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Solidarity Entrepreneurial Ecosystem in The Effort Towards Modern Cooperatives: A Social Network Analysis Approach

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Abstract. This study examines a solidarity entrepreneurial ecosystem in the East Priangan Region, West Java. This study uses a mixed method involving 77 cooperatives in Sumedang Regency, Garut Regency, and Tasikmalaya City. Data collection instruments are in the form of questionnaires and interview guidelines. The results of the questionnaire data processing were then processed with the gephi 9.2 application to produce a graph of the network structure of the Solidarity Entrepreneurial Ecosystem in the East Priangan Region, West Java. Furthermore, the resulting network structure will be analyzed by descriptive method. The results show that the government is the actor most connected to cooperatives in the Solidarity Entrepreneurial Ecosystem network structure. The government is the most critical factor in supporting the digital transformation of cooperatives into modern cooperatives. Cooperatives should open their connections to these actors by exploring collaboration opportunities, especially in digital transformation. Policymakers (the government) can use this study to formulate and determine suitable strategies and policies for digitizing cooperatives. Further research should be done to extend the analysis of the Solidarity Entrepreneurial Ecosystem by including all actors, not just cooperative actors. By integrating all actors' perspectives, a complete model of the Solidarity Entrepreneurial Ecosystem can be created.

Keywords: Modern Cooperatives, Solidarity Entrepreneurial Ecosystem, Social and Solidarity Economy, Social Network Analysis (SNA)

1. Introduction

Cooperatives have been regarded as the backbone of the economy. Gibson & Graham (2010) stated that cooperatives are community-based organizations with an important role worldwide in alleviating poverty and creating jobs for economic growth and social change (Hambani & Harefa, 2019). However, cooperatives have yet to play a role as expected nationally, namely as one of the pillars of the economy (Oman Hadipermana, 2009). Sitepu & Hasyim (2018) state that Cooperatives' development still needs to improve in the institutional and cooperative business fields. Developing cooperatives' inhibiting factor requires more management dedication to cooperative survival. It means that the personality and mentality of the administrators, supervisors, and managers still need to be cooperative, so they must be improved again. In other words, there are still managers who need to be entrepreneurs. Some need help to formulate plans, programs, and business activities. They must lead and mobilize employees to carry out the specified plans, programs, and business activities. For that, we need an "entrepreneurial spirit" who is observant in detecting opportunities and dares to make decisions at the right time (Dalimunte, 2011).

Cooperatives need cooperative entrepreneurs to deal with the various problems it faces. Cooperative entrepreneurs who act as innovators will enable cooperatives to create economic growth and prosperity (Oman Hadipermana, 2009). Entrepreneurial activities are proven to produce innovative products and services (Roundy, 2017; Purbasari et al., 2020). Moreover, Cooperative entrepreneurship will ultimately determine the success of cooperatives in adopting technology that will lead cooperatives to become modern cooperatives (Purbasari & Raharja, 2021). It is in line with the government's program. As a concrete step to commemorate the 74th Cooperative Day commemoration on July 12, 2021, cooperatives in Indonesia will be rebranded as modern, contributive, and competitive business entities (Humas Kementerian Koperasi dan UKM, 2021). The Ministry of Cooperatives and SMEs targets that by 2021, and it will be able to produce 100 modern cooperatives (Catriana, 2021). The Minister of Cooperatives and SMEs stated that the government has four strategies to develop modern cooperatives to achieve this target. First, developing a cooperative business model through food corporatization. Second, developing factory sharing with open partnerships to connect with the supply chain. Third, developing Multi-Party Cooperatives. Fourth, strengthening the institutions and businesses of Cooperative members through amalgamation strategies (spin-off and split-off). These four strategies are realized through regulations such as Law Number 11 of 2020 and Government Regulation Number 7 of 2021. The government also emphasizes that cooperatives' entrepreneurship mindset must be changed and support innovation in cooperatives through digitalization with the launch of IDX COOP (Cooperative Innovation Portal) in 2020, which documents various cooperative innovation ideas and practices. The government admits that various problems or cases of cooperatives arise due to negligence or mismanagement of cooperative practices. As a solution, the government is strengthening the supervisory function through the reform of cooperative supervision by presenting PermenKopUKM Number 9 of 2020 and the establishment of Functional Positions for Cooperative Supervisors spread throughout Indonesia intending to tighten cooperative supervision further (Humas Kementerian Koperasi dan UKM, 2021; Purbasari & Raharja, 2021).

Entrepreneurship is generated from the interaction between individual attributes and the surrounding environment (Stam & Bosma, 2015; Acs et al., 2017; Purbasari et al., 2018), which can support the implementation of the previously mentioned strategy for the development of modern cooperatives. Furthermore, based on (Kusdiyanti, 2008), entrepreneurial competence in the business continuity framework is closely related to the elements and roles in the business environment that can encourage competency improvement and business sustainability. This business environment is known as the concept of an entrepreneurial ecosystem. Building the right entrepreneurial ecosystem is hoped to support optimal business growth and competitive business sustainability for Indonesian cooperatives (Purbasari et al., 2020).

In connection with this explanation, in the digital era today, every organization or business operates

in a business environment characterized by rapid technological changes, constantly changing customer tastes, and intense competition (Droge, Calantone, & Harmancioglu, 2008; Adityawan et al., 2023), and needs to have an effective and efficient innovation to be successful in its operations, in the long run (Kalogiannidis et al., 2022). The digital era also encourages cooperatives to transform into modern cooperatives immediately. It not only provides positive progress but also impacts increasing social inequality. Social Economy and Solidarity (SSE) is a viable alternative to these conditions because it involves companies and organizations, such as cooperatives, associations, foundations, and social enterprises, that produce goods, services, and knowledge with economic and social goals (Borzaga et al., 2017). The Cooperative is the social business model most suitable for Solidarity Economy Enterprises (SEE). It is because cooperatives are based on self-reliance, self-responsibility, democracy, equality, and solidarity (Wijers, 2019).

Modern cooperative structures have become a crucial objective for implementing Social Economy and Solidarity. However, in many instances, previous research has manifested this through various pressures and obstacles associated with the mode of operation, making its perpetuation or advancement difficult or impossible. For the Social Economy and Solidarity to fulfill their social roles in the current environment, the "solidarity entrepreneurial ecosystem" must be strengthened (Morais & Bacic, 2018). Therefore, it is necessary to establish a productive entrepreneurial ecosystem for the Social and Solidarity Economy in order to facilitate the formation, sustainability, and growth of Solidarity Economy Enterprises. Building a robust entrepreneurial ecosystem is a complex and challenging due to a particular region's inherent socioeconomic, political, and cultural characteristics. Establishing an entrepreneurial ecosystem for the Social Economy and Solidarity is crucial to liberating Solidarity Economy enterprises (Morais & Bacic, 2020). Therefore, the study complements the previous research by reviewing Solidarity Entrepreneurial Ecosystem Model concerning modern cooperatives using a very relevant and essential approach, namely a social network analysis approach. From this research, it is hoped that actors and their positions in the Solidarity Entrepreneurial Ecosystem will be found, which play an essential role in supporting modern cooperative success.

This research was conducted in the East Priangan region of West Java, considering several factors. In recognition of Tasikmalaya's status as the City of Cooperatives in Indonesia, the Indonesian Cooperative Monument is located in the East Priangan region, specifically in Tasikmalaya, for historical reasons. Another factor is that all West Java Province stakeholders have consented to construct the eastern portion of the Priangan Tatar Solidarity Economy Enterprises (Noer Soetrisno, 2018). The plan aligns with the direction of West Java's economic development, which is now heading east according to the mandate of the National Development Planning Agency (Bappenas). This work plan is a follow-up from the Ministry of Industry (Kemenperin) to move the industrial area to spur industrial growth east of West Java. The development of the East Priangan Region will undoubtedly positively affect the development of cooperatives in the East Priangan Region, providing much economic potential that cooperatives must utilize (Purbasari et al., 2018). Not only that, but the research on the Solidarity Entrepreneurial Ecosystem model in the Effort Towards Modern Cooperatives in the East Priangan Region also supports the West Java government's policy which is intensively encouraging the digitization of cooperatives to become modern cooperatives (Purbasari & Raharja, 2022).

In connection with the explanation of the significant research on the ecosystem of solidarity-based entrepreneurship, this study attempts to answer the question of how the Solidarity Entrepreneurial Ecosystem Model using a social network analysis approach as an effort toward a modern cooperative by taking the case of modern cooperatives on the East Priangan Region, West Java. The Solidarity Entrepreneurial Ecosystem Model is important because it helps maximize collaboration in developing the quality of cooperative entrepreneurship as an effort towards modern cooperatives in the East Priangan Region, West Java.

2. Literature Review

2.1 Entrepreneurial Ecosystem

A functioning ecosystem is a natural environment and its components, including biotic and abiotic forces. From a business environment perspective (Moore, 1993), the concept of an ecosystem has been adopted, particularly regarding entrepreneurial networks. To thrive in today's competitive environment, businesses must join an ecosystem in which they develop skills, innovate, and progress together. In this sense, ecosystems are progressively transforming business and nature into structured systems from chaotic collections. Moore (1993) argues that ecosystems respond to the need to foster innovation and creativity when determining solutions to economic and social problems. The concept of an entrepreneurial ecosystem extends beyond forming an entrepreneurial network. This understanding encompasses a region's ability to establish a structure of actors and infrastructure that facilitates the development and expansion of pilot business activities (Nicotra M et al., 2017; Purbasari et al., 2018; Purbasari et al., 2023).

Along with the growing emphasis on the importance of the entrepreneurial ecosystem, Isenberg (2010; 2011) defines the entrepreneurial ecosystem as a collection of institutional networks that help entrepreneurs succeed at every stage of creating and developing new businesses. The entrepreneurial ecosystem is an appropriate framework for analyzing the interdependencies and relationships between various actors interacting in complex economic systems, such as individuals, organizations, entities, local, regional, and national institutions, as well as policymakers and stakeholders in a regional context (Axelrod & Cohen, 2000; Nambisan & Baron, 2013; Morris et al., 2015; Neumeyer & Santos, 2017; Purbasari et al., 2023). It can be regarded as a service network where entrepreneurship is the center of activity and a success indicator (Purbasari et al., 2019a).

2.2 Solidarity Entrepreneurial Ecosystem (SEE)

As systematized by Serrano (2015), An ecosystem is a "network of actors" (entrepreneurs, researchers, financiers, and policymakers) that takes into consideration the physical-territorial and cultural characteristics of a territory. This region consists of multiple systems, including a) political systems (alliances and coalitions between social actors and political actors that form the basis of territorial governance), b) the production system (which promotes the formation of a network of actors involved in the production of goods and services), and c) the territorial innovation system (created by several groups of actors involved in generating and diffusing innovations). This "physical component" has sociological, political, and economic implications. The construction of a solidarity entrepreneurial ecosystem is a participatory community process in the constitution of regional cooperatives, where, according to Bajo et al. (2017), cooperatives emerge after the community begins to participate, to a certain degree, in the process of constructing citizenship and its incorporation into the development process along with norms and practices. Consequently, cooperatives can result from a heightened awareness of shared requirements and discovered capacities that transcend social movements (Morais & Bacic, 2020).

"Community participation" is essential to forming and maintaining a solidarity entrepreneurial ecosystem. (Bajo et al., 2017). Community involvement is crucial to forming and maintaining cooperatives in each region. This participation causes the community to assume the role of protagonist in their participation in the co-construction of norms and practices, i.e., as the most significant participatory actors in the co-construction of territorial public policies. Knowledge, political consciousness, and legal means to identify policies and actions; b) access to markets; c) public and fiscal support for start-ups; d) access to financing; e) instruments to promote mutually supportive networks; and f) research development and capacity building in the area (European Commission, 2019; Morais & Bacic, 2020).

In addition to the composition of the ecosystem structure, it is crucial to consider the fundamental role of the actors involved and their efforts and responsibilities in developing a solidarity entrepreneurship ecosystem, which may include entrepreneurs, universities, and participation in the

collaborative development of public policies. In addition, the capacity of actors to recognize the significance of co-evolution will be crucial to the maintenance of leadership in an ecosystem. In other words, the sustainability, maintenance, and evolution of an ecosystem depend on the vitality of the ecosystem as a whole and not on the vitality of its components. Actors or stakeholders must recognize the interdependence between ecosystem organisms and emphasize the collective character of the solidarity entrepreneurial ecosystem network. Consequently, the degree of interconnectivity, i.e., the interdependence of all system components, is an additional fundamental aspect of ecosystem development (Morais & Bacic, 2020).

Based on this explanation, by combining actors in a cooperative-oriented entrepreneurial ecosystem based on previous research conducted by Purbasari et al. (2020) (cooperative entrepreneurs, government, academics, banking, professionals, markets, and social communities), with several components that become part of a coherent organizational structure of the solidarity entrepreneurial ecosystem process (Bajo et al., 2017; European Commission, 2019; Morais & Bacic, 2020), the framework of the solidarity entrepreneurial ecosystem consists of:

a. Cooperative Entrepreneur
b. Academics; access to knowledge, research development, and capacity building in the field, as well as instruments to promote mutually beneficial networks
c. Government: political awareness and legal means to identify policies and actions; public and financial aid for new businesses
d. Market: Accessibility to markets
e. Banking & Investors: Access to financial support
f. Society; society participation

2.3 Modern Cooperative

Over the years, cooperatives have contributed significantly to the global economy. More than 800 million individuals worldwide are estimated to belong to cooperatives, and another 100 million work for cooperative enterprises (Mazzarol & Reboud, 2009). The sixty-fourth session of the United Nations General Assembly proclaimed 2012 the "Year of Cooperatives" in recognition of the cooperative movement's global significance. Cooperatives have been demonstrated to play a crucial role in alleviating poverty, creating jobs, fostering general economic growth, and fostering social transformation (Okem, 2016; International Cooperative Alliance, 2016).

The International Cooperative Alliance (ICA) defines cooperatives as "autonomous associations of persons united voluntarily to meet common economic, social, and cultural needs and aspirations through jointly owned and democratically controlled cooperative enterprises" (International Cooperative Alliance, 2016). Cooperatives benefit consumers, producers, and employees who form or join them. Members are consumers and co-owners of the business. The provision of (some) capital for cooperatives to operate and democratically establish their strategies and policies is required for ownership. Cooperatives can be regarded as market-based enterprises that maximize outcomes for their members and as member-owned social organizations (Wijers, 2019).

The industrial revolution in England established modern cooperatives (Kokkinidis, 2010). Cooperatives are social organizations that are anticipated to share more in societies where economic and power inequality rises and where the need to contend for resources increases market influence (Wijers, 2019). The modern cooperative movement established ICIS (International Cooperative Identity Statement), which promotes global ideals such as self-reliance, self-responsibility, democracy, togetherness, equality, justice, and solidarity (Faedlulloh, 2015; International Cooperative Alliance, 2016). These values are inherited from the Cooperative's pioneers, who emphasized integrity, transparency, and social responsibility. The following is an explanation of each value of modern cooperatives:

1. Self-reliance; The value of self-reliance is based on the belief that every human being must

strive to change his life

2. Self-responsibility; means that members accept responsibility for the cooperative and for themselves. All members must consciously be prepared because responsibility will soon follow. In contrast to a corporation, cooperative members have multiple roles. The owner is automatically the investor. In a cooperative, members are users as well as supervisors of the operation of the Cooperative. Therefore, all cooperative members must have self-awareness in carrying out their responsibilities.
3. Democracy; This means that the implementation of cooperatives must be carried out democratically. In determining the policy of the cooperative, all elements, be it members, administrators, or supervisors, must consult together.
4. Togetherness means the Cooperative's progress or decline results from a collaborative process. So that the Cooperative does not recognize the term "I" but "we."
5. Equality; means that each member has the same position in formulating policies. Achieving this democratization process must be directly proportional to the value of equality applied in cooperatives. Therefore, the Cooperative does not recognize social background, religion, race, or position.
6. Justice; each member is treated fairly according to the level of economic participation or services contributed. Cooperatives place value on distributive justice following the contributions of their members. This logic is constructed as a social engineering step so that the members, who are also owners, participate in building and developing their cooperatives. With the active role of members both on the business and social side, cooperatives can expand their benefits. It applies to every cooperative, consumer, workers' cooperative, or financial.
7. Solidarity; the cooperative movement fosters a sense of solidarity among members as capital in building and developing cooperatives. This solidarity is also a sub of social capital in cooperatives that can impact reciprocity among its members, directly or indirectly.

The seven values above are a source of trust in cooperatives. After the consistent application of these values, trust will present itself. The more it develops, the more significant social capital is fostered and then grows and will undoubtedly bear fruit (Faedlulloh, 2015).

2.4 Social Network Analysis: Network Theory

Frequently, networks exhibit a "together" pattern, demonstrating an extraordinary equilibrium between cooperation and competition. Interactions on the intranet and the internet are predicated on cooperation and conflict (Carayannis & Campbell, 2011). Based on network theory, Social Network Analysis employs the mechanisms and processes of interaction within a network's structure to generate specific outcomes for individuals and groups. (Burt, 1992; Fritsch et al., 2008; Borgatti & Halgin, 2011; Neumeyer & Santos, 2017; Purbasari et al., 2019b; Purbasari et al., 2023). A network consists of actors or components linked by specific ties, such as friendships. These relationships are interdependent to achieve the same objective, establishing a pathway that indirectly connects actors who are not directly linked or bound. Actors then populate the structures created by network bonding patterns. Most network theory research compares network structures and actor positions to group and actor outputs (Borgatti & Halgin, 2011).

Social Network Analysis is relevant to the entrepreneurial ecosystem because ecosystems contain discrete elements interacting with various network configurations. According to Ben Letaifa et al. (2016), ecosystems result from network theory. Network theory can define organizational social interactions and explain relationships between organizations with similar or complementary characteristics that facilitate access to resources and information. Jack & Rose (2010) state that network theory is essential to entrepreneurship research. For value creation, network approaches and strategic thinking can examine the interdependencies and relationships between ecosystem actors (Zahra & Nambisan, 2011; Kapoor & Lee, 2013; Purbasari et al., 2019b). Network theory implicitly incorporates

the components of the entrepreneurial ecosystem. The degree of connection between businesses, government agencies, incubators, accelerator members, investors, and higher education stakeholders influences social network connectivity (Neumeyer & Santos, 2017; Purbasari et al., 2019b; Purbasari et al., 2023).

Studies on the solidarity entrepreneurial ecosystem still need to be more extensive and vital. Studies on the entrepreneurial ecosystems for Solidarity Economy Enterprises are needed based on entrepreneurial processes and ecosystems for financial firms. Making evaluation indicators and monitoring the structure of the solidarity entrepreneurial ecosystem is difficult and complex, but it is one of the biggest tasks of the 21st century (Morais & Bacic, 2020). Recent studies on cooperatives and SSE indicates the increasing significance of public policy in supporting this sector, given its relationship to local development, social inclusion, and resilience practices in regions deemed socially, economically, and politically vulnerable (Bajo et al., 2017). As an effort toward a modern cooperative, this study aims to examine a solidarity entrepreneurial ecosystem using a social network analysis approach.

On the foundation of the above literature summary, researchers developed the research framework represented in the figure below:

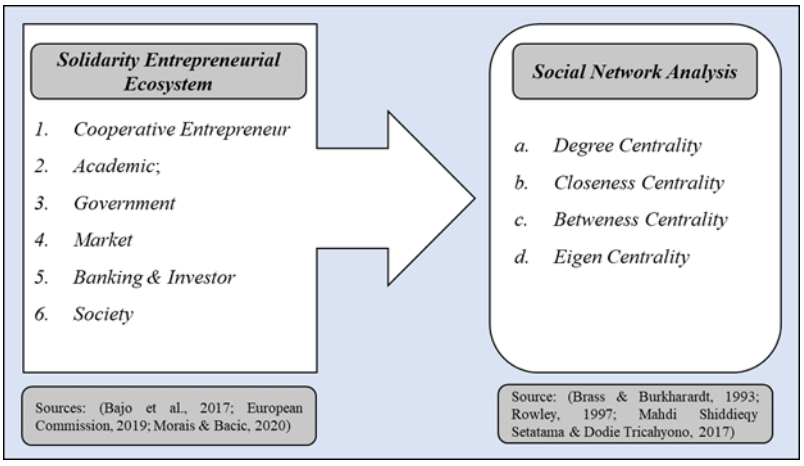

Fig. 1: Research Framework for Solidarity Entrepreneurial Ecosystem With Social Network Analysis (SNA) Approach

3. Research Methodology

This study employs mixed methods, which collect quantitative and qualitative data in a single study, prioritize data collection, and integrate data at one or more research stages (Creswell, 2017). This study uses the SNA approach, where this approach is more frequently used to determine the central node or actor in a network, including degree (degree, betweenness, closeness, and eigenvector centrality) to identify actors who are influential or have a high interaction value in the network (Rowley, 1997; Borgatti et al., 2009; Setatama & Tricahyono, 2017). The position of each actor in the solidarity entrepreneurial ecosystem will be determined from the description of the indicators on these dimensions.

3.1 Respondents and Informants

This study's respondents and informants are cooperative managers in the East Priangan Region. Respondents and informants in this study were selected purposefully (purposive sampling), a sampling method based on specific population-related characteristics (Bougie & Sekaran, 2019). The characteristics of respondents and informants in this study are:

1. Cooperatives located in the East Priangan area
2. Cooperatives with active and certified status

The determination of the size informant is based on the data saturation level derived from the interview's results. The solidarity entrepreneurial ecosystem that will be studied in this research is related to modern cooperatives covering the East Priangan Region, including Sumedang Regency, Garut Regency, and Tasikmalaya City.

An individual analysis is the employed level of analysis (cooperative managers). It is because the solidarity entrepreneurial ecosystem exhibits one of the characteristics of complexity, which is a large number of interconnected networks of actors and factors (relational structure) (Kantis & Federico, 2012), making it challenging to analyze the ecosystem as a whole. A level limit is required (Ben Letaifa et al., 2016). The micro level was chosen to apply network analysis to the entrepreneurial ecosystem (Alvedalen & Boschma, 2017).

3.2 Data Collection

This study used questionnaires and interviews to gather data. The questionnaire in this study was developed to gather data on the dimensions of the ecosystem idea of solidarity entrepreneurship, modern cooperatives, and social network analysis: network theory. The questionnaire contains multiple-choice and open-ended fields to examine the mode and frequency of respondents' responses. The indicators assess conditions and situations without attempting to correlate variables. In-depth interviews were performed to confirm and enrich questionnaire answers. An ordinal scale questionnaire was used in this study. This scale is applied sequentially from low to high or vice versa. The data categories of an ordinal scale are distinct, have logical principles, and are determined by the scale's particular characteristics. The questionnaire collects quantitative data (numbers) that are qualitatively evaluated using a Rating Scale. The selection of the four measurement scales for the questionnaire is based on the respondents' ease of responding (Bougie & Sekaran, 2019).

Table 2: Operationalization Variables

Variabel	Dimension	Data Collection	Measurement
Entrepreneurial Ecosystem Solidarity **(Sources: European Commission 2016; Kim & Jung 2016; Morais & Bacic 2019; Bajo 2017; Morais & Bacic, 2020)**	*a. Cooperative Entrepreneur* *b. Academic* *c. Government* *d. Market* *e. Banking & Investor* *f. Society*	Questionnaire Interview	1. 2 Scale (No and Yes) 2. Open Answer 3. Gephi 9.2
Social Network Analysis (Network Theory) **(Source: Brass & Burkharardt, 1993; Rowley, 1997; Mahdi Shiddieqy Setatama & Dodie Tricahyono, 2017).**	a. Sentralitas (*Centrality*) • *Degree Centrality* • *Closeness Centrality* • *Betweness Centrality* • *Eigen Centrality*	Questionnaire	

Source: Research Results (2022

3.3 Data Processing and Analysis Techniques

This study uses a micro level of analysis (Cooperative Organizations as Cooperative Entrepreneurs) which means the perception used to develop a solidarity entrepreneurial ecosystem model with a social network analysis approach: network theory is the perception of cooperative entrepreneurs (Cooperative Management).

Using the SPSS program, the questionnaire responses from the cooperative management were tabulated. The results of the data tabulation are then used as the data source for the gephi 9.2 application, which is statistically processed to generate a graph of the network structure of the cooperative solidarity entrepreneurial ecosystem in the East Priangan Region. In addition, the resulting network structure will be analyzed using a descriptive method. The centrality dimension is used to develop the network structure of the solidarity entrepreneurial ecosystem. Centrality is a characteristic of a social structure that can provide information about the function of actors within that structure, specifically actors with a solid capacity to connect with other actors (Rowley, 1997; Neumeyer et al., 2017; Purbasari et al., 2023).

Until completion, the processing and analysis of qualitative data derived from in-depth interviews are interactive, so data saturation occurs. Data Analysis includes Data Reduction, Data Display, and Conclusion Drawing/Verification (Miles et al., 2019). The results of the questionnaires and interviews are reduced, triangulated, interpreted (given meaning by the researcher), and validated to accurately describe a situation, individual characteristics, or symptoms that occur in specific groups.

4. Results and Discussion

4.1 Analysis of Solidarity Entrepreneurial Ecosystem Network Structure in the Effort Toward Modern Cooperatives in the East Priangan Region with Social Network Analysis (SNA) Approach

This study uses social network analysis to examine a Solidarity Entrepreneurial Ecosystem in East Priangan, West Java. The Solidarity Entrepreneurial Ecosystem model is developed by generating a network structure within the ecosystem to show the place of each actor in cooperative digitalization. The network structure of the cooperative Solidarity Entrepreneurial Ecosystem in the East Priangan Region of West Java will then be described, analyzed, and concluded. Gephi 9.2 creates the following network structure based on analysis results.

4.1.1 Degree Centrality Indicator

Nodes or actors with many links are central. Degree centrality indicates how many nodes or actors can directly reach each other. According to laboratory data and the degree centrality network's visual structure, the Department of Cooperatives and SMEs (government actors) has the most connections (56) with cooperative actors in the Solidarity Entrepreneurial Ecosystem in the East Priangan Region of West Java.

The Department of Cooperatives and SMEs, as government actors in the Solidarity Entrepreneurial Ecosystem in the East Priangan Region, West Java, is a regional apparatus in West Java Province with the primary responsibility of carrying out government affairs in the field of cooperatives and small businesses, including savings and loan business permits, empowerment, and development of small businesses (https://opendata.jabarprov.go.id/).

The Department of Cooperatives and SMEs has recently instructed cooperatives to overcome the digitalization challenge to embrace the digital era and facilitate cooperative management activities. The Department of Cooperatives and SMEs play a role in digitizing cooperatives through cooperative digitalization training activities funded by the Non-Physical Special Allocation Fund. The training focuses primarily on financial technology-related topics. Manual recording gradually gave way to digital recording. The goal of digitalization training for cooperatives is to enhance the capacity of human resources, in this case, the management or administrators, to manage cooperatives and facilitate monitoring activities and financial reports. Nonetheless, digitalization or a computer-based cooperative administration system is unquestionably a Department of Cooperatives and SMEs priority now.

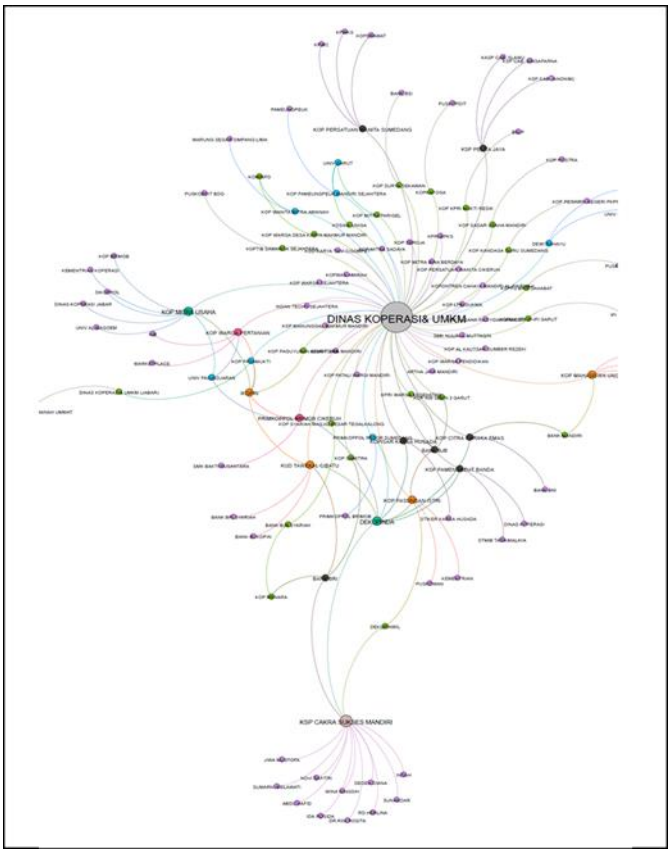

Fig. 2: Degree Centrality Network Structure
(Source: Gephi 9.2 Results, 2022)

The Department of Cooperatives and SMEs collaborated with Dekopindo and the Ministry of Cooperatives to organize digitalization training for cooperatives. In this digitalization training, the Department of Cooperatives and SMEs and Dekopindo assist cooperatives in utilizing digital applications for financial reporting. Dekopindo socializes digital applications to cooperatives to facilitate the process of digitizing cooperatives, with cooperatives having the option to purchase the application based on their requirements. The research findings indicate a shift in the attitudes and mentalities of cooperative managers, who are increasingly aware that digital applications can mitigate deficiencies in preparing financial reports and monitoring operational processes. If something is inappropriate, it is simple to investigate, making it more straightforward for cooperative administrators to produce accurate financial reports.

The government's efforts are consistent with its stated function in Government Regulation (PP) No. 7 of 2021 on the Ease, Protection, and Empowerment of Cooperatives and Micro, Small, and Medium-Sized Enterprises. This regulation encourages cooperatives to undergo digital transformation to enhance their competitiveness. If the government's efforts can be carried out sustainably, its goal of establishing 500 modern cooperatives by 2024 will be achieved (Syaiful et al., 2022).

4.1.2 Closeness Centrality Indicator

Closeness centrality is the average length of the shortest path between a node or actor and the rest of the graph. The amount of central nodes or actors enhances their proximity to all others. A node or actor's proximity centrality determines its network communication speed.

According to laboratory data and the Closeness centrality network structure (see Figure 10), KSP (Savings and Loan Cooperatives) CAKRA SUKSES MANDIRI (cooperative actor) has the quickest path (highest closeness centrality (1)). In the East Priangan Region of West Java's Solidarity Entrepreneurial Ecosystem, this KSP CAKRA SUKSES MANDIRI has emerged as the agent with the most remarkable ability for knowledge and information dissemination.

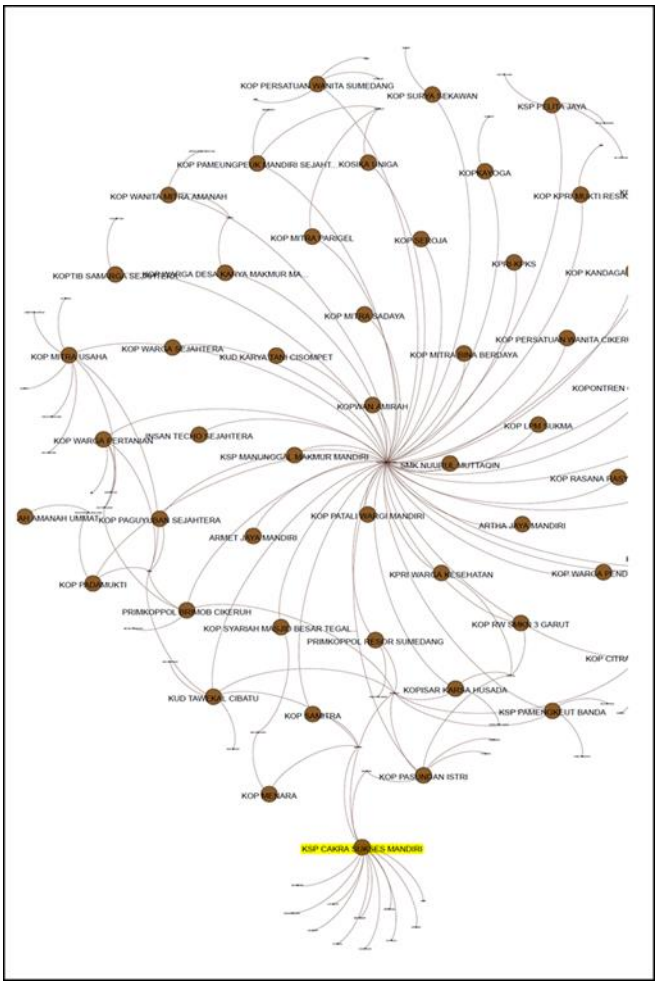

Fig. 3: Closeness Centrality Network Structure
(Source: Gephi 9.2 Results, 2022)

The actors' position within the Solidarity Entrepreneurial Ecosystem network will facilitate the rapid transmission of information and knowledge during digital transformation. KSP CAKRA SUKSES MANDIRI is positioned to mediate between the two most numerous actors in the Solidarity Entrepreneurial Ecosystem in this study. Consequently, many actors will rely on KSP CAKRA SUKSES MANDIRI in the context of interactions with other actors in order to acquire the required resources for digital transformation.

KSP CAKRA SUKSES MANDIRI is a savings and loan cooperative in the Garut Regency. Several parties were digitizing KSP CAKRA SUKSES MANDIRI, including other cooperatives, the Government (Department of Cooperatives and SMEs, Dekopinda and Dekopinwil), banks, investors, and the market. With all actors connected to KSP CAKRA SUKSES MANDIRI and based on the network structure of the closeness of centrality, KSP CAKRA SUKSES MANDIRI can be understood as actors who can disseminate knowledge and information to all actors involved in the Solidarity Entrepreneurial Ecosystem in the East Priangan Region, West Java.

Cooperative actors must recognize that the current era of technological development demands the digital transformation of cooperatives in Indonesia. The existence of cooperatives as one of the economic actors in Indonesia plays a crucial role in the national economy (Fatimah dan Darna, 2011; Diffa et al., 2021). As an institution, cooperatives must be managed similarly to commercial institutions (Sujarwo & Listiawati, 2019). As community-based organizations with an established identity, cooperatives can lead global social and economic initiatives and solidarity (Iyer et al., 2021). Therefore, KSP CAKRA SUKSES MANDIRI, with its essential role in the network structure of the Solidarity Entrepreneurial Ecosystem, must be able to support and assist other cooperative actors in the process of accelerating the digital transformation to become modern cooperatives so that cooperatives in the East Priangan Region can be competitive and sustainable in the digital age.

4.1.3 Betweenness Centrality Indicator

Betweenness Centrality is measured by measuring the number of times a node acts as a direct intermediary between two other nodes along the quickest path.

According to laboratory data and the betweenness centrality network structure (Figure 11), the Solidarity Entrepreneurial Ecosystem in the East Priangan Region, West Java, does not have a single actor with the most direct route (direct mediation) between two nodes or actors in the network structure. Actors make 0. No intermediary directly mediates two nodes or actors in West Java's East Priangan Solidarity Entrepreneurial Ecosystem.

Thus, none of the betweenness centrality network structure actors can act as an intermediary with the most direct path (direct mediation) between the two actors in the Solidarity Entrepreneurial Ecosystem network in the East Priangan Region, West Java. All actors in the East Priangan Region of West Java's Solidarity Entrepreneurial Ecosystem network have the same potential and position to mediate between the two actors.

Cooperatives are a form of social and solidarity economy (SSE) in which various corporate and organizational actors, mainly cooperatives, communities, associations, foundations, and social enterprises, create goods, services, and knowledge with economic and social objectives (Morais & Bacic, 2018). As a social and solidarity economy, cooperatives help overcome barriers to sustainable growth (Utting, 2018). Thus, actors in the betweenness centrality dimension of the Solidarity Entrepreneurial Ecosystem network structure in the East Priangan Region of West Java may hinder knowledge and information dissemination in the context of digital transformation to become a modern cooperative. All actors, incredibly cooperative actors, must pay attention to this in order to develop and expand their network in order to strengthen connectivity by utilizing the position of the intermediary actor with the most direct path (direct mediation) between two actors (betweenness centrality) in the network structure of the Solidarity Entrepreneurial Ecosystem in the East Priangan Region. It will help cooperatives in the East Priangan Region optimize their digital transformation efforts by using intermediary actors in the network structure.

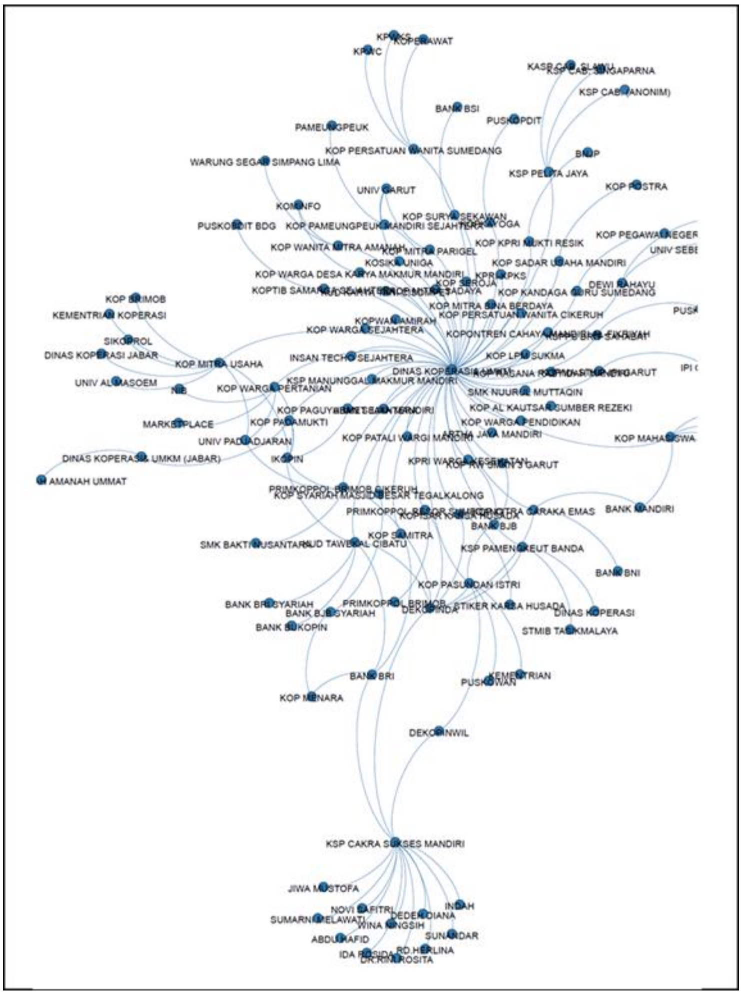

Fig. 4: Betweenness Centrality Network Structure
(Source: Gephi 9.2 Results, 2022)

4.1.4 Eigencentrality Indicators

Eigencentrality (also referred to as Eigenvector centrality) measures network node or actor effect. Eigencentrality determines this node or actor's connectivity. This measurement indicates a social network node or actor's relevance.

According to laboratory data and the eigencentrality network structure, the Department of Cooperatives and SMEs (government actors) is well connected to nodes and other actors in the Solidarity Entrepreneurial Ecosystem in the East Priangan Region (Figure 12). The measurement results support the previous finding on the prior dimension that the Department of Cooperatives and SMEs is the most central actor in the Solidarity Entrepreneurial Ecosystem in the East Priangan Region of West Java.

According to questionnaire calculation and gephi application, the Department of Cooperatives and SMEs has the most connections and is the most important and involved actor in the Solidarity Entrepreneurial Ecosystem in the East Priangan Region, West Java, especially in cooperative digitalization.

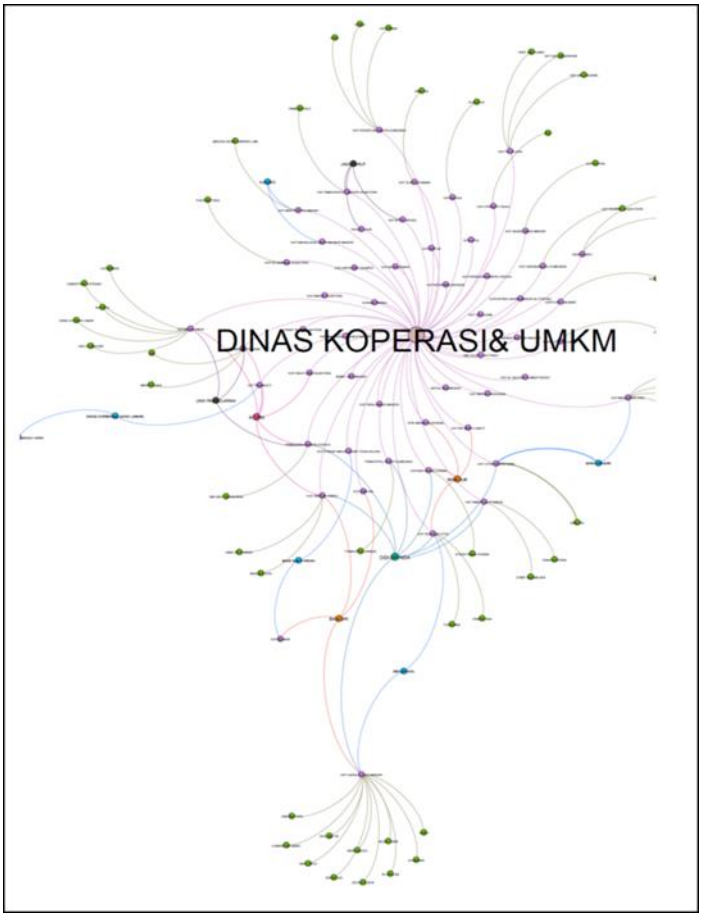

Fig. 5: Eigencentrality Network Structure
(Source: Gephi 9.2 Results, 2022)

5. Conclusions and Recommendations

Based on the results and discussion, according to the centrality dimension study on the network structure of the Solidarity Entrepreneurial Ecosystem in the East Priangan Region, West Java, the Department of Cooperatives and SMEs (government actors) is the most important actor. The Department of Cooperatives and SMEs have the most connections (degree centrality) and are the most significant government actor in the East Priangan Region, West Java Solidarity Entrepreneurial Ecosystem (eigencentrality). The KSP (Savings and Loan Cooperatives) CAKRA SUKSES MANDIRI is a cooperative actor with the most significant ability to disseminate knowledge and information (closeness centrality) to all actors in the Solidarity Entrepreneurial Ecosystem in East Priangan, West Java. In the meantime, no actor in the Solidarity Entrepreneurial Ecosystem network in East Priangan, West Java, is the best position to act as a mediator in the most direct way (direct mediation) between the two actors.

Some helpful advice is provided. According to the study, most cooperatives in the East Priangan Region of West Java are not linked to colleges, markets, banks, investors, or the social community associated with the digital transformation of cooperatives in the Solidarity Entrepreneurial Ecosystem. Each actor has particular abilities that can accelerate cooperatives' digital transformation. Cooperatives should open their connections to these actors by exploring collaboration opportunities, especially in digital transformation.

Further research should be done to extend the study of the Solidarity Entrepreneurial Ecosystem by including all actors, not just cooperative actors. By integrating all actors' perspectives, a complete model of the Solidarity Entrepreneurial Ecosystem can be created. Stakeholders, particularly policymakers (the government), can use this study to formulate and determine suitable strategies and policies for digitizing cooperatives in the East Priangan Region of West Java. Cooperatives can create affordable and user-friendly applications for all their business processes by optimizing training and consistently

promoting cooperative digitalization with university business incubators and skilled IT experts. The resulting policy is expected to affect cooperatives' competitiveness in the digital era positively.

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