farming and processing. The advantage of the local potential in Tambaksari is inseparable from the synergy between the local government and the people of Tambaksari. This study observed the patterns of actor interactions in 64 IRs in Tambak Sari. Data were collected from questionnaires and analyzed using the Social Network Analysis (SNA) method. The results showed that Tambaksari IRs have a network density of 5.5%, which suggests that the relationship was weak. Network analysis using UCINET illustrates the separation of the IR group, which further reinforces the existence of competition in the network. The study reveals the dominant actor in the network interaction based on the measure of degree centrality, closeness centrality, and betweenness centrality. He is the actor with id # 29 who is the Chairman of IR-2, 54 years old, who has a Pindang Fish Processing.

Keywords: BUMDes, home industry, social network analysis

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1. Introduction

Tambaksari Village, Rowosari District, Kendal Regency is a village that has great potential in terms of fish processing. Local government groups these industrial activities into a group of BUMDes (Village-Owned Enterprises) under the leadership and responsibility of Mr. Bagus Setiawan as the director. Based on the results of interviews with the Tambaksari BUMDes, it was stated that home industries (*industry rumahan, IR*) in Tambaksari village was divided into 3 IRs, namely IR-1, which means that the business involves 1 or 2 actors, IR-2 consists of 3 to 4 actors, and IR-3 which is industrial scale involving more than 4 actors. The IRs under the BUMDes include fish farming and processing by people who are grouped into Home Industries. In order to support the home industries, the village government holds a meeting every 2 months, providing assistance, training, and provide capital so that the community are encouraged to work together with the village government to increase the potential of Tambaksari Village. Strong synergy between actors from both the village government and the community has made the Home Industry in Tambaksari as a pilot project of Home Industry at the Kendal Regency Level.

The management of BUMDes of Tambaksari is carried out in an effective, efficient and structured manner [1]. Configuration of the communication network is carried out to determine the roles of actors [3] [4] from government to actors in the Home Industry and data flow that helps the development of BUMDes Tambaksari. A review of the communication network between the BUMDes actors needs to be conducted, so that it can useful for other villages to develop the potential of their villages, which focuses on how to create network configurations that increase accessibility to data sources, as well as to regulate the access right (Brass, 1984) in [2].

This paper reports the analisys of communication network of Tambaksari Home Industry using Social Network Analysis (SNA). SNA was used to model or map the communication network in BUMDes Tambaksari,

Rowosari District. UCINET was used as a tool in Network Analysis.

The results of the mapping shows the relationship between home industry actors. It can be referred to find out what factors that influence the home industry relationship in Tambaksari

2. Method

a. Research Flowchart

The study used a questionnaire survey method covering all home industries industry rumahan, IR) in Tambaksari, Rowosari District. The IR actots in Tambaksari already knew each other.. The research stages are described in the flowchart, Figure 1.

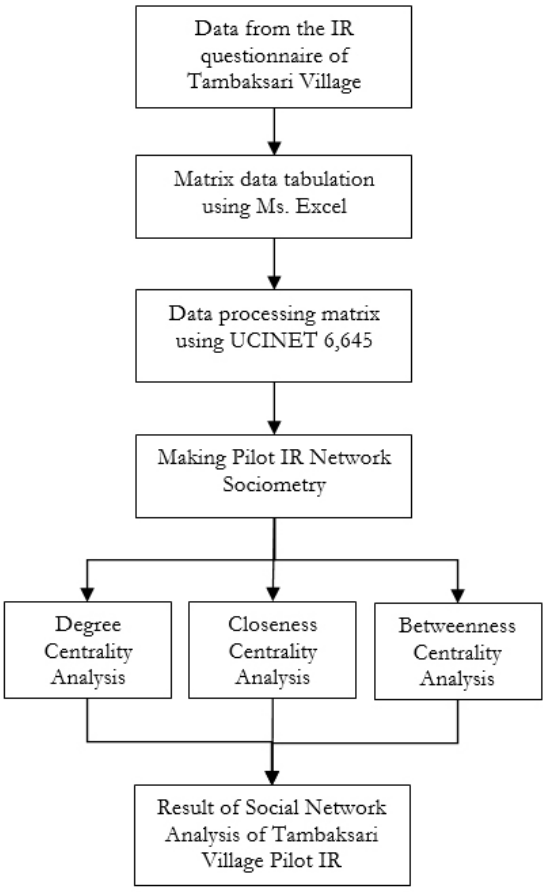

Figure 1. Research Stage Flowchart

b. Data analysis technique

The research data were obtained through a questionnaire distributed to 64 IRs in Tambaksari, Rowosari District. The researcher used a saturated sample, which means that data collection came from all IR actors involved in the research. From the research data collected has 5 attributes, namely ID, part, type of preparation, group and age. The collected questionnaire data are then tabulated into matrix data and grouped based on the names of actors, attributes and relationships between actors, then input data on the UCINET application and make sociometric images using NetDraw [5], followed by making the results of the IR network data analysis. The following are several stages of the Social Network Analysis (SNA) used in the data analysis of the home industry network:

c. Social Network Analysis (SNA)

The use of Social Network Analysis (SNA) has long been used to map and describe a social network in society before the era of social media such as Twitter, Facebook, and other social networking sites [6]. The interactions in the communication network pattern of the Home Industry will form a picture or map [7]. This will produce a communication network that can be seen and used as a reference for the development process for Villages that have not been able to make good use of their regional potential. SNA can be used to identify actors who play an important role in complex networks [8], [9] so that they can map the structure of relationships between individuals or entities [10] which are interrelated and interdependent on behavior and attitudes in social relationships described by nodes [11]. The actors in the network and ties or edges means a line connecting one node to another node [12]. The choice of the SNA method is based on the fact that by using this method, we can visualize how the relationship between entities that can be visualized to the smallest relationship in the network between individuals [13].

d. Stages of Social Network Analysis (SNA)

a) Degree Centrality calculates the number of interactions a node has. By calculating the degree centrality of node ni, using formula (1):

$$C_D(n_i) = d(n_i) C_D(n_i) = d(n_i) \quad (1)$$

where $d(n_i)$ = the number of interactions this node has with other nodes on the network.

b) Closeness Centrality calculates the distance between a node and all other nodes in the network to measure the closeness or shortest distance of a node. To calculate closeness centrality, you can use formula (2).

$$C_B(n_i) = \sum gjk\,(n_i)/gjk \quad (2)$$

where $gjk\,(n_i)$ = the number of shortest paths from node *j* to node *k* passing through node *i*, and gjk = the number of shortest paths between 2 nodes in the network

c) Betweenness Centrality is a calculation of how often a node is passed or mediated by other nodes to go to a particular node in the network. This value serves to determine the role of actors who bridge interactions in the network. The more often these actors become intermediaries for other actors, the more important these actors are.

Calculation of the betweenness centrality of a node using formula (3).

$$C_c(n_i) = [N - 1/\sum d(n_i, n_j)] \quad (3)$$

where N = the number of nodes in the network and $d(n_i, n_j)$ = the number of shortest paths connecting nodes *ni* and *nj*

3. Result

Based on the data that has been processed using the NetDraw tool, the cyrcle symbol is the IR-1 group and the square is the IR-2 group. The processing types are distinguished by magenta color with color ID-1 as the processing home industry of Pindang Fish, light blue color with color ID-2 as smoked fish processing home industry, dark brown color with color ID-3 as Wet Fish processed home industry, white color with color ID-4 as Salted Fish processing home industry, green color with color ID-5 as Food Processing home industry, light brown color with The color ID-6 is the Home industry Processing and other Business, and the dark blue color with the color ID-7 is the IR Companion. The results of the group sociogram and types of processing are presented in Figure 2.

The Home Industry in Tambaksari Village, Rowosari District, which can be seen in Figure 2, has 2 IR groups and 6 types of processed products. Tambaksari Village Home Industry under the auspices of BUMDes, in each IR group has a companion, with actor # 1 as a companion to IR-1 group and actor # 2 as a companion to IR-2 group which can be seen in Table 1.The dominant type of processing in Tambaksari Village IR can be seen In table 2, namely Pindang Fish with ID 1 and Processed snacks from fish with ID 5. The Pindang Fish is the superior product of Tambaksari Village because the number of businesses is more than other types of processing as seen in Table 2.

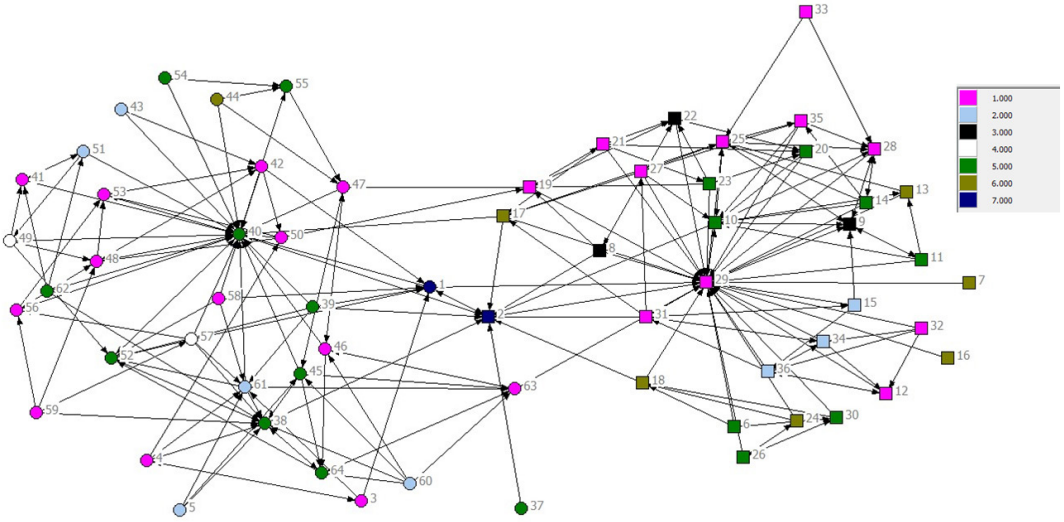

Figure 2. Sociogram Group and Type of Process

Table 1. IR Group Description

Symbol	Information
Circle	Group IR 1
Square	Group IR 2

Table 2. Description of the Type of Process

ID	Information	Number of Enterprises
1	Pindang Fish	24
2	Smoked Fish	8
3	Fresh fish	3
4	Salted fish	2
5	Snacks	18
6	Processed and other businesses	7
7	IR companion	2

a. Density

Figure 3 shows the sociogram of all Tambaksari Village IR data based on age and information on the part of the actors, until the bonding data is obtained which shows the relationship that occurs between the actors.

The results of descriptive statistical calculations using UCINET 6,645. The number of coefficients indicates that there are 221 ties (network) that occur in the network. The average density in the network is 5.5% which means that the density is less than 50%. A very significant difference in network ties can be concluded that the relationship between actors in the network is weak. The interaction patterns between actors are presented in Figure 3 and Table 5.

The bond data shows the weak relationship between actors. The closeness between IR actors is very weak, communication and relationships are less intensive, from the two IR groups in Figure 3 it can be seen that the communication that exists between IR actors and the IR chairman is closer, than the closeness between other IR members. In addition, the weak relationship between actors is also due to the fact that most of the actors are IR actors who are more concerned with how their business can rotate properly every day so as to reduce social interaction between IR actors in daily life, but in fact these IR actors are neighbors and already know each other. This is reinforced by the existence of a statement from the IR actor stating that the IR relationship lacks communication between other actors. The communication that is established is more of an important matter related to his business. Communication with other IR actors is less established if nothing is needed because the distance from their house is too far away. The IRs focus more on their respective businesses and less communicate with other IR actors who have a far distance from their home. The IR perpetrators said that IR actors could meet and communicate with almost all IR actors during the Tambaksari IR meeting.

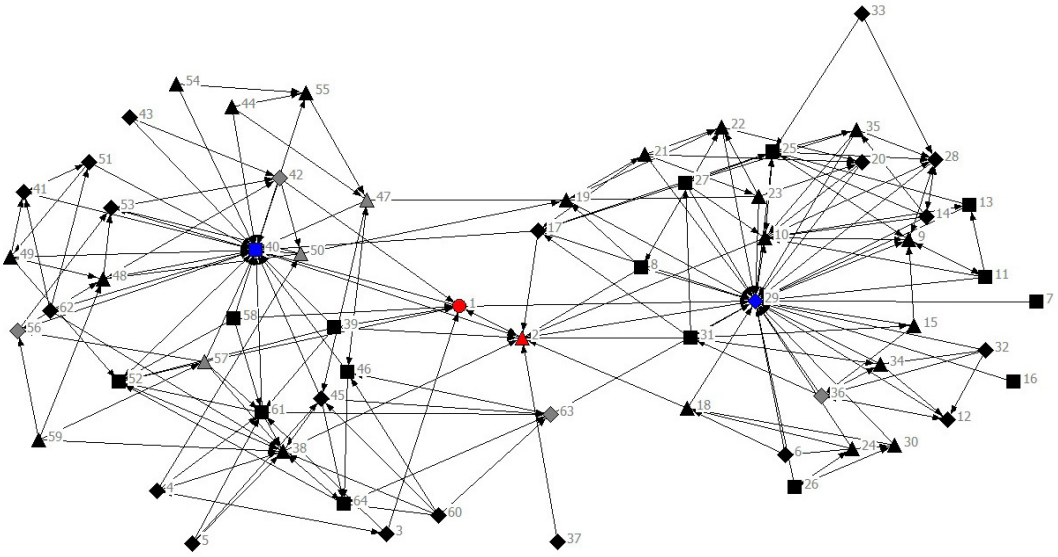

Figure 3. Sociogram All Data

Table 3. Age Description

Symbol	Information
Circle	21-30 years old
Square	31-40 years old
Triangle	41-50 years old
Diamond	more than 51 years old

Table 4. Part Description

Color	Infromation
Red	IR companion
Blue	Chairman of the IR
Black	Level 2 IR member
Dark Grey	Level 3 IR member

Table 5. Density

Density/ Average Matrix Value		
1. Density	**2. No of ties**	**3. Avg Degree**
0.055	221	3.453

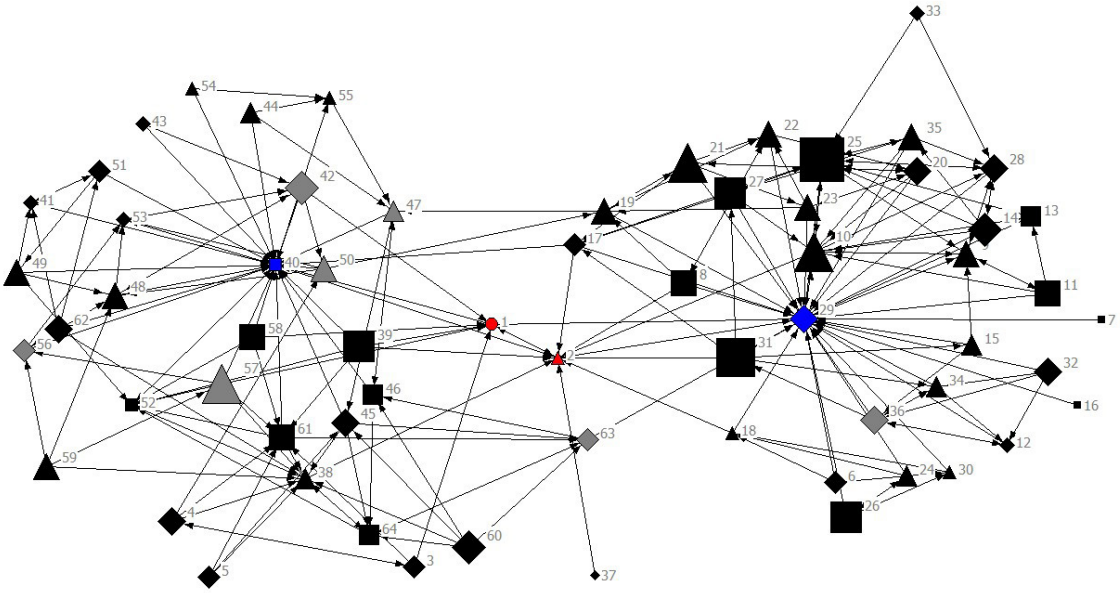

Figure 4. Sociogram Degree Centrality

Table 6. Degree Centrality

Freeman's Degree Centrality Measures				
ID	**OutDegree**	**InDegree**	**NrmOutDeg**	**NrmInDeg**
25	7.000	7.000	11.111	11.111
10	6.000	9.000	9.524	14.286
31	6.000	1.000	9.524	1.587
21	6.000	2.000	9.524	3.175
29	4.000	31.000	6.349	49.206

In Figure 3, it can be seen that the 2 IR groups were split into 2 parts, it can be concluded that the two groups did not have a comprehensive interaction, but the interactions were only in the scope of each IR. Interactions that are split into 2 indicate that the network has weak interactions. The weak interaction and splitting of the two groups, which can be seen in Figure 3, are prone to competition, seeing that the two groups have almost the same business, namely fish processing. Weak networks should be overcome by holding regular meetings as well as more intense communication between actors in the IR group. The intensity of meetings and communications that are often carried out between actors in the IR group can establish good relationships between IR actors so that the IR actors can collaborate on innovative ideas for the advancement of the Tambaksari Village Pilot IR.

b. Degree Centrality

Data level (degree) shows the interaction or relationship between actors who contact or are contacted by each actor. The number of levels (degree) in the network is 126, with the number of actors who contacted as many as 63 and 63 who were contacted. The value of 7 contacted (OutDegree) and 7 contacted (InDegree) from the data obtained means that actor # 25 sent information to 7 people in the network and received information from 7 people in the network. This shows that actor # 25 is an actor who often maintains contact with other actors in the network and is very influential in conveying and receiving information from other actors. Some IR actors said that actor # 25 is an actor who has a pindang fish business, actor # 25 also supplies pindang fish to other snack-processed actors so that this actor is an actor who

has high relationship interactions with other actors in the network..

Sociogram Degree Centrality based on data processed using the NetDraw tools obtained the following results:

Like actor # 10 which has the highest centrality number 2 as seen in table 6, with OutDegree 6 and InDegree 9. The two actors also have a relationship with actor # 29 as seen in Figure 4. Actor # 25 has an ID 1 Fish business. Pindang and # 10 have ID 5 Food Processed businesses which can be seen in Figure 2, both of them have a good relationship intensity as well as the intensity of contacting or being contacted by actor # 29 as the Chair of IR. However, the intensity of the relationship between actor # 25 and # 10 to contact or be contacted by other actors was higher than actor # 29. This can be seen in Figure 4, that the greatest Degree Centrality or intensity of contacting or being contacted by other actors is found in actor # 25.

Actor # 25 in IR is an actor who also has interactions with IR actors without other actors as intermediaries, many of the IR actors contact actor # 25 because the actor may be a source of information for other IR actors. Actor # 25 as a senior involved in the IR environment became the center of information about IR for several IR actors with whom he had close ties. In contrast to actor # 29, several factors that support actor # 25 have closeness to other IR actors, namely the similarity in production, supply of raw materials, having better experience than other IR actors who have similar production. Another thing that caused the IR actor to contact actor # 25 was the closeness of actor # 25 with actor # 29 who was the Head of the RT who was also the Chair of the IR who owned the Pindang Fish business as seen in Figure 4. Thus, actor # 25 was an intermediary. for some other IR actors who are close to him to find out information about IR obtained from the Chair of the IR.

The level of relationship between IR actors that occurs shows that the level of relationship is still valid for several actors who have positions and production similarities in IR only. The level of relationship between actors should be better with all IR actors so that IR actors can forge better collaboration by collaborating between businesses, it will allow IR actors to obtain raw materials more easily at lower prices.

c. Closeness Centrality

Sociogram Closeness Centrality based on data processed using NetDraw tools is presented in Figure 5. Closeness Centrality shows the distance or closeness needed by an actor to contact other actors. InCloseness shows how close an actor is to someone in the network and OutCloseness shows how close someone is to an actor in the network. From the calculation results in Table 7, the highest level of closeness (Closeness) is shown in actor # 29 having InCloseness 54.310, which means that the actor has a closeness value to contact other actors by 54 times and OutCloseness is 2.292, which means that other actors have closeness to contact the actor. equal to 2 times. The position of closeness with other actors makes the actor able to interact quickly with other actors.

Actor # 29 has a better relationship closeness than other IR actors, this affects how the relationship between actor # 29 and other IR actors, actor # 29 is better at conveying information to other IR actors, compared to actor # 2 as a companion IRs who convey directly to IR actors, because the relationship that occurs between actor # 29 and IR members is proven to be closer and more intensive, this closeness can be seen in Figure 5.

The closeness of the relationship with the IR of Tambaksari should involve all parties. Not only the Head of IR, IR assistants should also have better closeness to each IR actor in their respective businesses so that they can embrace IR actors to be more active in asking questions and not feel awkward when expressing complaints or ideas. All actors in IR should have a good synergy to generate new ideas of product innovations.

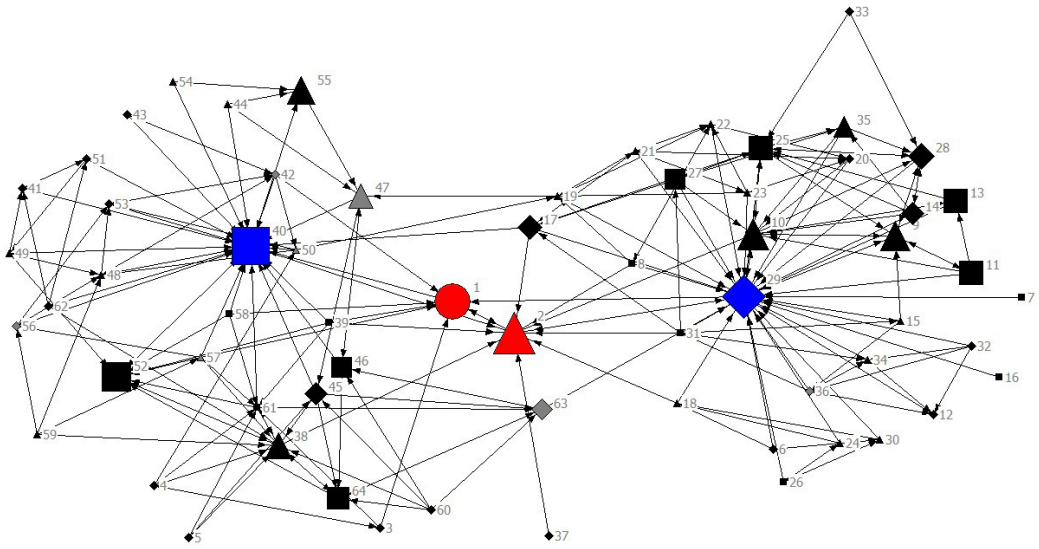

Figure 5. Sociogram Closeness Centrality

Table 7. Closeness Centrality

Closeness Centrality		
ID	inCloseness	outCloseness
29	54.310	2.292
2	54.310	2.283
40	49.219	2.288
1	45.985	2.282
10	37.278	2.289

d. Betweenness Centrality

Figure 6 shows Sociogram Betweenness Centrality, based on data processed using NetDraw tools. Betweenness Centrality in Table 8 shows the intermediation or relationship of actors. The data from the calculation of betweenness centrality shows that actor # 29 occupies the highest position with a Betweenness value of 664,983 and nBetweenness 17,025 and actor # 40 is in second place with a Betweenness value of 502,000 and nBetweenness of 12,825. The figure shows that actor # 29 has the most favorite position in the network and actor # 40 has the next favorite position after actor # 29 in the network because many actors rely on actors # 29 and # 40 to connect with other actors in the network. In addition, the two actors are the Chairmen of the IRs of the Both IR Groups. As seen in Figure 1 and Table 1, actor # 29 is the Chairperson of IR in Group IR 2 who owns a pindang fish business and actor # 40 is Chair of IR in Group IR 1 which has a snack processing business.

Actors with the highest betweeness centrality have the shortest distance to contact other actors in conveying and receiving information. This happens because the actor (node) occupies a position as an intermediary for other actors to connect with other actors in the network.

Actor # 29 is the Chair of the IR 2 group which has a pindang fish business and is 54 years old who is classified as a senior in Tambaksari village IR, this actor has an important position in the network because he is an intermediary for IR actors who want to convey complaints, problems, information to IR actors. It is also based on the activeness of these actors in the IR of Tambaksari village. Actor # 29 also acts as a mediator in the event of problems that occur from an IR member to another IR member, as well as an IR Assistant. Apart from actor # 29, actor # 40, who is the head of the IR 1 group who has a snack processing business and is 32 years old, is in second place in the mediation. Several IR actors said that actors # 29 and # 40 were active actors in the development of IR in Tambaksari village. These actors were said to be able to motivate other IR actors to be innovative in businesses managed by other IR actors. This intermediation can be seen in Figure 6.

Intermediation in IRs appears to be highly dependent on actors # 29 and # 40 as Chair of IRs. This also applies to updating information and problem solving within IRs who depend on the IR Chair. It is said that the IR member will know all the information obtained through the IR Chair as well as the IR assistant who will receive information from the IR member through the IR chairman.

Discussion

Network analysis using Social Network Analysis (SNA) can find out how the interaction between IR actors.. Through the processing of questionnaire data and interviews of the IR actors interaction using UCINET 6,645 shows that there is a gap between the two IR groups in Tambaksari which can be seen in Figure 3. The interaction in Figure 3 shows that the 2 IR groups are split into 2 parts. It can be concluded that in the two Group, there is no complete interaction, but the interaction is only in the scope of each IR. Interaction that is split into 2 indicates that the network has weak interactions and is prone to competition, since that the two groups have the similar business, which is fish processing. The two groups compete each other in the marketing of products and types of processed products. In addition, communication barriers at the Tambaksari Home Industry often occur with weak Density levels. In fact, the Tambaksari IR Committee has tried for all Tambaksari IR groups to build a close kinship in order to increase competitiveness with other Village IRs [14], however, communication within the IR of Tambaksari itself sometimes goes beyond the expectations of IR actors. who is in the IR Pilot of Tambaksari so that communication problems often occur. Poor communication eventually triggers the desire to compete [15]. Communication between home industries groups should be improved to avoid the bad impact of competition. The groups can establish good cooperation with collaboration between the two groups. Collaboration can make the two groups mutually beneficial to each other, such as in getting raw materials and complementing each other in meeting market demand. So that they can realize the common desire to maintain the Tambaksari Village Home Industries to be more advanced.

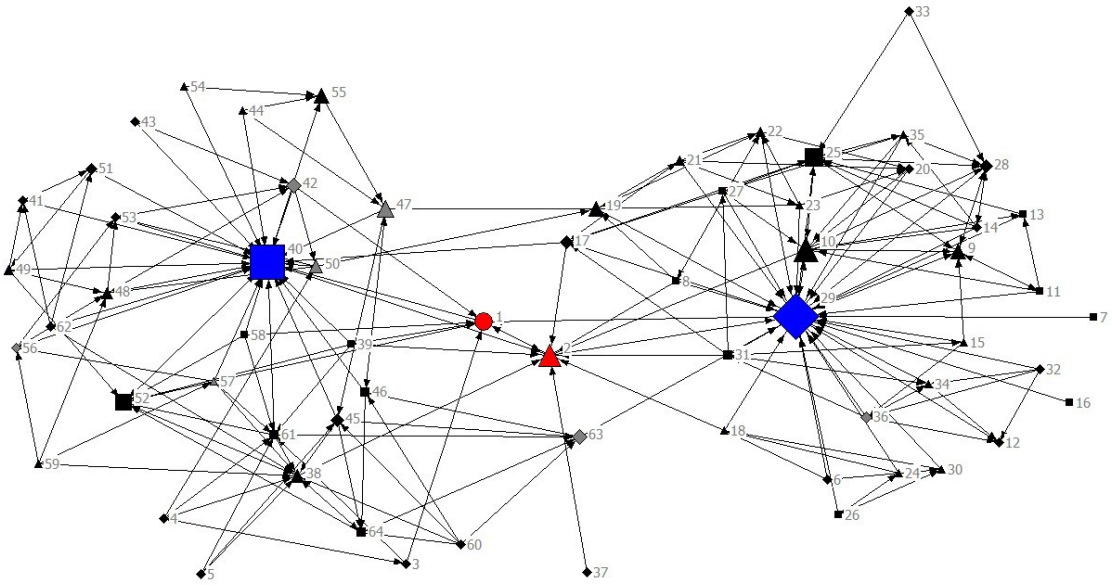

Figure 6. Sociogram Betweenness Centrality

Table 8. Betweenness Centrality

Freeman Betweenness Centrality		
ID	**Betweenness**	**nBetweenness**
29	664.983	17.025
40	502.000	12.852
10	310.783	7.957
2	275.000	7.040
1	197.833	5.065

4. Conclusion

In this study, the relationship between Tambaksari Home Industries actors is quite weak. It can be seen in the density level which indicates that there is less intensive relationship between home industries members. In this weak relationship there is actor # 29 who is the chairman of the IR-2 group, 54 years old, who is known to be friendly, and actor # 40 who is the Chair of the IR-1 group, 32 years old, and has a snack business. The two IR group leaders can be a strong link in the network. The current relationship is still centered on the IR Chair. Although actor # 29 becomes a strong liaison, actor # 25 who is in Group IR-2 has the best Degree Centrality, this shows that the actor has the highest centrality that allows other actors to be able to connect with him without the intermediary of other actors. Actors # 29 and # 40 have high Closeness Centraity and Betweenness Centraity compared to other actors. This shows that actors # 29 and # 40 have good closeness and liaison between IRs and other IRs who are members of IR, especially when compared to actor # 2 as IR's companion. Intensive communication greatly affects the actor's closeness to home industries members..

The interaction in the home industries of Tambaksari depends only on a few actors, as the Chair of the IR dominates the interactions. To improve the interactions between IR groups and IR administrators, it needs intensive regular meetings. The regular meetings can also intensify the interaction between IR actors.

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