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Full Length Research Paper

Estate appraisal as an example of social network analysis (SNA)

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In the transition to an information society, a government structure that possesses integrated, efficient, transparent and simplified business processes is a basic principle. In line with this, providing interoperability within the public sector that encompasses not only corporations and organizations but also local administrations and identifying the necessary procedures and standards for this is of significant importance. In this context, the social network analysis (SNA) is an effective tool. Using SNA, this study examined real estate (immovable) appraisal (valuation) that is widely used by the public sector as well as the private sector that is realized through multi-headed organizational structures in Turkey. With the numerical and visual analysis conducted at the central county of the province of Afyonkarahisar, answers were sought to questions such as, "In the work relating to real estate appraisal which organization is most concerned?" "In obtaining real estate appraisal related data which organization is cooperated with the most?" "Of the organizations that undertake real estate appraisal which organization is known the most?" "Which organization that carries out real estate appraisal is trusted the most?" In conclusion, the relationship between organizations that undertook real estate appraisals were evaluated using the SNA and an unseeable social relationship network was revealed.

Key words: Social networks, social network analysis, real estate appraisal, Turkey.

INTRODUCTION

In the competitive and shifting environment of life, it has become compulsory that any procedure providing a service be rapid, of quality, and economic (Reed et al., 2000). Providing this type of service can only take place with the effective cooperation of different service providers or providers working together for this service. For this reason, the need arises for an infrastructure for them to jointly work together. This need has arisen, in particular during the last ten years, in a very distinct manner not only in spatial data and services, but also in all other areas, such as e-government (Guijarro 2009; Peristeras et al., 2009; DPT, 2005).

In terms of spatial data, the infrastucture for inter-operability has been named as Spatial Data Infrastructure (SDI). National Spatial Data Infrastructure (NSDI) on the other hand, means SDI throughout a country. NSDI will provide an association between all public agencies, local administrations and the private sector nationwide together with all sectors that work with spatial data and, along with citizens, provide instant access as they require to an efficient infrastructure for data sharing and use of services in horizontal as well as vertical directions (Bishop et al., 2000; Thellufsen et al., 2009; Kok and Loenen, 2005).

Redefining the rights and obligations of organizations within the coverage of NSDI will not only restructure public organizations but will bring to the agenda, collaboration models for the public and private sectors. Making NSDI a reality and strengthening the role of the private sector and by overcoming the long standing subject of complaints of the public sector being cumbersome, will provide services in a rapid and economic

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manner (Rao et al., 2002).

Today, productivity between organizations requires the identification of functional, physical and hierarchical boundaries and providing efficient cooperation between these organizations (Nedovic-Budic and Pinto, 2001; Pirnejad et al., 2008). How can individuals manage something they cannot see? In advancing the workings of cooperation, it is well known that a reliable and sound network depends on the flow of information and that unifying fragmented networks will provide a better communication network (Liao and Seret, 1991).

Since cooperation between organizations cannot be seen, the system that will bring forth this function at the present time is social networks (SA) (Kadushin, 2005; Agranoff, 2007). The SNA on the other hand which means the scientific quantification of the relations between actors is used for obtaining figures in the relationship of various organizations for important events or the networks that these organizations establish (Gürsakal, 2009; Borgatti, 2002). The SNA which provides the opportunity to test organizational productivity is utilized to put forth all types of bilateral or multilateral relationships (Huisman, 2005).

In this study, real estate appraisal that is but one spatial data used, and organizational relations between public agencies, the private sector, local administrations and other sectors that uses spatial data and services will be made known through SA. Organizational relations will be analyzed not technically but socially and the joint working system that organizations are unaware and which is carried out without a particular set of rules will be put forth. This study was carried out for the central county of the province of Afyonkarahisar.

THE STUDY METHOD

Social network analysis

As old as the history of mankind, SA take place as a result of political, organizational, domestic, official, non-official, geographical and other relations (Berkman, 2000). This can also be expressed as the tie between social beings and in understanding this tie that takes place. Social beings can be described as actors and are seen as individual nodes in this profile. The SNA is used to analyze organizations, individuals, groups or all forms of structures that are in relation with each other and through inference are related to an individual or a group to produce information (Kapucu, 2005; Wasserman and Faust, 1994; Freeman, 2004) .

In the network structure, the individual or organization of the actor/node in the SA mechanism is considered as nodes and the relationship between these actors/nodes are explained as edge/link. The size of this network is determined on the number of actors. The node that is focused on the individual in the SA is termed the ego. In the social network mechanism, which actor is in the center and which is in the periphery and which are more advantageous in filling internal structural spaces, and which actors have relatively more closed relations are considered as expressing the basic features of the social network mechanism (Scott, 1991; Jackson, 2008; Breiger, 2004).

While the relations between actors in a network mechanism are expressed in numerical values, if a weighted average is used, this means that a weighted/valued network mechanism is involved. In Figure 1, the values, one through three, indicate the weight between the relations of the actors, while the arrows indicate the direction. If the network only indicates whether the relationship is present or not (if a relationship exists a value of 1, if not a value of 0 is given), the network mechanism is expressed as a binary. This study is analyzed by forming a weighted network matrix mechanism.

The most important concept in SNA is the social matrix formed by the actors in the group. If a social mechanism's size is 'n', then the network element size of the social matrix becomes n*n (Figure 1). In the light of the data obtained, the matrix formed is shown in Figure 1 (Wasserman and Faust, 1994).

After the introduction of the data on network relations to the matrix, the definition of the social web and its analysis is achieved. The mathematical computation and calculation methods used in defining and analyzing the social web varies from the statistical methods used in data analysis for any quantitive research in social sciences. In SNA, explaining the position of the actors within the network, identifying the relations between the actors and in defining the network that is made up as whole, specific computational methods are applied (Jablin and Putnam, 2001):

i. degree: Indicates the relations with other actors in the network.
ii. closeness: Is the degree of closeness either directly or indirectly with the other actors in the network.
iii. betweenness: Is the degree of presence of an actor among other individuals in the network. It indicates the degree of direct connection to the node (URL1, 2010; Everett and Borgatti, 1999; Borgatti et al., 2002; Gürsakal, 2009).

Real estate appraisal

Real estate, property or immovable appraisal is the procedure used in determining the possible value on the date of appraisal of a real estate, a real estate project or rights and benefits attached to the real estate through independent, impartial and objective criteria (Seele, 1974; Açlar et al., 2003; Demir, 2006; Açlar, 2008). Real estate appraisal in Turkey is used in tax procedures, expropriation, privatization, land adjustments, urbanization and other public sector procedures as well as the capital market, banking, insurance etc. and in private sector operations thousands of companies are in need of these services and the realization of these procedures are used as basic data (Açlar et al., 2003; Demir, 2006; Açlar, 2008).

Survey

A survey work was preferred in measuring the cooperation in the network, data sharing potential and trust in order to objectively calculate network rigidity. A survey is a frequently used method developed in order to obtain planned and standard information from individuals on various subjects, in particular, sociological research. With the information obtained from applying the survey method:

i. Whether there is a relationship between dependent and independent variables is examined,
ii. What the important independent variables are is identified, and
iii. In the light of this information new hypothesis are formed and new research is planned.

The survey in this article has been prepared by benefitting from Cross and Parker's (2004) study "The Hidden Power of Social Networks: Understanding How Work *Really* Gets Done in Organizations."

The face-to-face survey method was chosen because it provides an advantage over other methods in terms of explaining the questions and obtaining the correct answers (Tezcan, 1992; Powell,

Table 1. Normalized central measurements.

1	Maximum		Minimum	
Degree	State Hydaulic Works	0.406	Telecommunications	0.024
	Chamber of Commerce	0.382	Petroleum Pipeline Corp.	0.072
Closeness	State Hydaulic Works	0.316	Telecommunications	0.169
	Chamber of Commerce	0.303	Petroleum Pipeline Corp.	0.191
Betweenness	Chamber of Commerce	1.282	Land Reform	0.000
	State Hydaulic Works	0.942	Petroleum Pipeline Corp.	0.000

1998; Walonick, 1997; Salant and Dilman, 1994).

APPLICATION: REAL ESTATE APPRAISAL AS AN EXAMPLE OF SOCIAL NETWORK ANALYSIS

This study will attempt to put forth the communications network between public sector organizations, the private sector, local administrations and all other sectors that use real estate appraisal procedures and in this regard utilize spatial data and services. In identifying network relations from the data obtained and in conducting various calculations, certain programs were developed. As a result of the research conducted, among various programs, the UCINET 6 program (Borgatti et al., 2002) was chosen because of its use in scientific studies. The program has features on applications that provides a basic network coding analysis, calculation possibilities and obtaining network mechanism graphics according to the data inputted.

Application area

The population of central Afyonkarahisar province is 171,000, covering an area of 14,570 km² and located in the inner west of the Aegean region in Turkey (TUIK, 2010). The province is represented by all local representatives in the central administration. Together with the central county of Afyonkarahisar, the provincial center has 16 counties, 19 towns attached to the central county and 78 towns attached to counties and 490 villages (Figure 2).

Application

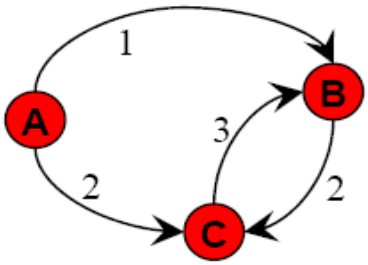
In this study, first, a survey using the face-to-face interview method was conducted among public sector organizations, the private sector, local administrations and all other sectors that carry out real estate appraisal procedures and in this regard that use spatial data and services in the central county of Afyonkarahisar province. The survey was realized among a total of 21 individuals that are employed by these organizations and based on the data obtained, a SNA was undertaken and the conclusions evaluated. The survey consisted of three main headings and six questions. In the first heading, “the relations that indicate network cooperation,” in the second heading, “the relations that indicate network data sharing potential and the levels of trust,” and in the third heading, “the relations that indicate the network’s rigidity” was sought through six questions.

In order to determine network cooperation, in the light of the answers to the questions: “How frequently do you meet with organizations that conduct real estate appraisal in the last 12 months?” and “How frequently did you receive the necessary data from these organizations in the last 12 months in order to undertake your work?” the networks in Figures 3 and 4 were generated.

The SA generated according to the actors’ “betweenness” measurement is indicated in Figure 3 and the numerical values of the relations between actors are shown in Table 1. In analyzing Figure 3, we note that the node of the actor whose “degree” is high becomes larger. The frequency of contact of organizations is understood from the thickness of the line. The advantage of the graphics is that it provides the opportunity to make visual comments. The closer the actors are within the network to important nodes, the higher are their value. In other words, to what degree they perform intermediary or a bridge role and the important coordination role that they can play can be seen.

In the light of the data obtained, in examining the visual network that is formed and the values in Table 1, “degree”, “closeness” and “betweenness” is most frequently realized by the State Hydraulic Works (“Devlet Su İşleri”) and the Chamber of Commerce (“Ticaret Odası”) and the least contact is observed to be among Turkish Telecommunications (“Telekom”), the Petroleum Pipeline Corporation (“Botaş”) and the Directorate of Land Reform (“Tarım Reformu”).

The visual network generated based on the data obtained is given in Figure 4. In Table 2, while the State Hydraulic Works and the Directorate of Cadastral and Land Registry are observed as the most frequent data



	A	B	C
A	0	1	2
B	0	0	2
C	0	3	0

Figure 1. Matrix (n*n) and structure.

Figure 2. Afyonkarahisar.

data obtaining organizations, the Housing Development Administration ("Toplu Konut İdaresi"), the Petroleum Pipeline Corporation, the Provincial Directorate of Agriculture ("Tarım İl Müdürlüğü") and the Directorate of Land Reform, on the other hand, are the less frequently data obtaining organizations.

As to the relations that indicate network data sharing potential and level of trust, based on the data obtained from the answers to the first question: "Which organizations that are indicated below are you aware that undertakes real estate appraisal?" the network in Figure 5 was generated. With this question, the answer to how much information that organizations have of each other that undertake appraisal was sought.

In the visual network generated in the light of data obtained and in reviewing the values in Table 3, it can be

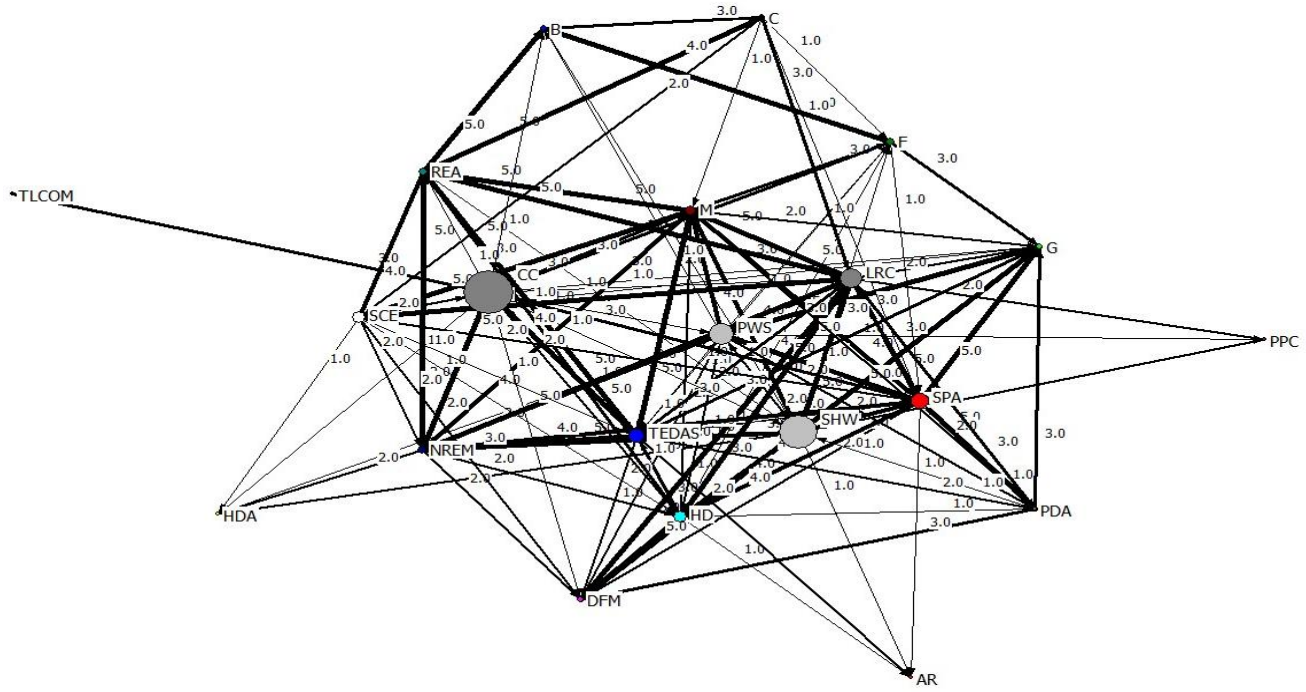


Figure 3. Visual network in the frequency of contact (within 12 months) between organizations that undertake real estate appraisal. TLCOM: Telecom, SCE: Survey and Cadastre Engineers, NREM: National Real Estate Management, DFM: Directorate of Forest Management, HD: Highways Department, AR: Directorate of Agrarian Reform, PDA: The Provincial Directorate of Agriculture, TEDAS: Turkey Electricity Distribution, SHW: State Hydraulic Works, SPA: Special Provincial Administration, REA: Real Estate Agents, CC: Chamber of Commerce, F: Foundations, C: Citizen, PPC: Petroleum Pipeline Corporation, PWS: Department of Public Works And Settlement, LRC: Directorate of Land Registry And Cadastre, G: Governorship, M: Municipality, B: Banks, HAD: Housing Development Administration of Turkey.

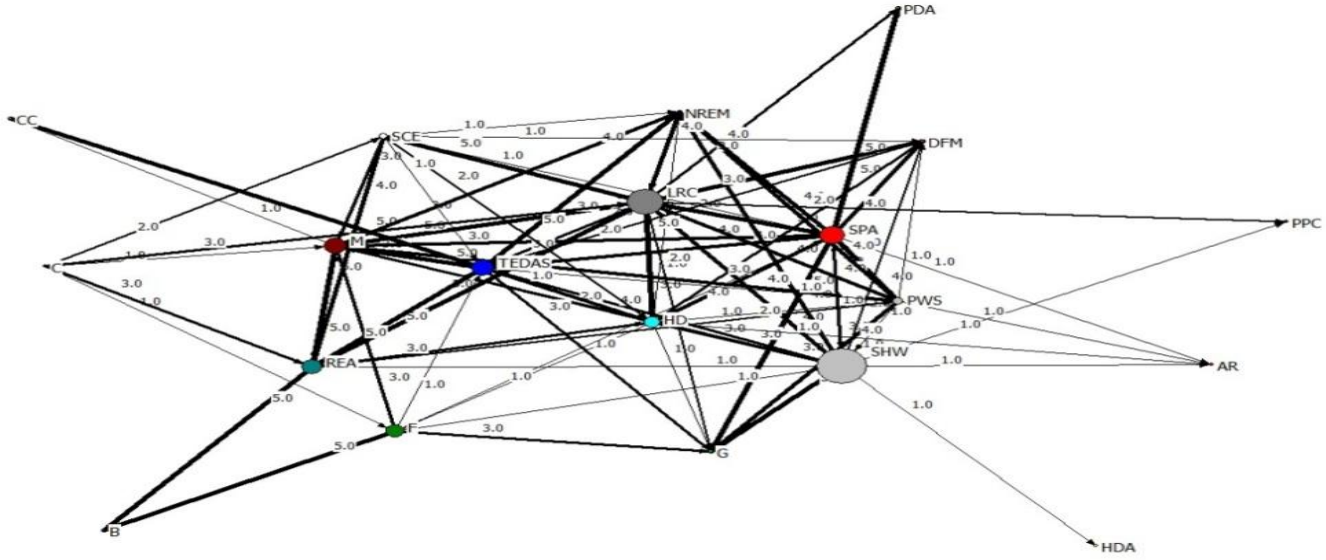


Figure 4. The frequency of obtaining verbal and numerical data necessary among organizations that undertake real estate appraisals. TLCOM: Telecom,SCE:Survey and Cadastre Engineers, NREM: National Real Estate Management, DFM: Directorate of Forest Management, HD:Highways Department, AR: Directorate of Agrarian Reform, PDA: The Provincial Directorate of Agriculture, TEDAS: Turkey Electricity Distribution, SHW: State Hydraulic Works, SPA: Special Provincial Administration, REA: Real Estate Agents, CC : Chamber of Commerce,F: Foundations, C: Citizen, PPC: Petroleum Pipeline Corporation, PWS: Department of Public Works And Settlement, LRC: Directorate of Land Registry and Cadastre, G:Governorship, M: Municipality, B: Banks, HAD : Housing Development Administration of Turkey.

Table 2. Normalized central measurements.

2	Maximum		Minimum	
Degree	State Hydraulic Works	0.449	Housing Dev. Admin.	0.032
	Cadastral and Land Registry	0.449	Provincial Agriculture	0.064
Closeness	State Hydraulic Works	0.318	Bank	0.178
	Cadastral and Land Registry	0.318	Housing Dev. Admin.	0.182
Betweenness	State Hydraulic Works	1.235	Land Reform Direc.	0.000
	Cadastral and Land Registry	0.851	State Hydraulic Works	0.000

Table 3. Normalized central measurements.

3	Maximum		Minimum	
Degree	Chamber of Commerce	0.454	Telecommunications	0.025
	State Hydraulic Works	0.429	Topography Bureau	0.076
Closeness	Chamber of Commerce	0.338	Topography Bureau	0.173
	State Hydraulic Works	0.323	Telecommunications	0.181
Betweenness	State Hydraulic Works	0.612	Land Reform Direc.	0.000
	Public Works Direc.	0.507	State Hydraulic Works	0.000

observed that the highest awareness among organizations is the State Hydraulic Works, the Chamber of Commerce and the Directorate of Public Works (“Bayındırlık Müdürlüğü”) and the least awareness is among Turkish Telecommunications, the Petroleum Pipeline Corporation, the Independent Topography Bureau (“Serbest Harita Bürosu”) and the Directorate of Land Reform. As can be seen from Figure 5, individuals from certain agencies are not aware of the organizations that conduct appraisals.

To the question: “Are you able to access the organizations indicated below to obtain data or information?” on the relations that indicate network data sharing potential and the level of trust, the data from the answers are given in the network generated in Figure 6.

Looking at the visual network generated in Figure 6, in the light of data obtained and the values in Table 4, the organizations that have established the highest access are the Directorate of Public Works, the State Hydraulic Works and the Special Provincial Administration, while the least accessed organizations are the Chamber of Commerce, the Housing Development Administration and the Independent Topography Bureau.

The data obtained from the answers to the question: “What is your level of trust from the organization you obtain data?” that is related to the relations that indicate network data sharing potential and the level of trust, has generated the network in Figure 7. In examining the visual network in Figure 7 and the values in Table 5 in the light of the data obtained, among the most trusted organizations in terms of the level of trust to one another are the Special Provincial Administration, the State Hydraulic Works and the Independent Topography Bureau and the least level of trust was found to be the Chamber of Commerce, the Housing Development Administration and the Petroleum Pipeline Corporation.

In terms of the relations that indicate network rigidity, the network formed from data obtained from the answers to the question: “If I had established more communications with these organizations it would have been more effective in our business” is given in Figure 8. In examining the visual network in Figure 8 and the values in Table 6 in the light of the data obtained, the answers to the question: “If I had established more communications with these organizations it would have been more effective in our business,” indicate that the highest values were obtained by the Directorate of Cadastral and Land Registry and the Special Provincial Administration and the organizations with the lowest values were Turkish Telecommunications, the Chamber of Commerce and the Independent Topography Bureau.

CONCLUSION AND DISCUSSION

At the present time, creating the infrastructure of the Geographic Information System in Turkey that is in conformity with technological developments at the national level and the Infrastructure for Spatial Information in the European Community (INSPIRE) directive, together with the objective of making it available to users through a joint infrastructure of the geographical information that public sector organizations and agencies are responsible for, as well as establishing a web portal that will meet the

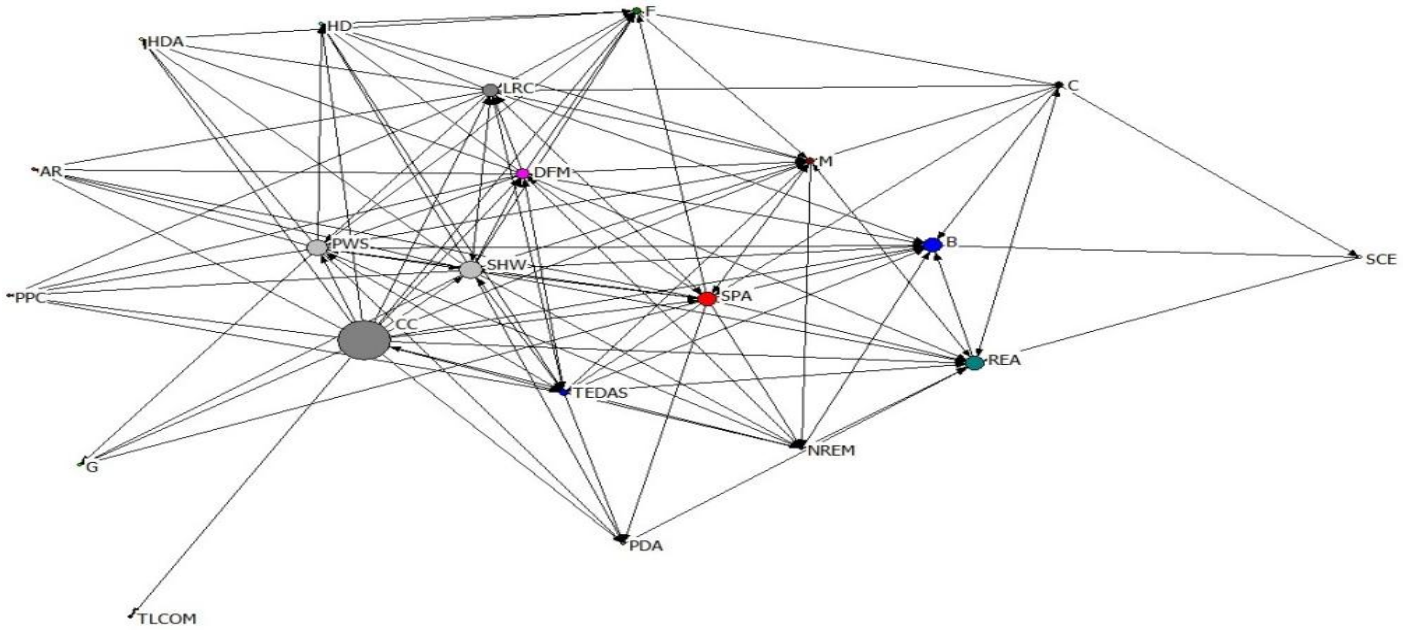


Figure 5. "Which organizations are you aware that undertakes real estate appraisal?" TLCOM: Telecom,SCE:Survey and Cadastre Engineers, NREM: National Real Estate Management, DFM: Directorate of Forest Management, HD: Highways Department,AR: Directorate of Agrarian Reform, PDA: The Provincial Directorate of Agriculture, TEDAS: Turkey Electricity Distribution, SHW:State Hydraulic Works, SPA: Special Provincial Administration, REA: Real Estate Agents, CC: Chamber of Commerce,F: Foundations, C: Citizen, PPC: Petroleum Pipeline Corporation, PWS: Department of Public Works And Settlement, LRC: Directorate of Land Registry and Cadastre, G: Governorship, M: Municipality, B: Banks, HAD: Housing Development Administration of Turkey.

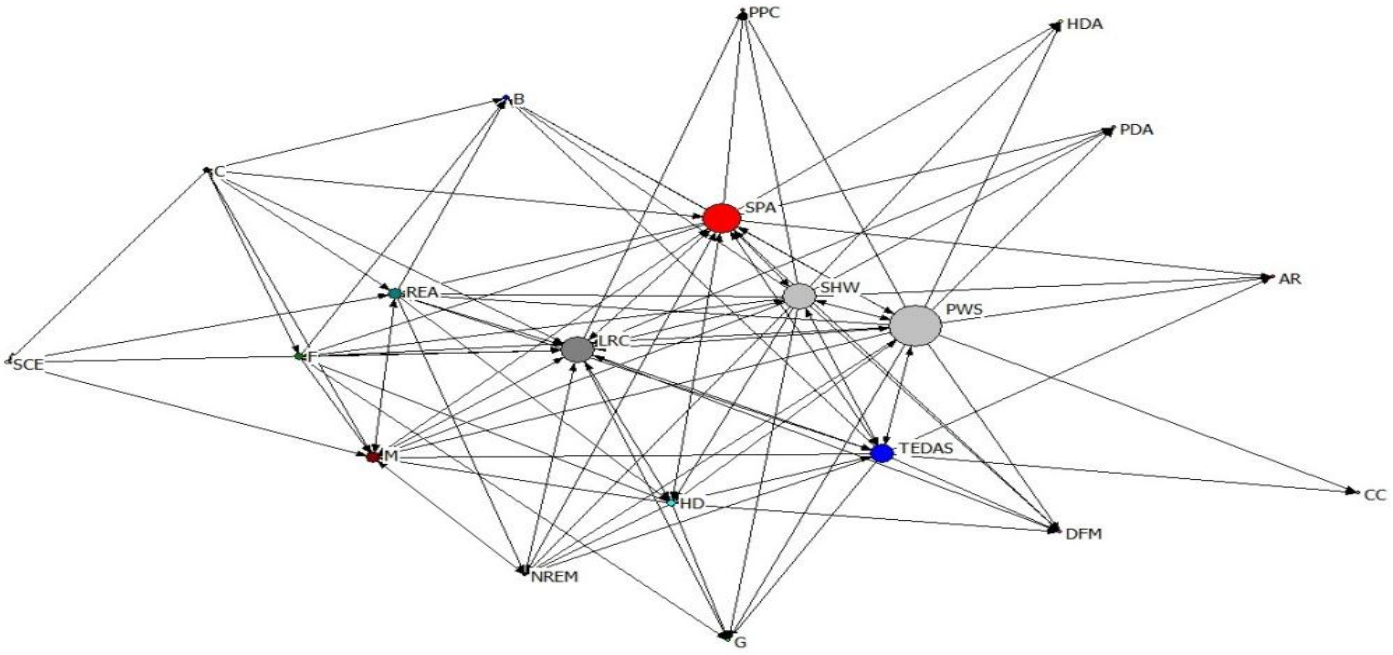


Figure 6. The relations in accessing data or information by organizations. TLCOM: Telecom,SCE:Survey and Cadastre Engineers, NREM: National Real Estate Management, DFM: Directorate of Forest Management, HD: Highways Department, AR: Directorate of Agrarian Reform, PDA: The Provincial Directorate of Agriculture, TEDAS: Turkey Electricity Distribution, SHW: State Hydraulic Works, SPA: Special Provincial Administration, REA: Real Estate Agents, CC: Chamber of Commerce, F: Foundations, C: Citizen, PPC: Petroleum Pipeline Corporation, PWS: Department of Public Works And Settlement, LRC: Directorate of Land Registry And Cadastre, G: Governorship, M: Municipality, B: Banks, HAD: Housing Development Administration of Turkey.

Table 4. Normalized central measurements.

4	Maximum		Minimum	
Degree	Public Works Direc.	0.489	Chamber of Commerce	0.057
	State Hydraulic Works	0.460	Housing Dev. Admin.	0.086
Closeness	Public Works Direc.	0.342	Chamber of Commerce	0.189
	Special Prov. Admin.	0.327	Topography Bureau	0.194
Betweenness	Public Works Direc.	1.259	Topography Bureau	0.000
	Special Prov. Admin.	0.867	Chamber of Commerce	0.000

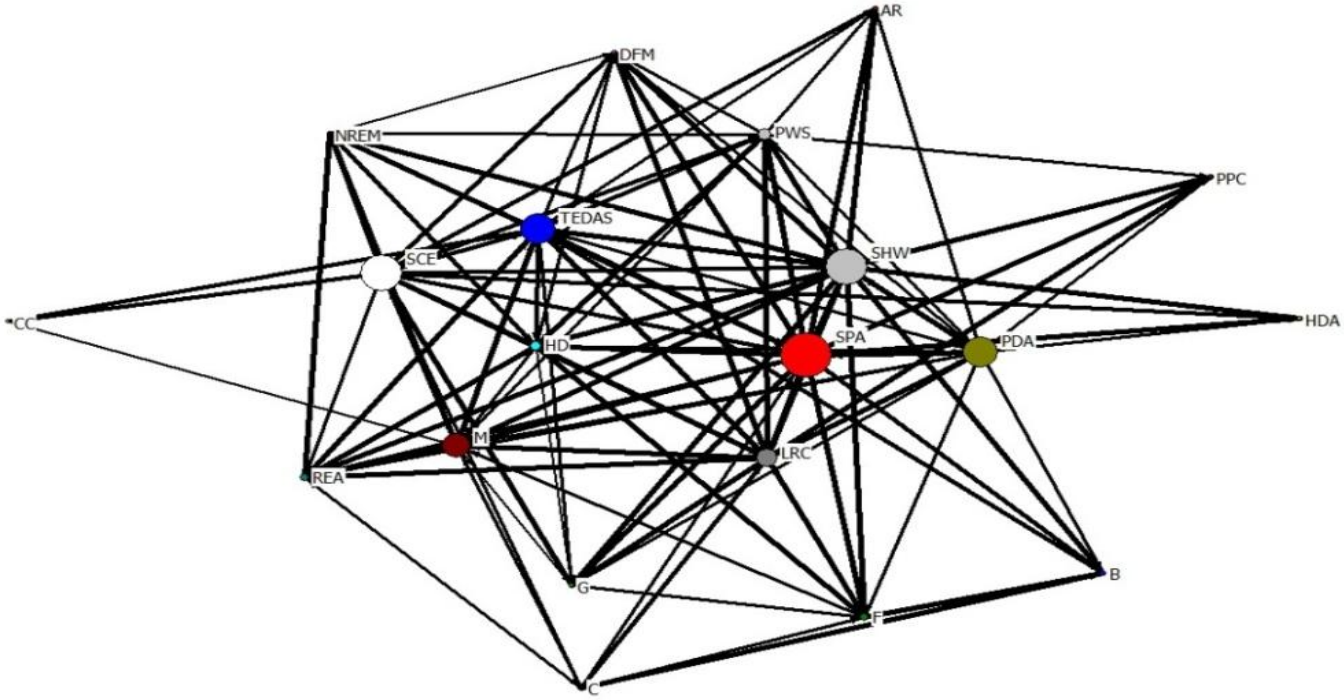


Figure 7. Network indicating the level of trust between organizations from which data is obtained. TLCOM: Telecom, SCE: Survey and Cadastre Engineers, NREM: National Real Estate Management, DFM: Directorate of Forest Management, HD: Highways Department, AR: Directorate of Agrarian Reform, PDA: The Provincial Directorate of Agriculture, TEDAS: Turkey Electricity Distribution, SHW: State Hydraulic Works, SPA: Special Provincial Administration, REA: Real Estate Agents, CC: Chamber of Commerce, F: Foundations, C: Citizen, PPC: Petroleum Pipeline Corporation, PWS: Department of Public Works And Settlement, LRC: Directorate of Land Registry And Cadastre, G: Governorship, M: Municipality, B: Banks, HAD: Housing Development Administration of Turkey.

Table 5. Normalized central measurements.

5	Maximum		Minimum	
Degree	Special Prov. Admin.	0.429	Chamber of Commerce	0.186
	State Hyraulic Works	0.405	Housing Dev. Admin.	0.095
Closeness	Special Prov. Admin.	0.336	Chamber of Commerce	0.186
	State Hyraulic Works	0.320	State Hyraulic Works	0.197
Betweenness	Special Prov. Admin.	0.919	Chamber of Commerce	0.000
	Topography Bureau	0.746	State Hyraulic Works	0.000

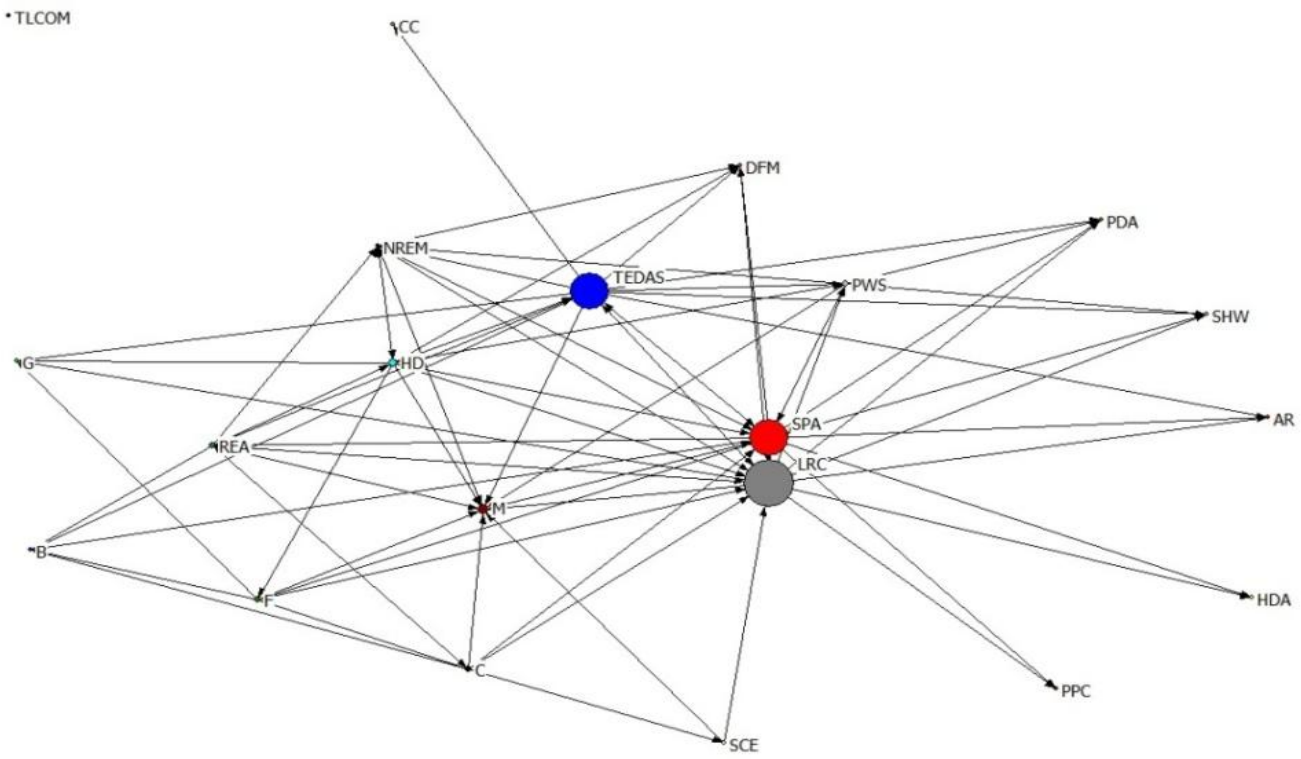


Figure 8. The relationship network: "If I had established more communications with these organizations it would have been more effective in our business" indicated the rigidity of the network. TLCOM: Telecom, SCE: Survey and Cadastre Engineers, NREM: National Real Estate Management, DFM: Directorate of Forest Management, HD: Highways Department, AR: Directorate of Agrarian Reform, PDA: The Provincial Directorate of Agriculture, TEDAS: Turkey Electricity Distribution, SHW: State Hydraulic Works,SPA: Special Provincial Administration, REA: Real Estate Agents, CC: Chamber of Commerce, F: Foundations,C : Citizen, PPC: Petroleum Pipeline Corporation, PWS: Department of Public Works And Settlement, LRC: Directorate of Land Registry and Cadastre, G: Governorship, M: Municipality, B: Banks, HAD: Housing Development Administration of Turkey.

Table 6. Normalized central measurements.

6	Maximum		Minimum	
Degree	Cadastral and Land Registry	0.647	Telecommunications	0.000
	Special Prov. Admin.	0.609	Chamber of Commerce	0.038
Closeness	Cadastral and Land Registry	0.326	Telecommunications	0.000
	Special Prov. Admin.	0.318	Chamber of Commerce	0.217
Betweenness	Cadastral and Land Registry	1.765	Telecommunications	0.000
	Special Prov. Admin.	1.313	Topography Bureau	0.000

requirements of all user organizations through a standardized content with the purpose of identifying geographical data interchange standards, is currently on-going with an e-government project entitled the Turkish National Geographic Information System (TUCBS). Despite these developments, the daily social relations between various organizations are not known. In this context, procedures conducted based on real estate appraisal as but one datum of spatial data and the organizational relations between public sector agencies, the private sector, local administrations and all other sectors that use spatial data and services, has been at-tempted through SA using the province of Afyonkarahisar as an example. The study utilized the survey method consisting of six questions asked face-to-face to relevant organizations. With the answers provided, six invisible networks were obtained which these organizations were unaware and which continues not being subject to any particular rule or regulation. As can be seen from the shape of the networks, the organizations that are invoved

with real estate appraisal and whose data are required move closer to the center of the network when these organizations need to communicate while organizations which have a lesser need for real estate appraisal move away from the network's center. In examining the networks, the following organizations, in general, are nearer the center: The Chamber of Commerce, the Directorate of Cadastral and Land Registry, the State Hydraulic Works, the Provincial Directorate of Public Works and the Special Provincial Administration. Among these organizations the Chamber of Commerce in particular, where members apply for all types of information due to their needs in fulfilling their business, provides the required information or in simplifying access to this information; keeps indexes and statistics on economic, commercial and industrial activities within their region and, monitors and records the market prices of leading goods, materials and items which are among this organization's responsibilities. The Directorate of Cadastral and Land Registry, on the other hand, undertakes all forms of registration procedures relating to real estate; keeps in an orderly manner title deed recordings; follow-up and audit revisions to title deeds and the safe keeping of title deeds and documents. These organizations not only provide a service but also extend data to other organizations and individuals. The organizations that are distant to the center are the Petroleum Pipeline Corporation, Turkish Telecommunications, the Housing Development Administration, foundations and banks. These organizations undertake procedures only in particular areas such as natural gas, telephone and housing.

In examining the network figures, Figure 3 does not present a problem in the frequency of contact between organizations and that this frequency of contact is directly proportional to the exchange of spatial data can be observed. Furthermore, by looking at line width, it can be seen that there are many organizations that are in contact with each other. In Figure 4, we note that there are no major problems in the exchange of spatial data between organizations. In the awareness network shown in Figure 5, it can be understood that in general organizations are aware of the type of business that each undertakes and which type of data can be obtained from a particular organization. In looking at Figure 6, we note that no problems occur in the sharing of different types of data and that the information networks these organizations can be said to possess have a participatory and transparent structure. That the level of trust in the receipt of data from each other is high is noted in the network in Figure 7. In Figure 8, by looking at the network that is generated from the question, "Which organizations would you have wanted a dialogue that would have been better if you had?" we can state that organization do not want to break away from each other and that at all times want to maintain communications with each other can be observed in general terms. Spatial data as the end product of real estate appraisal where public sector agencies agencies, administrations and the private sector generate data in many areas as well as all sectors that conduct business based on spatial data can be analyzed and presented with the help of SNA in terms of its social aspects and its joint business system that is invisible, that operates without the awareness of organizations and that is not attached to any particular procedure or rule. This can form the basis of a structure that has an integrated, efficient, transparent and simplified business process. In line with this, the foundation of interoperability and the necessary procedures and standards that involve all the relevant actors can be provided.

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