

---

## **An Investigation of Organizational Cooperation Based on Spatial Data Sharing and Interoperability**

**Fatih TAKTAK<sup>1</sup>,**

Asst. Prof. Dr.

Usak University, *Faculty of Engineering,*

Department of Geomatic Engineering, Usak, Turkey.

**Hulya DEMIR<sup>2</sup>,**

Prof. Dr.

Yildiz Technical University, *Faculty of Civil Engineering*

Department of Geomatic Engineering, Istanbul, Turkey.

### **Abstract**

Collection, processing, storage of information and communications network that provides transmission from place to place through networks is important. A functional and physical communication network among the public institutions, the local governments, the private sector and all sectors doing business with Spatial Data is available. Communicative compatibility that operative according to a certain hierarchy is extremely an important dynamic in terms of the productivity and efficiency of the system. Collaboration between institutions or individuals is realized through informal networks that are not bound to designated rules. Taking advantage of the network analysis, Existing collaborations and communication networks can be formally presented. In this study, the relationship between public bodies, local governments, private sectors and all the sectors working with spatial data was examined socially, and an effort was made to reveal the collaboration system which the institutions built unawares and are running without adhering to any rules through "social networks" for the first time.

The questions in the face-to-face survey with the institutions that selected to show their cooperation within the network were tried to be revealed. By evaluating the obtained networks, at the national level, it were made suggestions that would be useful and could lead.

**Keywords:** Spatial Data Sharing, Interoperability, Organizational Communication, Organizational Network, Social Network Analysis

## **INTRODUCTION**

The improving computer technologies have made it possible for official/unofficial communication or relation networks between individuals or, more generally, all kinds of actors to be materialized. To this end, several softwares have been made available for academic or specialist communities. It thus has paved the way for building a social network model desired for many applications and benefiting from the properties and findings obtained. Concept of social network was first used by Ferdinand Tönnies and Emile Durkheim in 1800s, and it provided the basis for today's social network analysis (SNA). In 1900s, J. Barnes conducted a more systematic study on a certain group, and therefore, is considered to be the founder of social network analysis. Barnes defined the social network in 1950s a structure of connections. Thanks to Barnes, academic or specialist communities started to focus on the subject more and more, and many researches have been performed for the use of the computer technologies developed recently and limitless applications (Freeman 2004, Scott and Carrington 2011, Chan and Liebowitz 2006).

National spatial data infrastructures are a system that leads up to interoperability, enabling either horizontal or vertical effective data sharing, immediate access to services and use required by related persons from all public bodies, local governments, private sector and all sectors which work with spatial data. It is a comprehensive application which is built so that institutions can access the data they require fast, economically and productively to operate. Technological applications based on the spatial data have been increasing day by day, and so the number of users accordingly (Craglia and Campagna 2010, Bregt et al. 2008).

It is necessary to determine the functional, physical and hierarchic boundaries of the institutions and ensure an efficient cooperation between them for an interinstitutional data sharing today. The system to build the invisible interinstitutional cooperation is social network. SNA which can be also defined as digitalizing and making the relationships between the actors scientific is used to turn the intra and interorganizational relationship networks into digital data. Since the shape and properties of the network obtained based on the digitalized data will present the productivity of the institutional or interinstitutional communication network, it shows how to take necessary precautions or provide support on the topics analyzed (Chan 2001, Cromptvoets et al. 2008, Cromptvoets et al. 2010; Peng et al. 2016).

In this study, an application was implemented to have an opinion about the institutional functioning of NPDI in our country and its perception by related persons. It is aimed to reveal the relationship network between the public bodies, local government, private sector and other sectors working with spatial data which produce spatial data in district of Usak province and get information about the current status of the national spatial data infrastructure. This is a study

which will be able to present the interoperability of the institutions unawares and without adhering to any rules through the social, not technical, examination of the interinstitutional relationship network. The social network analysis was examined and the organizational structure between the institutions was revealed.

## **SOCIAL NETWORK ANALYSIS**

SNA is defined as a method that investigates the interpersonal social relationship structures, an analytical framework for examining the relationships between social beings and researches of mapping and measuring the relationships between social actors (Adkins, 2008; Kale, 2007; Zhou, 2008). SNA is based on the assumption of the importance of the relationship between the interactional groups. Social beings defined as actors are shown as nodes on the level. Social relationships affect how people feel as a result of their experiences, in other words, their subjective spaces and to which information and resources they can access with these experiences (Hawe and Ghali, 2008; Budhiraja and Khatri, 2013). The benefit of the SNA is that it provides the opportunity to define the relationships between people and then examine their ways of being connected to each other (Haythornthwaite, 2005; Firestone et al., 2012; Firestone et al., 2011).

SNA is a method often utilized to reveal the social dynamics in sociological and organizational studies. It is also used to determine the information sharing patterns in education and online learning communities and understand the social capital accumulation in the network. Since information is an important factor in the generation of wealth, economic actors want to direct the information to themselves (Harrer, 2006; Niles-Yokum, 2015). This is one of the reasons that make SNA important. The question "In which circumstances can the people who are closer to the information use this as an advantage?" can be answered with SNA (Gürsakal, 2009; Sorenson, 2006; Zhao, 2013).

SNA which is based on the assumption of the importance of the relationship between the interactional groups is the analysis of all kinds of relationship between institutions, people or groups shown as nodes on the line, in general, the actors who are in relationship with each other. The aim of SNA is to examine the structure of a social network, make deductions about an institution or group and produce information (Demir and Taktak, 2011; Cook et al., 2013).

SNA focuses on the connections between the actors in the network rather than their qualities in the process of examining the network structure. Certain values obtained as a result of identifying the relationships between the actors in the network and digitalizing them during the analysis are called "measures" (Hanneman and Riddle, 2005; Gencer et al., 2009). Through measures such as density, centrality and closeness used in SNA, the networks are mixed, their types are identified, the complex structure of the networks is analyzed and the network becomes more

understandable. The position, connections and weak or strong sides of an actor in the social network can be revealed by determining the measures such as density and centrality of a network (Gürsakar, 2009). Various measures can be obtained by performing the SNA at different levels. When an analysis is conducted for the network generally, different measures are determined in the examination of the subgroups in the network and the evaluation of each actor in the network (Hanneman and Riddle, 2005; Gencer et al., 2009). Even though there are different denominations, each being is called "node"; each connection/relationship between the beings is called "connection" in the network basically. Since the connections between two nodes in visualization applications are shown with a line that connects the nodes to each other, they are generally called "edge" (Chakrabarti, 2003).

Certain measuring methods are utilized in the social network analysis to explain the position of the actors within the network, identify the relationship between the actors and defined the network as a whole (Jablin and Putnam, 2001).

#### **a- Social network mechanism measures used for actors and network mechanisms**

By using degree, indegree, outdegree, range, closeness, betweenness, centrality, prestige, roles of the actors in the network mechanism, intensity, centralization and Dimensional Network science, very large networks can be modeled, the resistance and reliability of the networks can be analyzed, mathematical algorithms needed for all these experiments and measures can be developed and the relationship between the architecture and functions of the network can be understand more comprehensively (Gürsakar, 2009; Chakrabarti, 2003).

Centralization provides information about the position of the network. If the network has intensified on one or more actors, there is centralization in the network mechanism. The fact which actors are on the edge in the network mechanism is expressed with the position the actor takes within the network mechanism. The distress in the network is whether "a node has been formed in the center" or "several centers are available across the network". The network is studied in three parts in terms of centrality. These are degree, closeness, and betweenness. Their definitions are given in Table 1 (Scott, 1991; Freeman, 2004; Barnett, 2011).

**Table 1:** Social network mechanism measures used for actors

Measure	Definition
<b>Degree</b>	Number of direct connections to other actors.
<b>Indegree</b>	Number of connections of other elements to the actor (receiving connections).
<b>Outdegree</b>	Number of connections of the actor to other elements (sending connections).
<b>Closeness</b>	The closeness of an actor to other actors within the network or the degree of accessibility. It is generally calculated by averaging an actor's path distance (direct or indirect connections) to all others. While a direct relation is valued at 1, indirect relations are valued at a lower number proportionately.
<b>Betweenness</b>	It is the degree of an actor's preference to be or intermediate between two actors which are closest to each in the network mechanism. It is generally calculated according to the average of all possible bilateral relations in the network.
<b>Centrality</b>	It is the measure of an actor's degree of being positioned in the center in the network mechanism. The measures of degree, closeness, and betweenness are generally used as the determinants of the centrality. Some centrality measures weight an actor's relation with others by using others' degree of centrality.
<b>Density</b>	The ration between current connections and possible connections in the network mechanism.

## INSTITUTIONAL COMMUNICATION

It is possible for institutions to realize their common objective only when they communicate with each other; and only then they can continue their operation. Communication is an element that can exist between individuals and between individuals and groups including the inner communication of the person and that coordinates the organizational structure (Erogluer, 2011; Belasen, 2008).

Institutional communication is the production, transmission and interpretation of the data flow to coordinate the operations of the organization members so that the organizational objectives can be achieved and coordinate the hierarchic structure (Tutar, 2003). Communication is important for keeping the people who are the basic unit of the organization together and enabling the whole organization to work as effectively as possible. The interinstitutional communication is required in every large or small organization. Effective and sufficient communication is needed for establishing and maintaining an organization. The larger the organizations get, the more the quality of the organization communication is needed. The most important factor that provides the positive interaction between the individuals in an organization is the intraorganizational communication (Kalla, 2005; Cees Van Riel and Fombrun, 2007).

---

**APPLICATION**

Within the scope of the institutions in Usak province shown in Table 2, the cooperation of the institutions which produce or use spatial data was investigated with SNA method. Statistical and visual evaluations were made with the software NetMiner 4 which is a SNA software and preferred in scientific publications. In total, the survey is conducted with 24 pcs state institutions and private sector.

**Table 2:** Institutions surveyed in Usak province

<b>Name of Institution</b>	<b>Abbreviation</b>
Usak Municipality	UM
Special Provincial Administration	SPA
State Hydraulic Works	SHW
Housing Development Administration	HDA
Forest Management Directorate	FMD
The Directorate of Highways	DH
Department of Environment and Urbanization	DEU
Directorate of Title Deed Registry and Cadastre	DTDRC
Foundations	F
Turkish Electricity Distribution Company	TEDC
Governorship	G
Provincial Directorate of Agriculture	PDA
Real Estate Agent	REA
Banks	B
National Real Estate Department	NRED
Licensed Bureau of Surveying Engineering	LBSE
Telecom Directorate	TD
Directorate of Disaster Affairs	DDA
Independent Survey and Cadastre Office	ISCO
Chamber of Commerce	CC
Chamber of Agriculture	CA
Directorate of Museums	DM
University of Usak	UU
Courts	C

**a- Relations showing the cooperation within the network**

It is impossible to achieve institutional and social goals without a good intra and interinstitutional coordination and cooperation. Stability and development is achieved through interinstitutional cooperation and harmony. As institutional relations are managed healthily, the social development gets easier. In this context, survey questions 1, 2, 3, and 4 given in Table 3

which are capable of presenting the intra-network cooperation were asked to related persons.

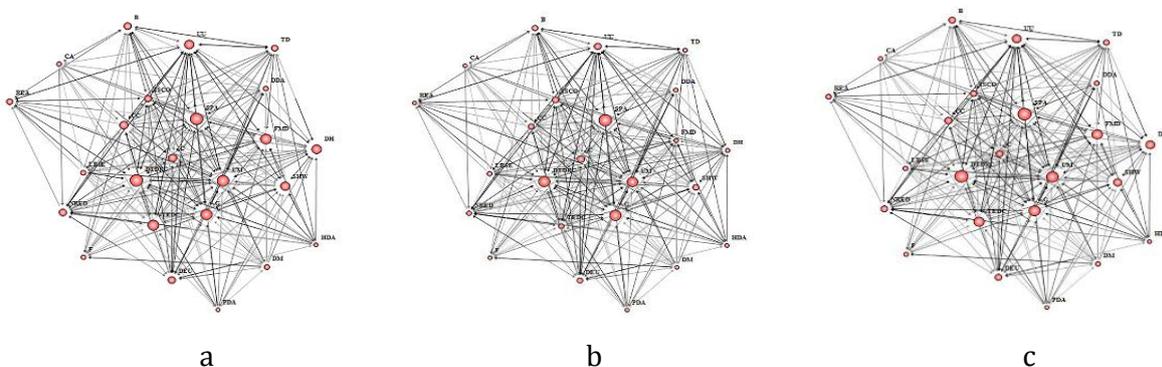
While preparing the survey questions, the book "hidden power of the social network" are utilized (Cross and Parker, 2004). The written book in this area; cooperation, sharing, solidarity and information about the decision-making processes are taken into account.

The four questions of The survey part forms that all the negotiations between other institutions of social life, in order to determine the information exchange and social cooperation was prepared under the main title " **Relations Showing the Cooperation within the Network** ". As the scale of the survey questions, the most appropriate "Likert scale" is used. As the number scales; predominantly representation of figure is considered to be from 0 to 8.

**Table 3: Social network analysis survey questions**

Relations Showing the Cooperation within the Network	
	←—————→ I disagree I agree
1 How often do you meet the institutions mentioned below? (in a year)	0 1 2 3 4 5 6 7 8
2 How often have you received the necessary information from these institutions in the recent year?	0 1 2 3 4 5 6 7 8
3 To what extent do these institutions provide the necessary information for your business?	0 1 2 3 4 5 6 7 8
4 How often do you give the information you produce at your institution to which institutions?	0 1 2 3 4 5 6 7 8

**Survey Question 1:** Each institution surveyed in Usak province was asked "How often do you meet the institutions mentioned below?", and network and centrality charts were obtained with the evaluation of the data obtained from the answers. The density of communication between/request of meeting with actors is shown in (Fig-1).



**Fig- 1:** According to the answers given to the first questions, for the actors and the relations between them;

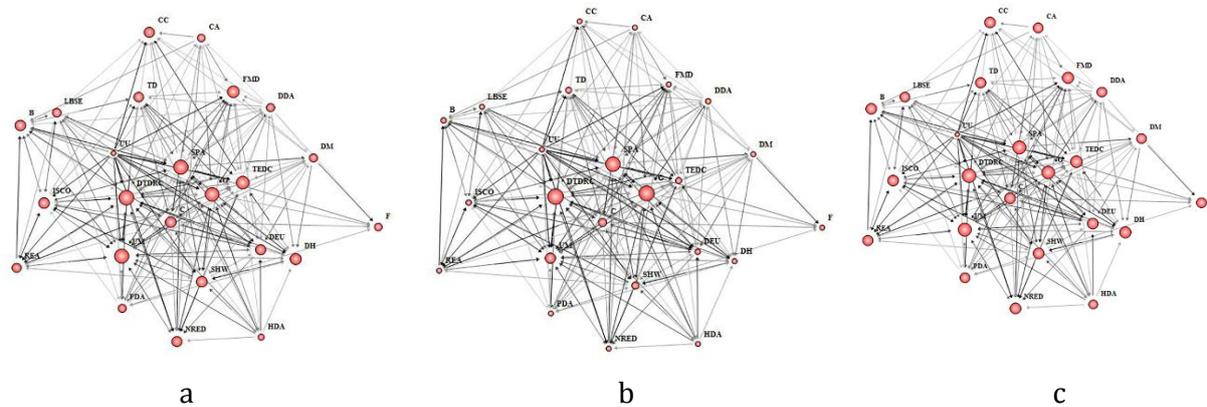
- a) Degree network map and degree centrality chart
- b) Betweenness network map and betweenness centrality chart
- c) Closeness network map and closeness centrality chart.

In Table 4 indegree, outdegree, in closeness, out closeness and betweenness values calculated according to the answers given to the first survey question by the public bodies, that is, actors are shown for three institutions each that have the highest and the lowest value. In this study, indegree centrality was examined and analyzed according to the sum of number of relation/meeting directly requested from a public body by other institutions and the fact how many different institutions this relation/meeting request came from. Similarly, outdegree centrality was calculated using matrixes built with the sum of number of relation/meeting directly requested from a public body by other institutions and the fact how many different institutions this relation/meeting request came from.

**Table 4: "How often do you meet the institutions mentioned below?" question's maximum and minimum results of in/outdegree, betweenness, and in/outcloseness values**

		Maximum		Minimum
<b>internal degrees</b>	Directorate of Title Deed Registry and Cadastre	1,000	Housing Development Administration	0,304
	Special Provincial Administration	1,000	Provincial Directorate of Agriculture	0,304
	Usak Municipality	0,957	Foundations	0,391
<b>external degrees</b>	Governorship	0,957	Foundations	0,261
	Special Provincial Administration	0,957	real estate agent	0,304
	Directorate of Title Deed Registry and Cadastre	0,913	Forest Management Directorate	0,391
<b>betweenness</b>	Special Provincial Administration	0,060	Provincial Directorate of Agriculture	0,000
	Directorate of Title Deed Registry and Cadastre	0,054	Chamber of Agriculture	0,001
	Usak Municipality	0,046	Foundations	0,001
<b>internal closeness</b>	Special Provincial Administration	1,000	Housing Development Administration	0,590
	Directorate of Title Deed Registry and Cadastre	1,000	Provincial Directorate of Agriculture	0,590
	Usak Municipality	0,958	Chamber of Agriculture	0,622
<b>external closeness</b>	Special Provincial Administration	0,958	Forest Management Directorate	0,622
	Governorship	0,958	The Directorate of Highways	0,622
	Courts	0,958	Chamber of Agriculture	0,639

**Survey Question 2:** Each institution surveyed in Usak province was asked "How often have you received the necessary information from these institutions in the recent year?", and network and centrality charts were obtained with the evaluation of the data obtained from the answers. The general overview of actors and relations between them is shown in (Fig- 2).



**Fig- 2:** According to the answers given to the second questions, for the actors and the relations between them;

- a) Degree network map and degree centrality chart
- b) Betweenness network map and betweenness centrality chart
- c) Closeness network map and closeness centrality chart

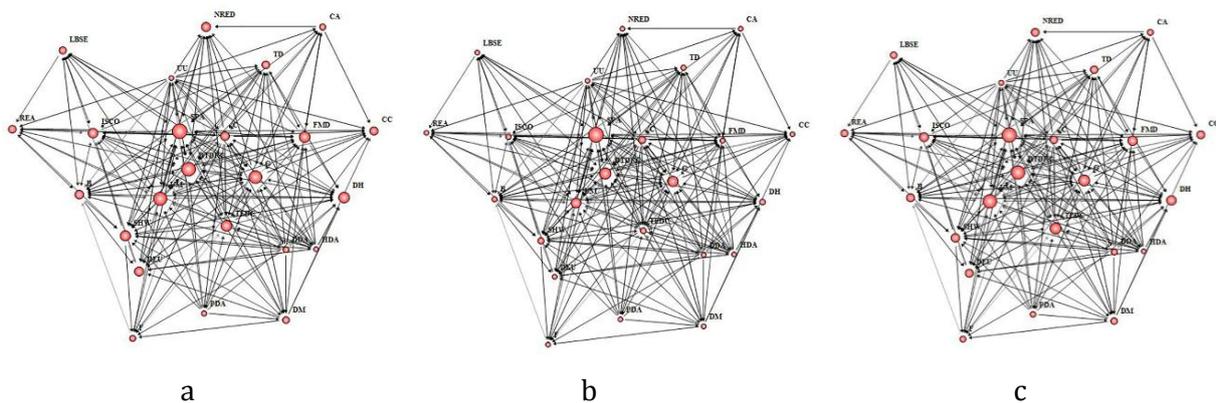
In Table 5 indegree, outdegree, in closeness, out closeness and betweenness values calculated according to the answers given to the second survey question by the public bodies, that is, actors are shown for three institutions each that have the highest and the lowest value.

**Table 5:** "How often have you received the necessary information from these institutions in the recent year?" question's maximum and minimum results of in/outdegree, betweenness, and in/out closeness values

		Maximum	Minimum
<b>internal degrees</b>	Directorate of Title Deed Registry and Cadastre	0,870	Foundations 0,000
	Usak Municipality	0,826	Chamber of Commerce 0,000
	Special Provincial Administration	0,826	National Real Estate Department 0,130
<b>external degrees</b>	Courts	0,913	Foundations 0,000
	Governorship	0,913	Chamber of Commerce 0,000
	Special Provincial Administration	0,913	Forest Management Directorate 0,087
<b>betweenness</b>	Directorate of Title Deed Registry and Cadastre	0,094	University of Usak 0,000
	Governorship	0,093	Chamber of Agriculture 0,000

	Special Administration	Provincial	0,086	Forest Directorate	Management	0,000
<b>internal</b>	Directorate of Title Deed Registry and Cadastre.		0,872	University of Usak		0,000
<b>closeness</b>	Usak Municipality		0,834	Housing Administration	Development	0,457
	Special Administration	Provincial	0,834	Chamber of Agriculture		0,533
<b>external</b>	Courts		0,915	Chamber of Commerce		0,000
<b>closeness</b>	Governorship		0,915	Foundations		0,000
	Special Administration	Provincial	0,915	National Real Estate Department		0,501

**Survey Question 3:** Each institution surveyed in Usak province was asked "How often have you received the necessary information from these institutions in the recent year?", and network and centrality charts were obtained with the evaluation of the answers. The general overview of actors and relations between them is shown in (Fig- 3).



**Fig- 3:** According to the answers given to the third questions, for the actors and the relations between them;

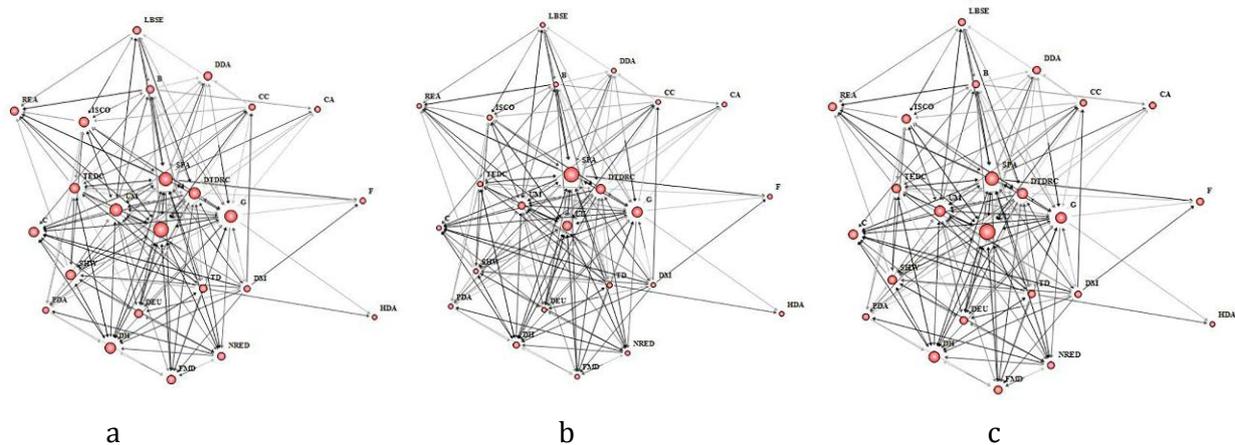
- a) Degree network map and degree centrality chart
- b) Betweenness network map and betweenness centrality chart
- c) Closeness network map and closeness centrality chart

In Table 6 indegree, outdegree, in closeness, out closeness and betweenness values calculated according to the answers given to the second survey question by the public bodies, that is, actors are shown for three institutions each that have the highest and the lowest value.

**Table 6:** "To what extent do these institutions provide the necessary information for your business?" question's maximum and minimum results of in/outdegree, betweenness, and in/out closeness values

			Maximum		Minimum
<b>internal degrees</b>	Special Administration	Provincial	0,957	University of Usak	0,130
	Usak Municipality		0,913	Housing Development Administration	0,130
	Directorate of Title Deed Registry and Cadastre		0,913	Provincial Directorate of Agriculture	0,217
<b>external degrees</b>	Special Administration	Provincial	0,957	National Real Estate Department	0,130
	Courts		0,957	Foundations	0,261
	Directorate of Title Deed Registry and Cadastre		0,870	real estate agent	0,261
<b>betweenness</b>	Special Administration	Provincial	0,131	Chamber of Commerce	0,000
	Directorate of Title Deed Registry and Cadastre		0,089	Chamber of Agriculture	0,000
	Governorship		0,078	National Real Estate Department	0,000
<b>internal closeness</b>	Special Administration	Provincial	0,957	Housing Development Administration	0,468
	Usak Municipality		0,915	University of Usak	0,513
	Directorate of Title Deed Registry and Cadastre		0,915	Provincial Directorate of Agriculture	0,540
<b>external closeness</b>	Special Administration	Provincial	0,958	Chamber of Commerce	0,000
	Courts		0,958	National Real Estate Department	0,523
	Governorship		0,920	real estate agent	0,561

**Survey Question 4:** Each institution surveyed in Usak province was asked "How often do you give the information you produce at your institution to which institutions?", and network and centrality charts were obtained with the evaluation of the data. The general overview of actors and relations between them is shown in (Fig- 4).



**Fig- 4:** According to the answers given to the fourth questions, for the actors and the relations between them;

- a) Degree network map and degree centrality chart
- b) Betweenness network map and betweenness centrality chart
- c) Closeness network map and closeness centrality chart

In Table 7 indegree, outdegree, in closeness, out closeness and betweenness values calculated according to the answers given to the second survey question by the public bodies, that is, actors are shown for three institutions each that have the highest and the lowest value.

**Table 7:** "How often do you give the information you produce at your institution to which institutions?" question's maximum and minimum results of in/outdegree, betweenness, and in/out closeness values

			Maximum		Minimum
<b>internal degrees</b>	University of Usak		0,783	Chamber of Agriculture	0,174
	Special Provincial Administration		0,696	Foundations	0,174
	Usak Municipality		0,609	Directorate of Museums	0,217
<b>external degrees</b>	Special Provincial Administration		0,957	Courts	0,000
	Directorate of Title Deed Registry and Cadastre		0,957	Foundations	0,000
	TEDAS		0,957	Housing Development Administration	0,000
<b>betweenness</b>	Special Provincial Administration		0,186	Chamber of Agriculture	0,000
	Governorship		0,103	Real estate agent	0,000
	Directorate of Title Deed		0,087	Foundations	0,000

Registry and Cadastre					
<b>internal closeness</b>	University of Usak		0,791	Housing Development Administration	0,399
	Special Administration	Provincial	0,725	Chamber of Commerce	0,470
	The Directorate of Highways		0,621	Chamber of Agriculture	0,470
<b>external closeness</b>	Special Administration	Provincial	0,958	Housing Development Administration	0,000
	Directorate of Title Deed Registry and Cadastre		0,958	Foundations	0,000
	Governorship		0,958	Courts	0,000

The first evaluation was performed for the density measurements so that the complex structure of the network can be analyzed and the network can be understandable (Table 8). The density of the number of the links between the nodes of a network means that actors (institutions) know each other or there is more interaction. The maximum number of links that can form in the network in the SNA performed for twenty four institutions (n) in the thesis study is 552 (n\*(n-1)). Calculations of "general density of the network according to the number of links" given in Table 8 shows what percentage of the connections which can be built has been realized potentially.

**Table 8:** Density evaluation concerning the networks

Relations	Findings	Number of links presented (1)	Network's general density according to the number of links (2) = (1)/552	Realization level
Cooperation in the network	Institutions' frequency of meeting with each other	352	0.638	Upper intermediate
	Institutions' frequency of receiving information from each other	263	0.476	Intermediate
	Institutions' competence or productivity of providing each other with the information they need	277	0.502	Intermediate
	Institutions' frequency of providing each other with information	213	0.386	Lower intermediate

When the cooperation in the network in Table 8 is examined, institutions' frequency of receiving information from each other, their competence or productivity of providing each other with data and their frequency of providing each other with information which are important in terms of NPDI and can be the basic indicators of an cooperation are at intermediate or lower intermediate

level even though institutions' frequency of meeting with each other is upper intermediate. The fact that "Realization level" found by considering the general density of the network according to the number of links shows that institutions of which the network was built within the scope of NPDI are not strongly linked to each other and they are almost alienated from each other.

**Table 9:** Evaluation of indegree centrality of the networks

Relationships	Identifieds	Most	Least
the within	The frequency of meetings with each of the institutions	DTDRC and SPA	HDA and PDA
	The frequency of getting information from each of the institutions	DTDRC	F and CC
Cooperation network	Adequacy or efficiency in providing the information needed to each of the institutions	SPA	UU and HDA
	The frequency of providing information between institutions	UU	CA and F

**Table 10:** Evaluation of outdegree centrality of the networks

Relationships	Identifieds	Most	Least
the within	The frequency of meetings with each of the institutions	SPA, G	F
	The frequency of getting information from each of the institutions	C, G and SPA	F, CC
Cooperation network	Adequacy or efficiency in providing the information needed to each of the institutions	SPA, C	NRED
	The frequency of providing information between institutions	SPA, DTDRC and TEDC	C, F and HDA

When the indegree centrality in Table 9 is examined, institutions such as DTDRC and SPA; when the outdegree centrality in Table 10 is examined, institutions such as SPA, G and C come to the forefront in the relations showing the cooperation in the network.

**Table 11:** Evaluation of the betweenness values of the networks

Relationships	Identifieds	Most	Least
the	The frequency of meetings with each of the institutions	SPA	PDA
	The frequency of getting information from each of the institutions	DTDRC	UU, CA and FMD
Cooperation network	Adequacy or efficiency in providing the information needed to each of the institutions	SPA	CC, CA and NRED
	The frequency of providing information between institutions	SPA	CA, REA and F

When the betweenness centrality in Table 11 is examined, institutions DTDRC and SPA come to the forefront in the relations showing the cooperation in the network on the basis of active institutions that may intermediate.

**Table 12:** Evaluation of in closeness centrality of the networks

Relationships	Identifieds	Most	Least
the	The frequency of meetings with each of the institutions	SPA, DTDRC	HDA, PDA
within	The frequency of getting information from each of the institutions	DTDRC	UU
Cooperation network	Adequacy or efficiency in providing the information needed to each of the institutions	SPA	HDA
	The frequency of providing information between institutions	UU	HDA

**Table 13:** Evaluation of out closeness centrality of the networks

Relationships	Identifieds	Most	Least
the	The frequency of meetings with each of the institutions	SPA, G and C	FMD and DH
within	The frequency of getting information from each of the institutions	C, G and SPA	CC and F
Cooperation network	Adequacy or efficiency in providing the information needed to each of the institutions	SPA and c	CC
	The frequency of providing information between institutions	SPA, DTDRC and G	HDA, F and C

In the networks built, the results of in and out closeness values belonging to the institution(s) which can reach other institutions in the shortest way and has great ability to access information are shown in Table 12 and 13.

When the in closeness centrality in Table 12 is examined, institutions such as DTDRC and SPA; when the out closeness centrality in Table 13 is examined, institutions such as SPA, G and C come to the forefront in the relations showing the cooperation in the network on the basis of active institutions.

## **CONCLUSION**

In this study, it was aimed that the differences of institutions that produce spatial data are revealed; therefore, the ongoing planning process for the future is contributed within the context of NPDI. In Usak province for the NPDI application, the relationship between public bodies, local governments, private sectors which produce spatial data and all the sectors working with spatial data was examined socially, and an effort was made to reveal the collaboration system which the institutions built unawares and are running without adhering to any rules through "social networks".

To sum up, the study conducted in Usak province made many results and evaluations visible such as how the current cooperation works, which institutions take an active role on this topic, which institutions meet most, how frequently the necessary information is provided, to what extent the requested information is provided by the institutions, and how frequently the produced information is given to which institutions. Therefore, this study presents an insight into which institutions should be primarily taken into consideration in all kinds of adjustments and efforts to be made for the NPDI which is in the process of establishment. In addition, it is assumed that institutions which operate less with spatial data now since the number and quality of e-applications have improved and of which their structures have become clearer can play a more active role within the scope of NPDI. The primary aim concerning the NPDI is that current operations are run on the fastest and economic standard possible which is away from repetitive data production and can be used for each institution. Such study is therefore important for it makes the status quo visible.

## REFERENCE

- [1] Adkins D. (2008). The Use of Social Network Analysis to Measure Knowledge Sharing in The New York State Project Management Community of Practice, ProQuest, New York State Universities, New York. <http://sunzi.lib.hku.hk/ER/detail/hkul/4358515>.
- [2] Barnett G.A. (2011). Encyclopedia of Social Networks. Thousand Oaks, CA: Sage. University of California, Davis, USA, University of California, Davis.
- [3] Belasen A.T. (2008). The theory and practice of corporate communication: A competing values perspective. State University of New York - Empire State College, Sage Publications, CA.
- [4] Bregt A.K., Grus L., Crompvoets J., Castelein W.T. and Meerkerk J. (2008). Changing demands for Spatial Data Infrastructure assessment: Experience from The Netherlands, A multi-view framework to assess spatial data infrastructures, Digital Print Centre, The University of Melbourne, Australia, Melbourne, pp. 357–370.
- [5] Budhiraja I., Khatri A. (2013). A Study on Motives Behind The Use of Social Networking Sites, IJRESS, Volume 3, Issue 2, ISSN: 2249-7382.  
<http://euroasiapub.org/wp-content/uploads/2016/09/2-1-18.pdf>
- [6] Chakrabarti S. (2003). Social Network Analysis. Mining the Web, 203-254.
- [7] Chan K. and Liebowitz J. (2006). The synergy of social network analysis and knowledge mapping: a case study. International Journal of Management and Decision Making, 7(1), (pp. 19-35). DOI:10.1.1.477.584&rep=rep1&type=pdf
- [8] Chan T.O., Feeney M., Rajabifart A. and Williamson I.P. (2001). The dynamic nature of spatial data infrastructure: A method of descriptive classification, Geomatica, 55 (1), (pp. 65–72). DOI:10.1.1.15.2286&rep=rep1&type=pdf
- [9] Cook J., Norbert P. and Bachmair B. (2013). Using social network sites and mobile technology to scaffold equity of access to cultural resources. In: G. Trentin and M. Repetto, eds. Using Network and Mobile Technology to Bridge Formal and Informal Learning, (pp. 31-56).
- [10] Craglia M. and Campagna M. (2010). Advanced regional SDI in Europe: “Comparative cost-benefit evaluation and impact assessment perspectives. International Journal of Spatial Data Infrastructures Research, 5, (pp.145-167).  
<http://ijsdir.jrc.ec.europa.eu/index.php/ijsdir/article/viewFile/166/282>
- [11] Crompvoets J., Man E.D. and Macharis C. (2010). Value of spatial data: networked performance beyond economic rhetoric, International Journal of Spatial Data Infrastructure Research, 5, (pp. 96–119). DOI:10.1.1.502.1870&rep=rep1&type=pdf
- [12] Crompvoets J., Rajabifard A., Van Loenen B. and Delgado Fernández T. (2008). A multi-view framework to assess spatial data infrastructures, Melbourne University Press, Melbourne.
-

- [13] Cross R. and Parker A. (2004). The Hidden Power of Social Networks, Harvard Business School Press.
- [14] Demir H. and Taktak F. (2011). Konumsal Veri Üzerine Sosyal Ağ Analizi (SAA): Afyonkarahisar Örneği. Harita Teknolojileri Elektronik Dergisi, 3 (1), (pp. 7-16).
- [15] **Eroğluer K. (2011). Örgütsel İletişim ile İş Tatmini Unsurları Arasındaki İlişkiler: Kuramsal Bir İnceleme. Ege Akademik Bakış Dergisi, 11 (1), (pp. 121-136).**
- [16] Firestone S.M., Christley R.M., Ward M.P. and Dhand N. K. (2011). Adding the spatial dimension to the social network analysis of an epidemic. C. Fourichon, D.U. Pfeiffer Eds. Society for veterinary Epidemiology and Preventive Medicine, Annual Conference Proceedings, Leipzig, Germany, (pp. 171–181).  
DOI:<http://dx.doi.org/10.1016/j.prevetmed.2012.01.020>
- [17] Firestone S.M., Christley R.M., Ward M.P. and Dhand N.K. (2012). Adding the spatial dimension to the social network analysis of an epidemic: Investigation of the 2007 outbreak of equine influenza in Australia. Original Research Article Preventive Veterinary Medicine, 106(2), (pp.123-135).  
DOI:<http://dx.doi.org/10.1016/j.prevetmed.2012.01.020>
- [18] Freeman L. (2004). The Development of Social Network Analysis: A Study in the Sociology of Science, Vancouver, CA: Empirical Press, Canada.
- [19] Gencer M., Gunduz C. and Tunaloğlu V.S. (2009). CL-SNA: Social Network Analysis with Lisp, SPLASH Systems. Programming, and Applications: Proceedings of the 2007 International Lisp Conference, 17, ACM New York, USA. DOI:[10.1145/1622123.1622143](https://doi.org/10.1145/1622123.1622143)
- [20] Gürsakal N. (2009). Sosyal Ağ Analizi. Dora Basım Dağıtım Ltd., Bursa.
- [21] Hanneman R.A. and Riddle M. (2005). Introduction to Social Network Methods. Riverside, CA: University of California, Riverside. <http://faculty.ucr.edu/~hanneman/nettext/>
- [22] Harrer A., Zeini S. and Pinkwart N. (2006). Evaluation of Communication in Websupported Learning Communities—an Analysis with Triangulation Research Design, International Journal of Web Based Communities, 2 (4), (pp. 428-446). DOI: <http://dx.doi.org/10.1504/IJWBC.2006.011768>
- [23] Hawe P. and Ghali L. (2008). Use of Social Network Analysis To Map The Social Relationships Of Staff And Teachers At School. Health Education Research, 23 (1): 62-69. DOI:[10.1093/her/cyl162](https://doi.org/10.1093/her/cyl162)
- [24] Haythornthwaite C. (2005). Social Network Methods and Measures for Examining E-learning [online]. Available from: <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.135.6993&rep=rep1&type=pdf>, [Accessed 20 May 2013].
- [25] Jablin F.M. and Putnam L.L. (2000). The New Handbook of Organizational Communication : Advances in Theory. Research and Methods, Sage Publications, USA.
-

- [26] Kale U. (2007). Online Communication Patterns in a Teacher Professional Development Program. Thesis (PhD). Indiana Üniv. <https://books.google.nl/books?id= cfiQTFXokUC>
- [27] Kalla H.K. (2005). Integrated Internal Communications: A Multidisciplinary Perspective. Corporate Communications: An International Journal, 10 (4), (pp. 302-314). DOI: <http://dx.doi.org/10.1108/13563280510630106>**
- [28] Niles Yokum K., and Wagner D. L. (2015). The Aging Networks, 8th Edition : A Guide to Programs and Services. New York, NY: Springer Publishing Company.
- [29] Peng Q., Wang Kelvin C., P., Liu X., and Chen B. (2016). 98.2.1 SNA (Social Network Analysis). In , ICTE 2015 - Proceedings of the Fifth International Conference on Transportation Engineering, September 26-27, 2015, Dalian, China American Society of Civil Engineers (ASCE).
- [30] Scott, J. (2012). Social Network Analysis. London: Sage.
- [31] Scott J. and Carrington P.J., (2011). The SAGE Handbook of Social Network Analysis, SAGE.
- [32] Sorenson O. (2006). Editorial Objectives: Organization and Social Network. Management Science, Informs, 52 (10), 4. DOI: <http://dx.doi.org/10.1287/mnsc.1060.0645>
- [33] Tutar H. (2009). Örgütsel İletişim. Seçkin Yayıncılık, Ankara.
- [34] Van Riel C.B.M. and Fombrun C.J. (2007). Essentials of corporate communication: Implementing practices for effective reputation management, Routledge, New York.
- [35] Zhao Y. (2013). Social Network Analysis, R and Data Mining, (p. 123-136). [ftp://cran.r-project.org/pub/R/doc/contrib/Zhao\\_R\\_and\\_data\\_mining.pdf](ftp://cran.r-project.org/pub/R/doc/contrib/Zhao_R_and_data_mining.pdf)
- [36] Zhou D. (2008). Mining Social Documents and Networks. Thesis (PhD). Computer Science and Engineering, The Graduate School The Pennsylvania State Üniv. [https://etda.libraries.psu.edu/files/final\\_submissions/1666](https://etda.libraries.psu.edu/files/final_submissions/1666)

**Biography of Authors**

	<p>Asst. Prof. Fatih TAKTAK, born in 1978. He graduated in 1996 as Dipl.-Ing. in Geodesy and Photogrammetry Engineering at Selcuk University. He obtained his MsC degree in 2005 at Kocatepe University. He obtained his Ph.D. degree in 2013 at Yildiz Technical University. He is since 2014, Asst. Prof. of Engineering Faculty, Usak University. He is currently working on Land Management and urban transformation.</p>
	<p>Hulya Demir Prof. graduated in 1987 as Dipl.-Ing. in Geodesy and Photogrammetry Engineering at Yildiz Technical University. She obtained her MsC degree in 1989 at Yildiz Technical University. She obtained her Ph.D. degree in 1996 at Yildiz Technical University. She is currently a Prof. at Yildiz Technical University. She is currently working on Land Management.</p>