



8-9-2024

Shared place attachment in social networks

A case study



Master thesis shared place attachment in social networks

Program: MSc sustainability, society and planning

Date: 08-09-2024, version 2.0

Author: Ing. N.W. Haveman, S5021685

Supervisor: prof. dr. G. de Roo

University of Groningen, faculty of spatial studies

Abstract

In the literature there is a knowledge gap in the understanding how (shared) place attachment interacts with social networks. It is the goal of this study to find out how shared place attachment interacts with ties between actors in social networks. The presence of shared place attachment is important for the correct functioning and use of many (semi) public places in the world. To understand how these two variables interact with each other a social network analysis was performed on an informal network that is hybrid place bound. The data for the social network analysis was gathered through the use of a survey. In the study, evidence was found for a positive link between tie strength and shared place attachment. The evidence was however not completely conclusive. It was found that most of the shared place attachment was created by the group of actors and not by the individual actor's attraction to a place. Another conclusion that was drawn from the study is that there is a connection between well connected members of a network (so called central characters) and the existence of shared place connection. This connection is something to look into for further research, just as the strengthening of the evidence that shared ties lead to shared place attachment. This result is relevant for spatial planning because it provides another variable (shared ties) for the creation of better places (shared place attachment). By facilitating shared ties within a network, shared place attachment can be stimulated. For both of these further research proposals it is recommended that more case studies are performed, with a greater number of participants than the original study.

Keywords: social network analysis, social network, shared place attachment, interpersonal tie

List of contents

- 1. Introduction..... 7
 - 1.1. Scope 7
 - 1.2. Relevance 7
 - 1.3. Objectives and research questions 7
 - 1.4. Reading guide 8
- 2. Theoretical framework..... 9
 - 2.1. Social networks..... 9
 - 2.1.1. Actors and relationships..... 10
 - 2.1.2. Centrality and cohesion..... 12
 - 2.1.3. Evolution of social networks 15
 - 2.1.4. Distinctions in social networks 15
 - 2.2. Interpersonal relations..... 17
 - 2.2.1. Strength of ties 17
 - 2.2.2. Weak ties 18
 - 2.2.3. Strong ties..... 19
 - 2.3. Place attachment..... 19
 - 2.3.1. Actors and place attachment 20
 - 2.3.2. Places and place attachment..... 20
 - 2.3.3. Mental process of place attachment..... 20
 - 2.3.4. The importance of shared place attachment..... 21
 - 2.3.5. Measuring place attachment 21
 - 2.4. Conceptual model 22
- 3. Methodology 23
 - 3.1. Type of study 23
 - 3.2. Methods used..... 23
 - 3.3. The chosen social network 23
 - 3.4. Data collection..... 24
 - 3.5. Data analysis..... 25
 - 3.6. Ethical considerations 26
- 4. Results 27
 - 4.1. Participants..... 27
 - 4.2. Tie strength in the social network..... 28
 - 4.2.1. Central figures 29
 - 4.2.2. Bridging figures..... 30
 - 4.2.3. The network in summation 31

4.3.	Place attachment.....	33
4.3.1.	Individual actors	33
4.3.2.	Group of actors.....	33
4.3.3.	Place	34
4.3.4.	Mental process	34
4.3.5.	Shared place attachment within the network.....	34
4.4.	Shared place attachment and tie strength in the social network.....	36
4.4.1.	Central gaming café.....	36
4.4.2.	Local game store.....	36
4.4.3.	Commander weekend	37
4.4.4.	Participant 9’s home.....	37
4.4.5.	Participant 13’s home.....	38
4.4.6.	Observed trends	38
5.	Conclusion and discussion.....	39
5.1.	Conclusion	39
5.2.	Discussion	39
6.	Bibliography.....	41
7.	Appendixes	46
	Appendix 1: list of questions for the questionnaire.....	46
	Appendix 2: raw data tie strength.....	45
	Appendix 3: raw data place attachment	49

List of figures

Figure 1 Visual representation of the simple social network bases on the distances between actors (own work).	10
Figure 2 a couple of examples of structural equivalences in a simple network. In Network A actor 3 and 4 are structurally equivalent as are actor 1 and 2, In Network B this is also the case. In Network C actor 2 and 4 are structurally equivalent but actors 1 and 3 are not.	11
Figure 3 Network with a number of regular equivalences (own work).	11
Figure 4 Simple bureaucratic hierarchy partitioned into blocks based upon regular equivalence (own work).....	12
Figure 5 different forms of centrality in a simple network, with the actor(s) that have the highest degree of centrality in red. Actors 2 and 3 both have the highest connections to other actors in the network and share the highest degree centrality. Actor 2 has the highest closeness centrality because its connections are strongest (and thus shortest) with other actors in the network. Actor 3 has the highest betweenness centrality, because it has the highest number of times that a node lies on the shortest path between other nodes. Actor 3 acts as the most bridging actor in the network (own work).....	13
Figure 6 a number of simple social networks and the number of actors that need to be removed to disconnect the network in red. The more actors that need to be removed, the higher the cohesion of the network is, note the large number of actors needed to be removed in network D due to the strong interconnectedness between the actors (own work).....	14
Figure 7 evolutions of social networks through time (own work).	15
Figure 8 A number of micro networks connected by weak tie' bridges' (own work).	18
Figure 9 The tri-partite model of place attachment (Scannell & Gifford, 2010).	19
Figure 10 the conceptual framework of the study. This model shows how place attachment is created in different contexts that are relevant within a social network (own work).	22
Figure 11 Linear scale with corresponding scores for type of ties (own work).	25
Figure 12 Visualization of the social network based upon degree centrality, with actors further from the center being less central (own work).....	29
Figure 13 Visualization of the social network based upon betweenness centrality, with actors further from the center being less bridging in the network (own work).	30
Figure 14 A simplified view of the social network, the ties within this network are a summation of all ties found in the network (own work).	32
Figure 15 Centrality analysis of the places in the network, set out in a radial. Closer to the centre means a more central place. Places are represented by blue diamonds while actors are represented by red circles. 21=central gaming café, 22=local gaming store, 23=commander weekend, 24=participants 9 home and 25=participants 13 home.	35
Figure 16 Groups in the network based upon attachment to certain places. Red circles represent actors while blue diamonds represent places (own work).	Fout! Bladwijzer niet gedefinieerd.
Figure 17 Location of actor 6 on the edge of the network based on centrality and marked with a blue circle.	Fout! Bladwijzer niet gedefinieerd.
Figure 18 Connections between actors that share an attachment to the local game store. Solid lines represent strong connections and dotted lines represent weak connections (own work).	36
Figure 19 Connections between actors that share an attachment to the commander weekend (own work). Solid lines represent strong connections and dotted lines represent weak connection	37
Figure 20 Connections between actors that share an attachment to participant 9's home. Solid lines represent strong connections and dotted lines represent weak connection (own work).....	37

Figure 21 Connections between actors that share an attachment to participant 13's home. Solid lines represent strong connections and dotted lines represent weak connection (own work)..... 38

List of tables

Table 1 Scholars in the early days of social network theory, adapted from Freeman (2004), Prell (2011) and Zang (2010).	9
Table 2 Simple social network (own work).	10
Table 3 relationship matrix converted into distances, with a closer relationship correlating to less distance between the different actors (own work).	10
Table 4 The dimensions of distinction for social networks.	16
Table 5 Factors used by different scholars to determine tie strength.	17
Table 6 Overarching factors for the strength of ties.	17
Table 7 Questions for each factor of interpersonal connection strength (own work).	24
Table 8 Possible answers to the questions (own work).	25
Table 9 The different contexts and the variables of place attachment (own work).	25
Table 10 Breakdown into different tie types based upon tie strength (own work).	28
Table 11 Degrees of centrality for all actors in the network (own work).	29
Table 12 Number of times an actor laid in the shortest part between different other actors.	31
Table 13 Overview of groups and roles within the network (own work).	31
Table 14 Place with the most shared attachment within the network (own work).	33
Table 15 The place attachment of all actors to places within the network (own work).	

1. Introduction

Social networks have been a popular avenue of research ever since Henry White and his compatriots kickstarted the field in the 1970's (Prell, 2011). Since then, the field has expanded significantly. It has been influenced by many other fields of study, such as sociology, political science, network science and spatial planning. The link with spatial planning can be found in the social networks that are studied by this field. These cannot consist without a spatial component most of the time. Another connection is found in the objective of spatial planning to create places that promote the formation or existence of social networks. Although the field is expansive, holes in theory still exist, especially in the analysis of social networks. This study seeks to fill one of these knowledge gaps around the concept of shared place attachment in such social networks, a concept which without places don't function properly.

1.1. Scope

The study focusses on filling in the knowledge gap that exists in the application of social network analysis to uncover shared place attachment in a social network. Shared place attachment in this context refers to the shared emotional bonds that people establish with specific environments where they feel safe and comfortable and like to spend their time (Hidalgo & Hernández, 2001). There are very few studies that combine both concepts, while there is a large amount of overlap between the topics. There is only one study in which a pseudo social network analysis is used to uncover place attachment in a social network (Weijs-Perrée, et al., 2017).

1.2. Relevance

The relevance of the study for the spatial planning practice can be found in the increase of knowledge of how social networks contribute to the existence of shared place attachment. Shared place attachment is important for how many public and private places function (Firouzmakan & Daneshpour, 2015). This increased understanding could be used by professionals in practice on how to create shared place attachment for a certain place by stimulating social networks. A better understanding of the process behind the creation of shared place attachment can be used in making and implementing better planning policies. For instance, policies that support the creation of places that create place attachment or provide resources to strengthen place attachment. The scientific relevance can be found in the furthering of the literature of social networks and social network analysis. Place attachment has not been used in social networks analysis and has only been used a small number of times in literature on social networks. The results of the study will determine if place attachment has a link with social networks and should be explored in further studies. In the study a urban social network is studied, this network is connected by a joint interest in a card game. This network was chosen because of the large number of networks that share a similarity with this one. Making the research of this specific case applicable on many other networks. Through the study and analysis of the connections between the actors in this network and the place attachment of these actors, it is studied how social networks contribute to the existence of shared place attachment.

1.3. Objectives and research questions

The main objective of the study is to find out if there is a connection between the level of interpersonal connection and shared place attachment. Interpersonal connection in this study refers to the description of the bonds, associations, connections and relations between people (Jinhu & Xiaoting, 2022). The hypothesis in this study is that there is a positive correlation between the two factors. Simply said: the stronger the bond between two actors in a network, the higher the chance that they share some form of place attachment. There are also three secondary objectives for the study. The first is the introduction of place attachment in social network analysis. Only one study has been performed where place attachment was used in a pseudo social network analysis (Weijs-Perrée, et al., 2017). The second is the understanding of the different roles in a social network and the role they play in the creation of shared place attachment. Roles are a central concept within social network

analysis and are often used to understand the mechanics of said networks (Breiger, 2011). The third is to find out if there is a difference between place attachment as seen through one's own perspective versus as seen through that of a group, such as is predicted (but not yet proven) in the literature (Scannell & Gifford, 2010). To complete the objectives of the study a number of research questions will be answered. The main question for the study is as follows:

“Is there a positive correlation between a higher level of interpersonal connections and shared place attachment in a social network?”

The secondary research questions are as follows:

“Is there a difference between place attachment as seen through one's own perspective versus as seen through a groups perspective?”

“What are the roles in a social network and how are they involved in creating shared place attachment?”

1.4. Reading guide

The thesis consists of a number of chapters, with the first consisting of the introduction. The second chapter is the theoretical framework, consisting of the theoretical basis for the study. This framework consists of three main pillars, namely social networks, interpersonal relations and place attachment. For each pillar the theoretical basis as found in the literature is presented and the ongoing scientific debates within the theory are elaborated on. The pillars are then synthesised into a conceptual model. The third chapter describes the methods used in the collecting of data for the study, including the ethical and practical considerations and data collection and analysis schemes. It also describes the chosen social network and why this network was chosen as a case study. This chapter uses much of the theory found in chapter two, especially in the data analysis scheme. In the fourth chapter the results of the study are laid out and analysed. The findings are subdivided into those around tie strength and those about shared place attachment. In the analysis of tie strength, roles within the network are also analysed. During the analysis of place attachment the difference between place attachment through the individual level and the groups level is also looked into. Tie strength and shared place attachment are then combined to analyse and to answer the main research question. The conclusion and discussion based on these results can be found in the fifth chapter, in which all research questions are answered. This chapter also contains a discussion on the results and a recommendation for further research.

2. Theoretical framework

In this chapter the theoretical basis for the study will be laid out in a theoretical framework, which is organised along three pillars. The first pillar is social networks and serves as the arena in which the research is performed. The second pillar is that of interpersonal connections. A greater strength of these connections is hypothesized to correlate to greater shared place attachment. In the third pillar the concept of (shared) place attachment is further elaborated on. The framework discusses the theoretical basis as found in the literature and elaborates on the ongoing scientific debate on the theory for each pillar. The framework will be synthesised into a conceptual model that will be used to answer the main research question of the study.

2.1. Social networks

Social networks are a theoretical construct that is used to understand and analyse the relationships and ties between individuals, groups, organisations and other actors (Breiger, 2011). Social networks can be found in many settings, such as business transactions, geopolitical relations and face to face relations (Scott, 2017). The scientific interest in social networks started in the 1800's with scholars such as Émile Durkheim and Ferdinand Tönnies, who laid the groundwork for the understanding of social networks. George Simmel took these groundworks and was the first scholar to write in terms of social networks in the beginning of the 20st century. From 1930 till 1960, different scholars and research groups worked on research related to social networks (Zhang, 2010). These practices were fragmented and pursued along different avenues. These avenues were for instance those of structural balance (the theory that there is a balance between all relationships in a group), social anthropology, and sociology. In the 1960's and 1970's the scientific practice of social network analysis started at Harvard's sociology department led by Harrison White (Prell, 2011). By many scholars this is seen as the bundling of the different interpretations of social networks and their analysis (Freeman, 2004). From this point on, social network analysis and theory has evolved through a number of trajectories based on an ever-changing social reality (Prell, 2011). In Table 1 a condensed history of social network theory and analysis up to the work of White and his colleagues can be seen.

Time Period	Scholar(s)	Most important point
1890-1900	Tönnies	Social groups consist of social and direct ties with individuals that share values, beliefs, or formal and instrumental links.
1890-1900	Durkheim	Within a society there are actors that struggle against the structure (of society) to gain agency. With this struggle they create pressure for the society to create further structure. This interaction between structure and actors was coined as dualism by Durkheim.
1910-1920's	Simmel	First scholar to think in social network terms, concluded that there is a correlation between network size and the likelihood of interaction.
1920-1940's	Moreno and Jennings	Gestalt theory: how does the whole interact with parts of itself to influence the outcome of a social process. Also, the first use of graphical and mathematical methods to describe social interactions.
1940-1950's	Festinger, Cartwright and Harary	Structural balance: the theory of negative and positive relations between entities. This theory was translated into graph theory that was used to do statistical analysis on groups of related entities.
1930-1960's	Radcliffe-Brown, Manchester school	Social anthropology and the importance that networks play in looking beyond 'vague' concepts such as culture. Proposed a more data driven way to conduct social anthropology research.

Table 1 Scholars in the early days of social network theory, adapted from Freeman (2004), Prell (2011) and Zang (2010).

In the following paragraphs the historical evolution of different concepts within social network theory will be illustrated. These concepts only encompass those relevant for this study, since the literature on social networks is exceedingly large. The current scientific discourse around some of these concepts will also be highlighted. The work of Harrison White and his research group will be used as a starting point when describing the concepts.

2.1.1. Actors and relationships

Actors and the relationships between them are the building blocks of social networks. How scholars looked at actors and their relationships has changed throughout the decades. In the 1960’s researchers proposed the constructs of block modelling and multidimensional scaling (Liu, et al., 2017). Multidimensional scaling allowed researchers to convert relationships into distances. Before the invention of this construct researchers were limited to describing relationships between actors in qualitative terms such as acquaintance, friend or best friend. When these qualitative terms could be transformed into distances, researchers were able to use statistical analysis on social networks. This also allowed for researchers to place the actors in a social network in a grid map based upon the distance between them. In this way social networks could be transformed into visuals, allowing for further analysis of said networks (Palmer, sd). In Table 2, a simple social network is given in the form of a matrix. In Table 3 the connections between the different actors are converted into distances, with a closer relationship correlating to less distance between the different actors. In Figure 1 the connections between the different actors have been used to create a graphical representation of the social network. This image shows much clearer how the network works compared to the matrix in Table 2 and allows for further analysis.

-	Person 1	Person 2	Person 3
Person 1	-	2	3
Person 2	2	-	1
Person 3	3	1	-

Table 2 Simple social network (own work).

	Person 1	Person 2	Person 3
Person 1	-	Friend	Acquaintance
Person 2	Friend	-	Best friend
Person 3	Acquaintance	Best friend	-

Table 3 relationship matrix converted into distances, with a closer relationship correlating to less distance between the different actors (own work).

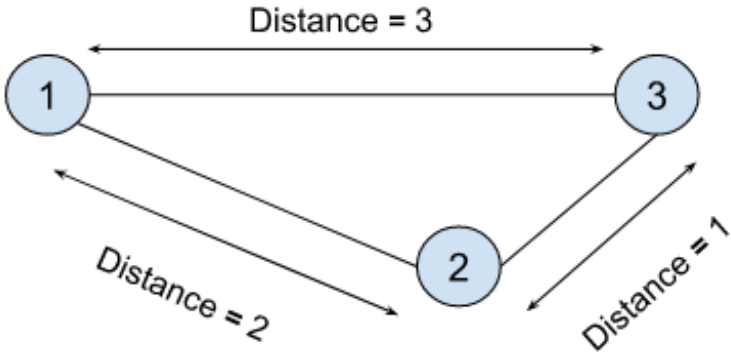


Figure 1 Visual representation of the simple social network bases on the distances between actors (own work).

Block modelling was first introduced by Francois Lorrain and Harrison C. White in 1971 (Doreian, 1999). Block modelling looks at the positions of actors in the network in relation to each other. By looking at similarities between actors in the network, called equivalences, they tried to understand the makeup of social networks and group actors together into blocks. In this way complex networks are transformed into a number of blocks, allowing for easier analysis. Most important in early blockmodelling was a concept called structural equivalence. Two actors in a network are structurally equivalent when they have exactly the same types of connections to other network members. This does not mean they have to be connected to the same network members or even each other (Breiger, 2011). In Figure 2 a couple of examples of structural equivalence are given.

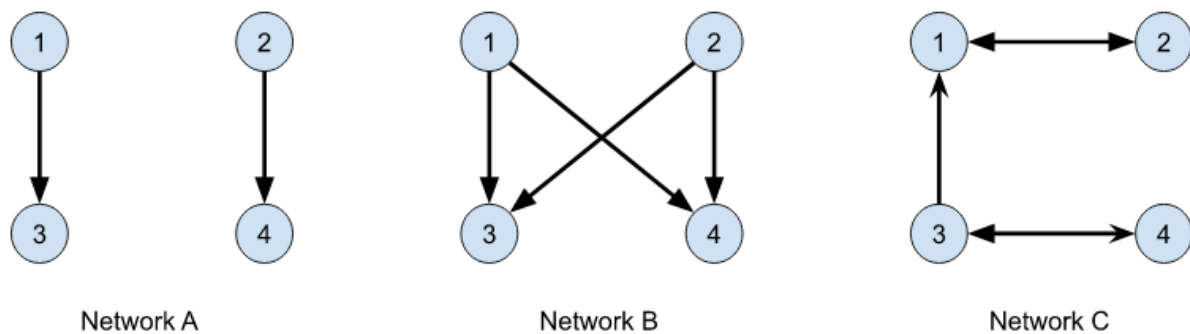


Figure 2 a couple of examples of structural equivalences in a simple network. In Network A actor 3 and 4 are structurally equivalent as are actor 1 and 2, In Network B this is also the case. In Network C actor 2 and 4 are structurally equivalent but actors 1 and 3 are not.

The theory of structural equivalence was a useful theoretical concept for subdividing a network into different blocks, but was not often observed in practice. Different kinds of equivalence were proposed by scholars to try and make the concept more suited to everyday reality, such as automorphic and stochastic equivalence (Breiger, 2011). The type of equivalence that was used most often in further research was that of regular equivalence. Two actors are regularly equivalent if they are equally related to equivalent others (Borgatti & Everett, 2000). This is illustrated by looking at the network in Figure 3. In this network there are no structural equivalences (since no actors share exactly the same connections), but 1 and 2 are regular equivalent. This is the case, because they are equally related to actor 3 and 4. The connection actor 1 has with actor 4 does not matter for regular equivalence here. On the same note actor 3 and 4 are also regular equivalent, because they share an equivalent connection with actor 1 and 2. Regular equivalence is most important for social research, because it is closely related to the concept of roles: actor 1 is related to actor 3 in a certain way that is equivalent to the relation between actor 2 and 4, for instance mother and daughter (Hanneman & Riddle, 2005).

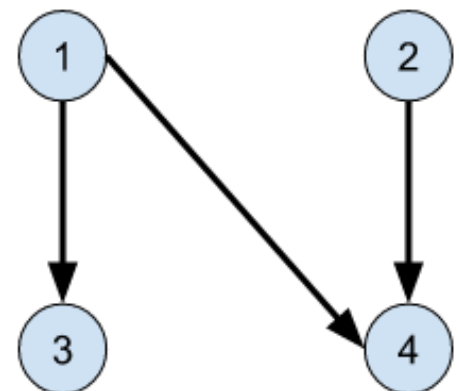


Figure 3 Network with a number of regular equivalences (own work).

In the mid 1970's blockmodeling as a concept and method was further crystalised by White and his colleagues at Harvard. They stated that a block model is a metarelational model that consists of A) a partition of actors in discrete subgroups or positions, and B) a statement of the presence or absence of a relational tie within or between the positions in each of the relations (White, et al., 1976). In simpler terms, block models are presentations of social networks that are sorted into clusters (also called blocks) based upon a form of equivalence (Doreian, 1999). An example is given in Figure 4, where a simple bureaucratic hierarchy is partitioned in blocks, based upon regular equivalence.

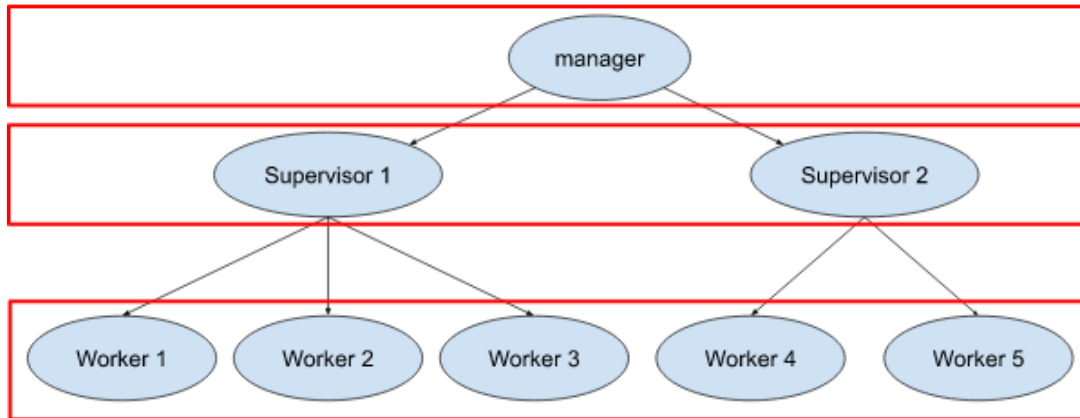


Figure 4 Simple bureaucratic hierarchy partitioned into blocks based upon regular equivalence (own work).

We can see that the network is partitioned into three blocks: workers, supervisors and managers. All the workers are structural equivalent to each other, because they have the same connection to a supervisor. This is an equal relation to an equivalent other. Regular equivalence is used in this partition over structural equivalence, because it is better suited to represent roles actors in a network take on. An example of such a role in this network would be that of worker or supervisor (Doreian, 1999; Breiger, 2011). Block modelling will be used later on in the research while analysing a social network. The network will be partitioned based upon regular equivalence. This will show any groups or cliques that have formed in the network. This data can be used to better understand the link between groups in a social network and place attachment.

2.1.2. Centrality and cohesion

Other important concepts pertaining to actors and their shared relationships are centrality and cohesion (Liu, et al., 2017). Centrality in a social network gives a measure of how central an actor is in the network, which can be related to how important or popular an actor is in the network. In the analysis of the social network, centrality measures will be used to determine if central actors have a link to shared place attachment. An example of such a link could be that central actors act as catalysts for creating shared place attachment in the network. Many attempts have been made by scholars to introduce the concept of centrality to human communication (Freeman, et al., 1980). In 1979 these early attempts were summarised by Freeman who uncovered three overarching ways in which centrality could be measured, based on the position of an actor in the network (Freeman, 1979):

- The degree (density) of points in the network: an index for activity
- The betweenness of points in the network: an index for potential for control and communication.
- The closeness of points in the network: an index for independence.

Building on Freeman, scholars conceived a large number of centrality measurements. Das et al. (2018) identified 14 different ways to measure centrality in social networks. The most used measures of centrality are listed below (Disney, 2020):

- Degree centrality: importance of an actor in the network is defined by the number of connections to other actors. This measure is used to find the most popular or well-connected actors in a network (Adiwijaya & Gozali, 2014).
- Betweenness centrality: measures the number of times a node lies on the shortest path between other nodes. This measure can be used to show which actors act as “bridges” between different parts of the network (Goh, et al., 2003).
- Closeness centrality: how close the actor is to any other actors in the network, based on distance. Can be used to find those who are most well connected or powerful in the network (Kazuya, et al., 2008).
- Eigen centrality: defines importance of an actor based upon the number of connections like degree centrality. Eigen centrality then goes a step further and takes into account how well the connections of connected actors are. Useful for identifying actors that have influence over the entire network (Adiwijaya & Gozali, 2014).

In the analysis of the social network, degree and closeness centrality will be used to determine actors in the network. Betweenness centrality will also be used to determine bridging actors in the network (see paragraph 2.2.2 for further elaboration on bridging in a social network). In Figure 5 degree centrality, betweenness centrality and closeness centrality have been graphically depicted. Note the difference between the central actor in betweenness and closeness centrality.

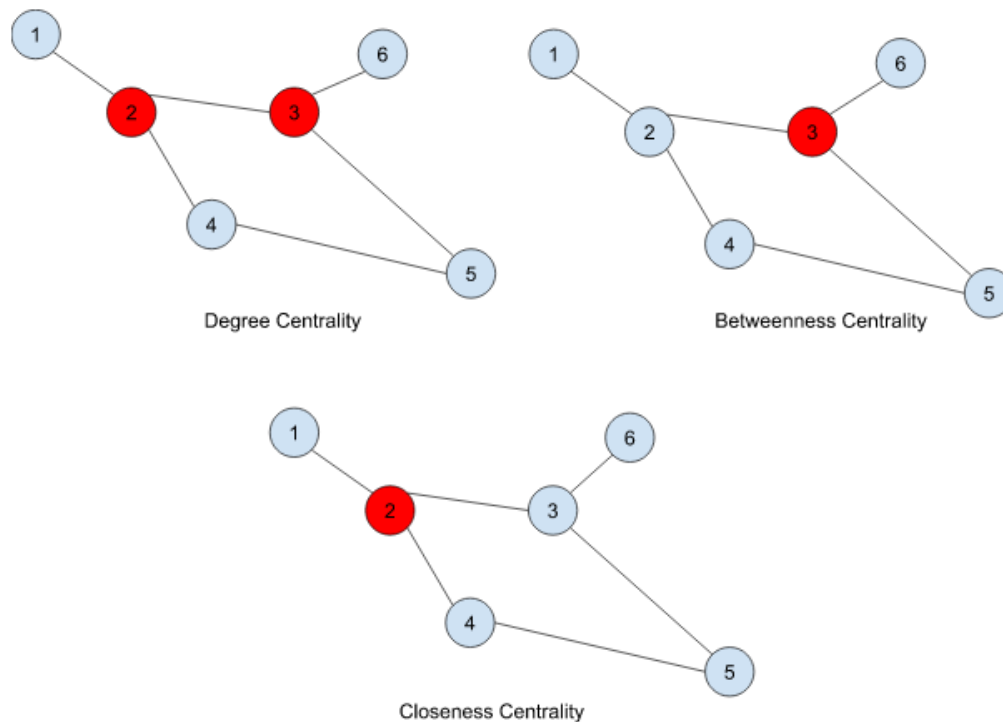


Figure 5 different forms of centrality in a simple network, with the actor(s) that have the highest degree of centrality in red. Actors 2 and 3 both have the highest connections to other actors in the network and share the highest degree centrality. Actor 2 has the highest closeness centrality because its connections are strongest (and thus shortest) with other actors in the network. Actor 3 has the highest betweenness centrality, because it has the highest number of times that a node lies on the shortest path between other nodes. Actor 3 acts as the most bridging actor in the network (own work).

Cohesion of a social network, also called social cohesion, is a measure of connectedness and solidarity within a social network. There are two main contributors to social cohesion. The first is the sense of belonging to the network. The second contributor is the quality of the relationships among actors within the network (Manca, 2014). Social cohesion is operationalised in social network analysis through the concept of structural cohesion. This concept looks at the minimal number of actors in a social network that needs to be removed before the network is disconnected. A higher number of actors that needs to be removed before disconnection of the social network occurs correlates with a higher level of cohesion (Moody & White, 2003). In figure 6 the concept of structural cohesion can be

seen. The actors in red indicate those that have to be removed to disconnect the network. A network is considered to be disconnected if there are no more connections between the actors in the network. Note the increasing number of actors that need to be removed the higher the number of internal connections become. A possible link between cohesion and shared place attachment will be researched in the analysis of the social network.

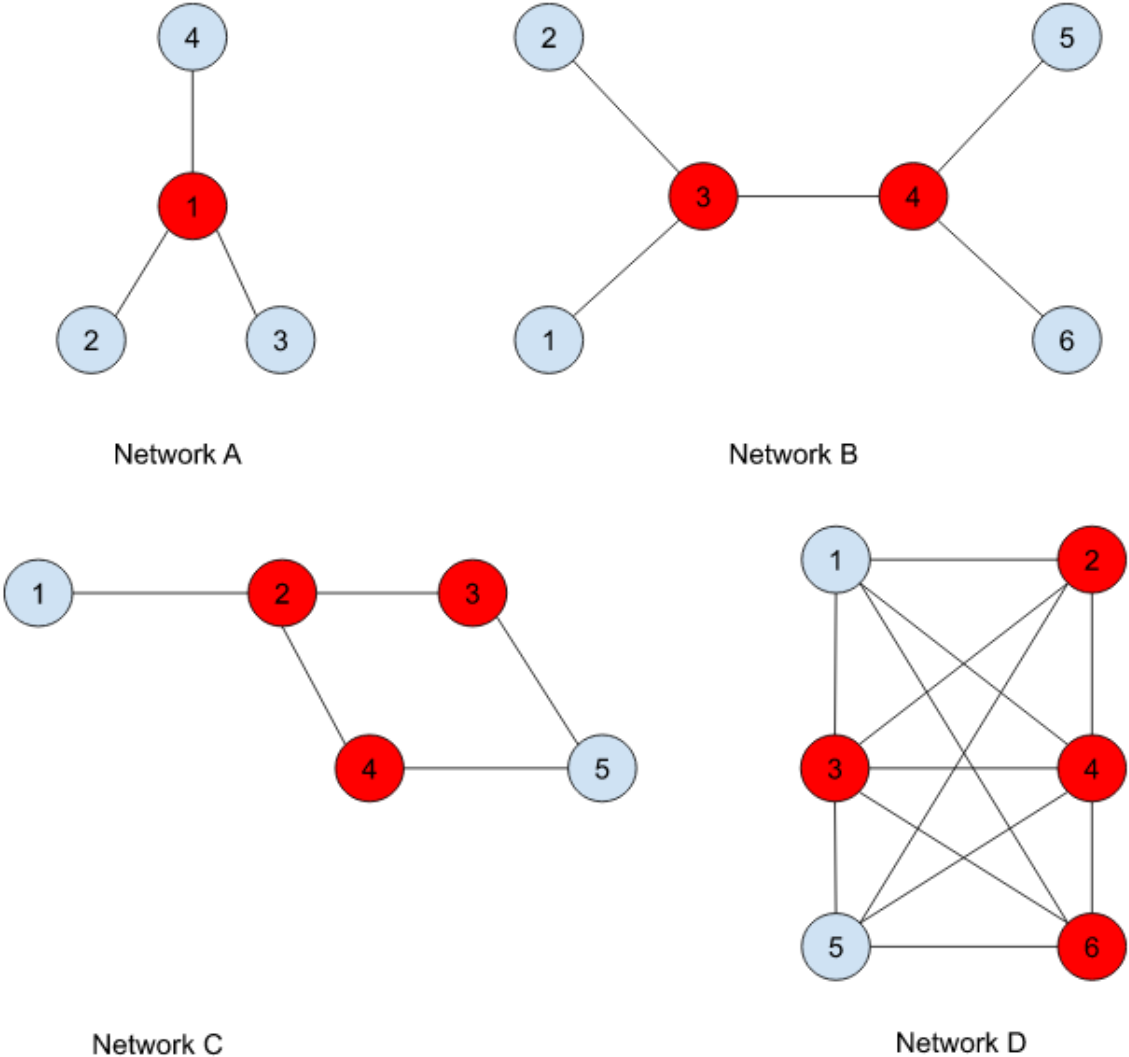


Figure 6 a number of simple social networks and the number of actors that need to be removed to disconnect the network in red. The more actors that need to be removed, the higher the cohesion of the network is, note the large number of actors needed to be removed in network D due to the strong interconnectedness between the actors (own work).

2.1.3. Evolution of social networks

As long as social networks have been the object of study, researchers have observed that these networks evolve over time. This phenomenon has been reported on the level of a single social network, but also with regards to the concept of social networks as a whole (Hellmann & Staudigl, 2014). It is important to understand the evolution of social networks since various distinctions in social networks have emerged throughout time (see 2.1.4). Change in social networks is created by events. These events can be as small as a new connection being added within the network or as large as societal changes (Dorian & Stokman, 1997). Large societal changes impact almost all social networks that are present in a society. Over the last couple decades, a number of these societal changes have affected the evolution of social networks in the western world. One of these changes is that society has become more individualistic. This societal change has been studied in depth by Putnam (2000). He describes how society has become less trusting and notes a decrease in civic engagement and available social capital. More recent research by Santos, et al. (2017) and Hamamura (2012) also notes this trend. A closely related trend is the emergence of faster communication technology, which lets people communicate over far greater distances through, for instance social media. This has changed the relation society has with space, communication over vast distances became easier and networks could now stretch over vast distances compared to before (Bretagnolle, et al., 1997). This change is also called space-time compression in literature. Over time these two changes have influenced social networks in two important dimensions: cohesion and space. In the cohesion dimensions a general lowering of overall cohesion could be seen in society and the networks it is made out of (Putnam, 2000). This has resulted in networks with more weak connections and fewer strong connections, that are easier to disrupt. In the space dimension, society gained the ability to communicate and socialise over incredibly large distances. For social networks this means that they do not need to be spatially bound any more, see for instance social media or friendship networks that span the continent. The evolution of social networks as laid out in this paragraph has been graphically summarised in Figure 7.

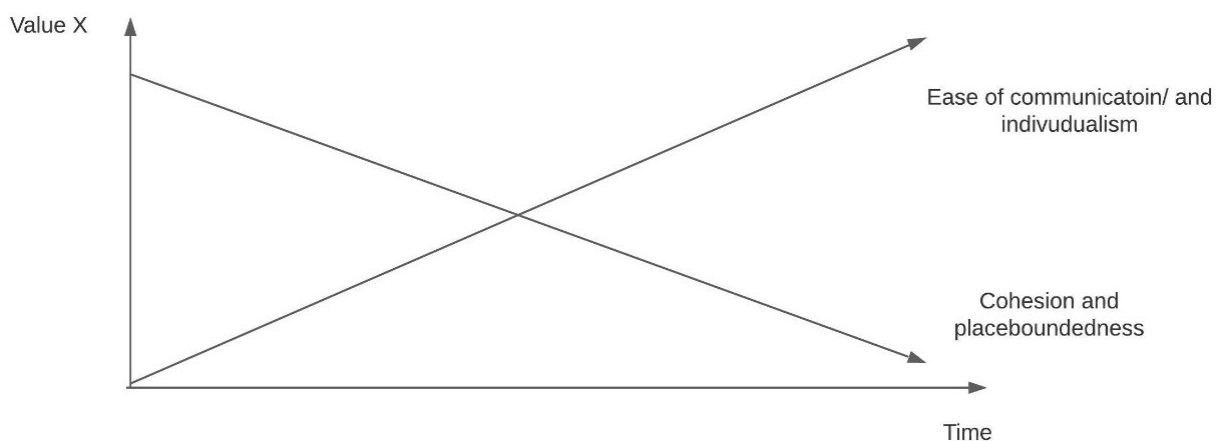


Figure 7 evolutions of social networks through time, showing the decline of cohesion and place boundedness and the increase in ease of communication and individualism/ (own work).

2.1.4. Distinctions in social networks

Defining social networks into types or categories is almost impossible, because of the sheer amount of different social networks that exist within a modern network society. Distinctions between different social networks can however be made for the purpose of analysing and studying these networks. The first scholar to make distinctions between different social networks was Tönnies in 1887. He proposed the existence of two ways in which social groups could be linked together. The first type of groups was connected by shared values and beliefs called *gemeinschaft*, most often translated to community. The second type of group was linked by impersonal, formal, and instrumental social links, called *gesellschaft*, most often translated to society (Tönnies, 1957).

Later scholars have synthesised this into the distinction between formal and informal networks (Rank, 2008). Formal networks are defined as hierarchical and rigid networks, governed by institutional rules. Most of the connections within the network are weak. An example of such a network would be a corporate hierarchy. Informal networks are governed by mutual interest and friendship, most of the connections in these networks are stronger than those in formal networks. An important difference with formal networks can be found in the absence of institutional rules on how the network is supposed to function (Allen, et al., 2007) (Van Kempen, 2015).

Another distinction can be made based on how place bound a social network is. In recent history, most social networks were very place bound, social contacts were limited by the speed of communication and travel (Bretagnolle, et al., 1997). When both of these began to increase, humans became way less place bound and could communicate over greater distances, which lead to hybrid networks. In these hybrid networks some part of the network was still bound to a place, but some part of the network was located in other places. These could be far away friends or contacts, that were only very rarely seen physically, but through better communication technology still played an active part in the network. With the emergence of the internet and especially social media, social networks that only existed online also emerged. Members of these networks only communicate with each other through online means, becoming essentially a non-place bound network. All three types (place bound, hybrid and non-place bound) can be found in our society nowadays. The evolution that caused the emergence of the hybrid and non-place bound networks is further described in paragraph 2.1.3.

A further distinction can be made between social networks based upon the number of different types of actors that are present within the network. In so called one mode networks, there is only one type of actor present in the network. In two or multiple mode networks there are multiple types of actors, for instance human actors and organisations (Breiger, 2011). Another distinction that can be made is the level of analysis. Some scholars use the levels of individual, aggregate and whole (Hanneman & Riddle, 2005), while others use the more common micro, meso and macro levels (Kadushin, 2012). On the individual or micro level, relations between a single actor and other actors or organisations/places are important. Networks on this level of analysis originate from one actor and are often called egocentric networks (Breiger, 2011). On the aggregate or meso level social networks that fall between the micro and macro level reside. These networks tend to be parts of greater social networks, consisting of smaller micro networks. With this level of analysis interactions between actors are the most important (Breiger, 2011). On the whole or macro level greater systems such as economies or flows of goods can be found. In Table 4 a summary of all the dimensions of distinction is given.

Dimension of distinction	Types of distinctions possible
Formality	Formal versus informal
Place bound	Place bound, non-place bound or hybrid
Mode	One mode, two mode, etc.
Level of analysis	Micro, meso, macro or individual, aggregate, whole

Table 4 The dimensions of distinction for social networks.

2.2. Interpersonal relations

Interpersonal relations describe the bonds, associations, connections and relations between people. These relationships can vary in degrees of intimacy, reciprocity, duration and power-distribution (Jinhu & Xiaoting , 2022). In social network analysis literature these relations are also called ties. In this paragraph both relations and ties will be used interchangeable. Three types of ties have been identified in the literature: absence of a tie, weak ties and strong ties (Krackhardt, 1992). These ties are described in depth further in this paragraph.

2.2.1. Strength of ties

The strength of a tie between actors in a social network can be measured on a linear scale, with the lowest part of the scale consisting of the absence of a tie and the higher part of the scale consisting of strong ties (Granovetter, 1973). Where a tie lands on the scale is based upon a number of factors. When these factors are added up, the strength of a tie can be calculated. This method will be used in this study to calculate tie strength. Scholars have put forward a number of factors to measure the strength of a tie. In Table 5 a number of these factors can be seen. In the studies conducted by Andrea, et al. (2007), Huszti, et al. (2013) and Bapna, et al. (2017) all factors were weight equally when calculating tie strength. In this study this precedent will be followed.

Factors	Scholar	Notes
Emotional intensity, intimacy, reciprocal services, time spent in the relationship.	Granovetter (1973)	-
Closeness/emotional intensity	Marsden & Campbell (1984)	Seeks to find a common indicator for tie strength.
Interaction, affection and time	Krackhardt (1992)	Builds further upon Granovetter, tries to get more objective factors
Trust, mutual confiding, multiplexy and shared interest.	Andrea, et al. (2007)	Concluded that the factors are the same for offline and online communities.
Like being with person, frequency of talking, frequency of meeting, intimate contact.	Huszti, et al. (2013)	Large case study.
Degree of interaction, embeddedness, physical world interaction	Bapna, et al. (2017)	Case study of an online social network

Table 5 Factors used by different scholars to determine tie strength.

While there seems to be a lot of differences between the factors at first, a closer look reveals a number of similarities. From these similarities a number of overarching factors can be synthesised, these can be seen in Table 6. These overarching factors will be used in the study to determine tie strength.

Overarching factor	Factors from scholars
Emotional intimacy	Closeness/emotional intensity, affection, intimacy, intimate contact, like being with person, trust.
Frequency of interaction	Physical world interaction, interaction, frequency of talking, frequency of meeting.
Time of interaction	Time, time spent in the relationship.
Reciprocity	Reciprocal services, mutual confiding.
Shared characteristics	Multiplexy and shared interest, embeddedness.

Table 6 Overarching factors for the strength of ties.

2.2.2. Weak ties

Weak ties are connections between people that don't really know each other well. They are what could be described as acquaintances. Weak ties act as a sort of social glue within networks, making interactions between different groups of people possible (Putnam, 2000). The quintessential work on weak ties has been written by Granovetter (1973). He described micro scale social networks which consisting of a number of strong ties (with some weak ties in the mix), with weak links acting as a 'bridge' between different micro scale social networks. Weak ties are seen as the link between the micro and the meso levels of social networks, with these ties connecting multiple micro level social networks into a meso social network (Rademacher & Wang , 2014). The theory of Grannoveter was confirmed by the small world phenomenon, which describes that all humans are embedded in a small world structure. This structure states that all people in the world are connected to each other through shared connections. It states that individuals have networks around them with whom they are well acquainted, but also that there are people with whom they have a weaker connection that connects the person to other networks (Milgram, 1967). This phenomenon has been observed by researchers in a number of later articles (Newman, 2000) (Telesford, et al., 2011). In the study, this model of how smaller scale social networks are linked together by weak ties to form larger scale networks is used. It must be noted that this view on networks mainly pertains to less formal networks, in more formal networks it is expected that there are far more strong hierarchical ties holding the network together. Since the network that is analysed in this study is an informal one, this view of how networks are linked together is used. In paragraph 4.1. groups will be formed through blockmodeling and the bridges between the groups will also be made apparent. In Figure 8 a number of micro networks connected by weak ties can be seen, forming a meso level network out of smaller micro level networks.

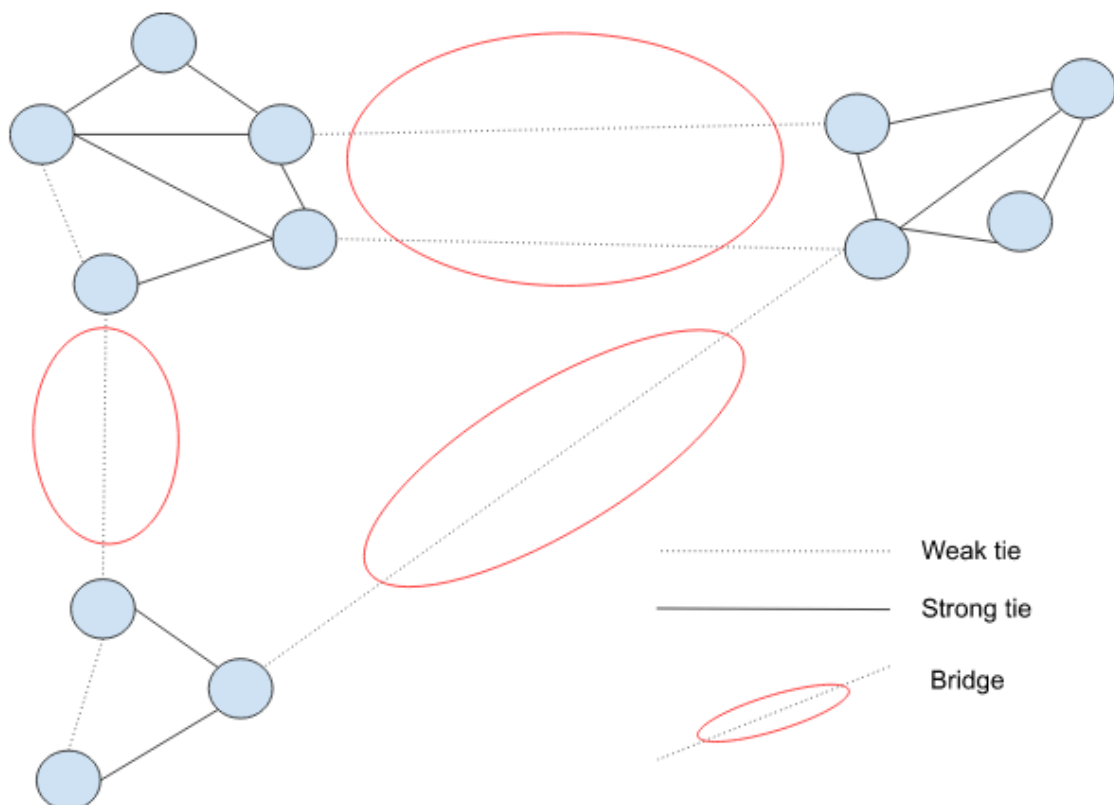


Figure 8 A number of micro networks connected by weak tie 'bridges' (own work).

2.2.3. Strong ties

Strong ties are typically related to close relationships, such as family, friendships or that of a mentor and his pupil. Strong ties can also be seen in a more formal environment such as that between an employee and his manager (Krackhardt, 1992). People tend to gravitate to those they have strong ties with, forming small self-contained networks called cliques. These cliques are often connected to other cliques through weak links (Cleemput, 2011), see Figure 8. Where weak ties are the glue that keep larger social networks together, strong ties keep micro level social networks together. This process is often called bonding (Putnam, 2000). While the analysis of weak ties is an important step in trying to understand how a network works in its entirety, strong ties tell the story of personal connections. It is these strong ties that will be used to determine if there is a link between tie strength and shared place attachment.

2.3. Place attachment

The concept of place attachment pertains to the emotional bond between people and (physical) places (Florek, 2011). Place attachment has strong links to feeling at ease and mental well-being and is one of the factors that determines if a place is considered to be 'good' (Lomas, et al., 2021). There are two major theoretical models that describe how place attachment is created. The model that was created by Raymond et al. (2010), is mostly focused on place attachment to nature in a more rural setting. Because the case study in this thesis is on a social network in a city and its connection to places in an urban setting, this model is not used. The theoretical tripartite model by Scannell & Gifford (2010) is used instead, presenting a more generalised framework for the factors that shape place attachment. In Figure 9 the framework can be seen. In this paragraph the working of place attachment will be further explained based on the three dimensions of the tripartite model.

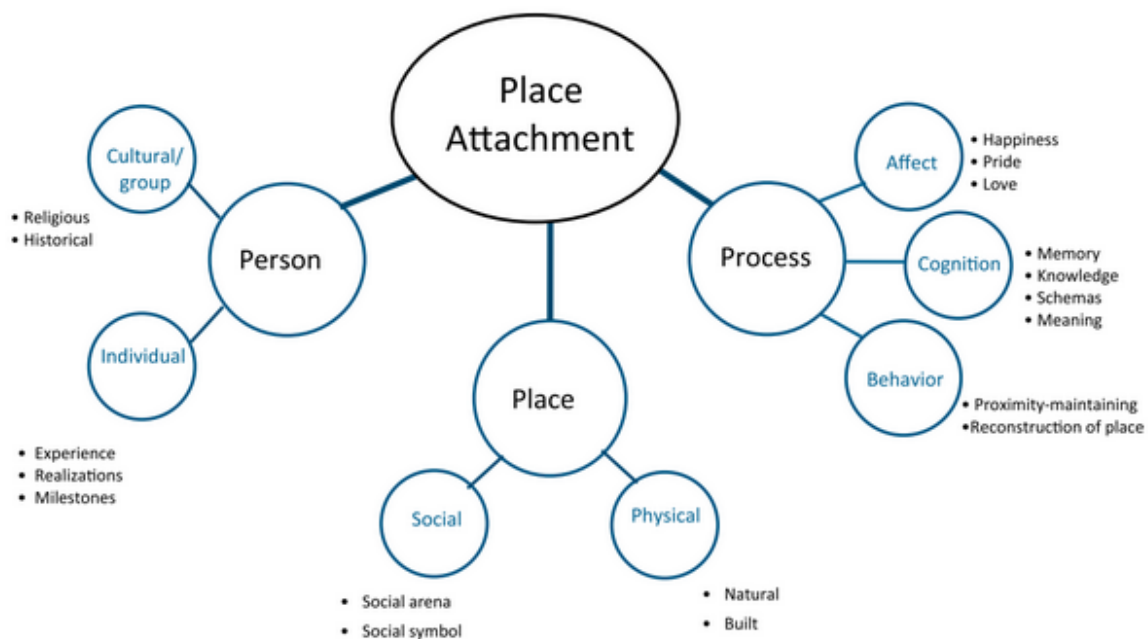


Figure 9 The tri-partite model of place attachment (Scannell & Gifford, 2010).

2.3.1. Actors and place attachment

Attraction to place by actors is experienced on both the individual and on the group level. In the triparte model this pertains to the dimension of 'person'. On the individual level place attachment is created by the personal connections that a person has to different places (Scannell & Gifford, 2010). For instance the connection to intimate places like a person's home (Brown & Perkins, 1992). These personal connections are created by significant personal experiences like realizations, milestones and one-of-a-kind experiences (Manzo, 2005). These personal experiences can also be created by interactions with other people such as loved ones or good friends. This is the link between the individual part of the person dimension and interpersonal connection. On the group level place attachment is formed by the shared symbolic meaning that is given to a place by the members of said group. Interpersonal connections also play a role in this creation of shared symbolic meaning by influencing what is found important. Actors need a connection with others of a certain magnitude to create a shared symbolic meaning of a place (Scannell & Gifford, 2010). Closer interpersonal connections should thus lead to more place attachment on the group level.

2.3.2. Places and place attachment

The characteristics of a place also play a role in the development of place attachment. This goes for both the physical and social characteristics of a place. In the triparte model this pertains to the dimension of 'place'. Physical characteristics of a place that impact place attachment can for instance be the amount of nature, the cleanliness of a neighbourhood or the amount of available sunlight (Scannell & Gifford, 2010). Some of these characteristics will make people feel more attached to a place, while some will lessen the attachment felt to a place. This is mostly specific to the personal taste of an individual (Lomas, et al., 2021). Social aspects of a place pertain to the bonds an individual has with other people that live or frequent a place (Scannell & Gifford, 2010). In this, the most direct link between shared place attachment and interpersonal connection can be found. It has also been found that place attachment on a neighbourhood level is nourished by daily encounters with neighbours (Brown, et al., 2003). This further strengthens the link between shared place attachment and interpersonal connections. Another study finds that social elements are more important than physical elements within the place dimensions of place attachment. This further strengthen the link between shared place attachment and interpersonal connections (Hidalgo & Hernández, 2001).

2.3.3. Mental process of place attachment

There are a number of mental processes on an individual level that lead to the creation of place attachment. In the triparte model this pertains to the dimension of 'process'. The main mental process of place attachment is rooted in emotions, both positive and negative. With positive emotions (such as love, pride and happiness) generally leading to an attachment to a place, while negative emotions (such as fear, hatred and trauma) lead to a detachment of a place. These emotions are affected by the memories, beliefs, meaning and knowledge that an individual possesses of a place. This process leads to a set of behaviours, namely proximity maintaining and the reconstruction of space (Scannell & Gifford, 2010). Proximity maintaining describes a behaviour in which individuals prefer to stay close to the places that they share a positive or strong bond with (Hidalgo & Hernández, 2001). Reconstruction of space describes the process of individuals changing their space to match with their preferences or nostalgic places. This behaviour can best be seen when a disaster has struck an area, but also occurs when people move to new areas (Francaviglia, 1978). The acting out of these behaviours by an individual are a good indication for the existence of attachment to a place.

2.3.4. The importance of shared place attachment

The existence of shared place attachment is important for the functioning of many public and private places, such as cafés, restaurants, schools and other gathering places. Without shared attachment to these places there would be very little incentive to go to them (Firouzmakan & Daneshpour, 2015). Place attachment plays an important part in the creation of the social fabric of a place. Itself being an important part for the creation of space from place (Streeck, 2013). This fits right into the agenda of place making, an idea that has gotten more traction as of late in both academic settings as in planning practice (Friedmann, 2010; Basaraba, 2021).

2.3.5. Measuring place attachment

A number of studies have been conducted on which variables can be used to measure place attachment, with Raymond et al. (2010) concluding that these variables differ based upon the context in which place attachment is measured. This view was further strengthened by Williams (2014) stating that there exists a diversity of ways in which place attachment is measured and conceptualized. He further states that there is no one research program that can successfully engage all facets of place attachment. In this study place attachment is measured based upon the tripartite model by Scannel & Gifford (2010) and it looks at place attachment through the context of the individual actor, the group of actors, the place (both physical and social layers) and the mental process. For each of these contexts a different variable will be measured in this study (Brown, et al., 2015). For the individual actor, place attachment is measured based upon the attraction an individual experiences to a place. This attraction is based upon significant personal experiences around this place. Place attachment for the group of actors is measured based upon the shared connections with a place. Attachment to place is measured based upon the attraction of an actor to a place (physical layer) and by the level of connections with other actors that are attracted to a place (social layer). For the mental process there are a number of different variables that can be measured. The variable of proximity maintaining is chosen, because it is the easiest to measure and is expected to be present in the case study.

2.4. Conceptual model

The conceptual model is a schematic representation of how different concepts in the study relate to each other. The model operates with the hypothesis that greater strength of interpersonal relations within a social network leads to a greater level of shared place attachment. The conceptual framework can be seen in Figure 10. On the left of the model the different relevant contexts for studying the existence of place attachment in a social network are given. For each of these contexts a mechanic has been identified that is likely to create place attachment within a social network. The mechanic that creates place attachment is given above the arrow that leads to place attachment. Based upon this model the main research question and secondary research questions will be answered. In the next chapter, the methods that will be used to answer these questions will be further explained.

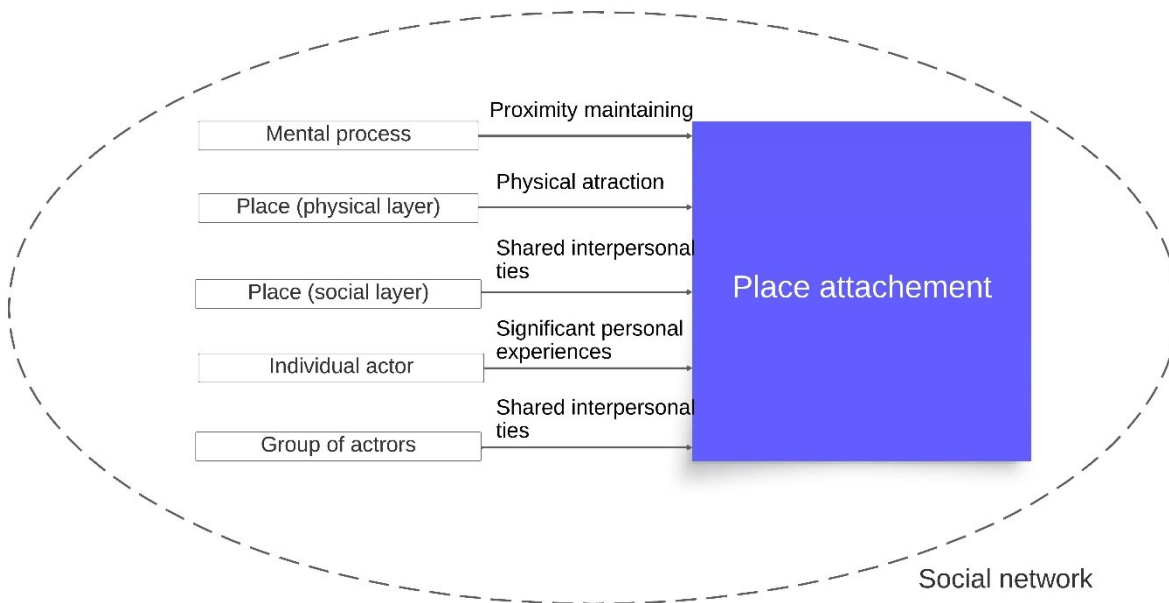


Figure 10 the conceptual framework of the study. This model shows how place attachment is created in different contexts that are relevant within a social network (own work).

3. Methodology

In this chapter the methodology of the study is described and so are the methods used and the reasons they were chosen. The social network that was chosen for the study is also described. The chapter furthermore contains the data collection and analysis schemes and finishes with a section dedicated to the ethical considerations of the study.

3.1. Type of study

The study uses a form of mixed methods, mostly borrowing from the qualitative field. The qualitative parts of the methods come forth in the way that the data gathered through a questionnaire is analysed and interpreted. There is also a quantitative part to the study, where the complex concepts of interpersonal connections and place attachment are synthesized in several 1 to 5 ratings.

3.2. Methods used

The main method used during the study is that of a social network analysis. This is a qualitative method for the study and analysis of social networks and the connections within them. There are a number of reasons why this method was chosen. The first reason is the connection that is studied. Social network analysis as a method is uniquely situated to analysis the connection between interpersonal relations and other measurable concepts (in this case shared place attachments) (Breiger, 2011). The second reason is the ability of social network analysis to uncover the dynamics in complex networks, such as the interpersonal connections and their effects on place attachment that are studied in this thesis (Schipper & Spekkink, 2015). The third reason is the furthering of science. There is only one other study where social network analysis was used to make conclusions about the level of place attachment (Weijs-Perrée, et al., 2017). With this study science will be brought further and a potentially new niche use for social network analysis can be uncovered. The secondary method used during the study is that of a questionnaire. This method was used to collect data for the social network analysis. The main reason for the use of a questionnaire is the efficiency of the method. The population that is covered for the research is relatively large and the use of a questionnaire is an efficient method for gathering data from a large sample (Mathers, et al., 1998). Questionnaires are better suited than interviews, because of the data that is needed for the social network analysis. Interviews provide a deep insight, but very little data that can be used in a social network analysis, because of this they are unsuitable for the use in this study (Codó, 2008).

3.3. The chosen social network

The social network that is used for the study is a gaming group that plays the popular collectible card game "Magic: The Gathering". Members of the group are situated around the city of Groningen and meet up regularly in locations throughout the city to play games of Magic: The Gathering together. The places the group meets up are in a café in the city centre and in the homes of members of the group. Meetups in the café tend to consist of 8 to 12 people, while meetups at people's homes usually consist of 3 to 5 people. Before meeting up to play, members sometimes share a meal in the city centre or partake in other social activities. Once a year a retreat is organized by the group, during which 24 members spend a weekend playing Magic: The Gathering and socializing together. The main way of communicating within the group is through private online messaging platforms such as WhatsApp and Discord. There is a clear core group with the most active members, that participate more in meetups and help to organize the weekend retreat. Outside the core there are member that participate in only some of the meetups or stay in the communication channels of the group to discuss the group's shared hobby. Place attachment is crucial for this group to function, since a physical place is needed to conduct the hobby. Shared place attachment also plays an important part in keeping the group together since they rarely meet up outside of participating in their shared hobby. In paragraph 2.1.4 a number of

different distinctions in social networks are given. The chosen social network is an informal network and is hybrid place bound. The network is single node and operates on the meso level of analysis. The network is chosen because of the ease of access. The author is part of the outer core of the network and thus has access to conduct research on the network. Another reason why the network is chosen is the level of analysis. Since the network is on the meso level of analysis, it is small enough to effectively use qualitative analysis. A large number of networks that are similar to the researched network exist. Because of this the results of the study are applicable to a wide variety of other social networks.

3.4. Data collection

Collection of data happens through three steps. In the first step interest for the study is created within the network. This was done through posting messages in the communication channels of the network and seeing if a positive reaction could be gathered. To increase interest in the research a reward for participating in the research was also promised. In the second step a link to sign up for the study was published in the communication channels. The link led to a form where more information about the questionnaire was provided. The information on this form was in Dutch (the native language of the participants in the study), to provide the most clarity in what participation would entail. It was also stated that further communication with regard to the study would be conducted in English. This was done to make sure that participants could provide informed consent (see paragraph 3.5) In this form personal data (name, email, age and profession) were collected to be used in the research and in step three. A Magic: The Gathering product was raffled under the participants, as an incentive to participate.

In step 3, participants that had signed up through the form were emailed a link to the questionnaire. The questionnaire was in English this time and started with once again stating the goals of the study and the relevant information. Once again ensuring that participants could give informed consent. The questionnaire consisted of two parts. The first part was designed to unveil the personal bonds that individuals had with other members in the network, while the second part was there to see with which places participants experienced strong place attachment. In paragraph 2.2.1, 5 factors for measuring the strength of an interpersonal connection were identified. Based upon the method of Granovetter (1973) strength of interpersonal connections can be determined by assigning scores to these factors and adding them up. For each of these factors' participants were asked to answer 1 question about all other participants in the study. A limit of 1 question per factor was maintained because of the large number of questions participants already had to answer (Regmi, et al., 2016). Structuring of the questions is based upon the questionnaires used by Andrea, et al. (2007) and Huszti, et al. (2013) in their studies on social networks. The questions for each factor can be seen in Table 7.

Factor	Question
Emotional intimacy	Do you trust this person, and do you feel like you can share intimate details with them?
Frequency of interaction	I interact often with this with this person (both physically and online)?
Time of interaction	I spend much time on an average interaction with this person
Reciprocity	Do you feel like this person would do something for you, if you did something for them?
Shared characteristics	Do you share any interest with this person?

Table 7 Questions for each factor of interpersonal connection strength (own work).

Participants were given five multiple choice answer possibilities to each of the questions. With the answers given corresponding to a score between 0 and 4, this allows for the later determination of tie strength (see paragraph 3.5). The answer options can be seen in Table 8. When participants did not know a person, they were instructed to choose the first option, with score 0.

Score	Answer
0	Strongly disagree
1	Disagree
2	Neither disagree/nor agree
3	Agree
4	Strongly agree

Table 8 Possible answers to the questions (own work).

In paragraph 2.3.5 four contexts are named to measure place attachment in the study. For each of these contexts a variable to be measured in the study is named and can be seen in Table 9

Context	Variable
Individual actor	Individual attraction to a place.
The group of actors	Shared connections with a place.
The place (both physical and social layers)	Shared connections with a place and the strength of their shared interpersonal ties.
The mental process	Existence of proximity maintaining.

Table 9 The different contexts and the variables of place attachment (own work).

Individual attraction to place is measured by asking which places are personally important to participants in the study. This is done through the following question: “Name 5 places that you personally feel an (emotional) attachment to”. Through this question the existence of proximity maintaining was also examined. To uncover shared connections with place, the participants were asked to name places that they felt a strong connection to through the social network. This was done through the following question: “Name places in connection to [the social network] that you feel a connection to”. The strength of shared interpersonal ties is gathered through the questions about tie strength. The entire list of questions that participants were asked to fill in during the questionnaire can be found in appendix 1.

3.5. Data analysis

The data that is collected through the survey yields two social networks. The first network is a one node social network which consists of the members of the network and their interpersonal connections. The strength of a tie between two actors is equal to the sum of the 5 scores that were collected for each factor of interpersonal connection in the survey. A higher total score means a stronger interpersonal connection. After the total tie strength has been determined the ties will be subdivided in the absence of a tie, weak ties and strong ties. This will be done according to the theory of Granovetter (1973), stating that tie strength can be seen as a linear scale with the lowest parts corresponding to the absence of a tie and the highest levels corresponding to a strong tie. See Figure 11 for the linear scale and the corresponding scores for each type of tie. The scores on what constitutes as a weak tie, a strong tie and the absence of a tie are based upon the total possible score in the survey.

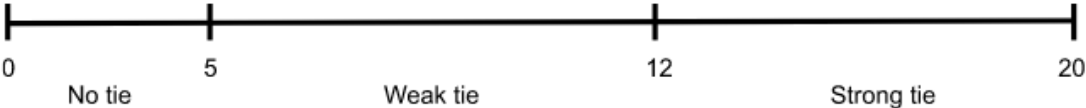


Figure 11 Linear scale with corresponding scores for type of ties (own work).

After the subdividing in weak and strong ties, the network will be visualised in a graph created through the open-source program social network visualizer. Through this visualisation the following characteristics of the network will be analysed:

- Identifying central characters in the network, through degree and closeness centrality analysis.
- Identifying bridging characters in the network, through betweenness centrality analysis.
- Identifying the blocks/groups in the network.

The second network that is created is a three-node network, which consist of the members of the network and the places they hold a personal and groups attachment with.

After the subdivision into weak and strong ties, the network will be visualised in a graph created through the open-source program social network visualizer. Through this visualisation the following characteristics of the network will be analysed:

- Identifying shared central places, through degree and closeness centrality analysis.
- Identifying blocks/groups around shared central places.
- Identifying the difference between personal place attachment and groups attachment.

When both networks have been identified and analysed, both will be combined into one network with different ties within the network (place attachment and interpersonal connections). Through this combination of the networks and the earlier analysis the hypothesis that greater interpersonal connections within a social network leads to greater shared place attachment will be tested.

3.6. Ethical considerations

There are several ethical considerations about the research, the most important is the possible harm caused by the study. This pertains to both harm done to the researcher and to the participants in the study, the dignity and rights of all participants should be protected (Springer Nature, 2022). The risk for harm to participants in the study comes from the social repercussions that can come from the information disclosed about the interpersonal relations with other people in the network. Especially when relations between members of the network are not as they were thought to be (University of Virginia, 2023). To reduce this possible harm all participants are made anonymous in the study. Identifying characteristics of participants are not displayed in the research. The reduction of harm to the researcher is also important since he is part of the studied network. The measures that are taken to reduce harm to the participants are also effective for the reduction of harm to the researcher. As an additional measure the researcher will provide a form of feedback to the network to show the results of the study. This is done to give closure to the relation between the researcher and the participants. In this way the researcher can go back to being a regular member of the network. The next ethical consideration is that of informed consent. The concept of informed consent states that participants should be fully informed about that which they give consent to, in this case the use of their data in the study (Maxwell & Beattie, 2004). This is done in the study by clearly stating the goal of the study, the use of given data and by allowing people to step out of the study at any time. Participants are given this information twice, once when signing up in their native language (Dutch) and once when participating in the survey in English. The last ethical consideration for the study is that of positionality. The researcher is part of the social network that is studied. This brings forward the possibility of biases but grants the researcher access to the network. Although there is a form of bias in each research, the chances of it effecting results are greater in this study. To minimize the effects of bias it is best to outline them and through a process of critical evaluation on the researchers' part keep them out of the research (Smith & Noble, 2014). Another important way to deal with biases is to be transparent when they appear, in this case stating the positionality of the researcher such that results from the study can be critically evaluated (Simundic, 2013).

4. Results

In this chapter, the results of the study are presented. Each part of the research is presented in its own paragraph through the method of report, analyse and conclude. This method consists of first reporting the results, then analysing them and drawing conclusions from the analysis. The chapter starts with a short description of the participants of the study. Then tie strength between actors in the social network is analysed. The central and bridging figures are also identified. Based upon the analysis a summation is made about the working of the network. Place attachment of the actors within the network is analysed next. This is done through the four contexts of the Individual actor, the group of actors, the place and the mental process. The outcome of this analysis is then coupled with shared place attachment in the network. The last part of this chapter is used to link shared place attachment to tie strength and to report on the trends that were observed in the research.

4.1. Participants

A total of 20 people participated in the study, no entries in the study were invalid and all participants consented to being part of the study. In Table 9 a number of characteristics of the participants have been given. Names of participants have been changed to pseudonyms as a measure to preserve anonymity.

Pseudonyms	Age	Gender	Profession
Participant 1	32	Male	HR advisor
Participant 2	29	Male	Bank worker
Participant 3	36	Male	Bookkeeper
Participant 4	27	Male	Financial controller
Participant 5	Not given	Male	Philosopher
Participant 6	37	Male	Director
Participant 7	36	Male	Software developer
Participant 8	38	Male	Project leader
Participant 9	33	Male	Financial controller
Participant 10	42	Male	Software tester
Participant 11	37	Male	Teacher
Participant 12	38	Male	Strategic advisor
Participant 13	45	Male	Information Manager
Participant 14	34	Male	Strategic advisor
Participant 15	20	Female	Game developer
Participant 16	26	Female	Data analyst
Participant 17	39	Male	Data engineer
Participant 18	37	Male	Professor
Participant 19	26	Male	Planner
Participant 20	35	Male	Software engineer

Table 9 Participants in the study (own work).

Most of the participants in the study were male and between the age of 20 and 40. Many participants of the study have a profession that requires a high level of education and is generally well paying. These characteristics (mainly male, well-paying jobs and highly educated) match with the general characteristics of the group. In this way this sample is a good depiction of the rest of the group. The sample composes about 25-30% of the group's active members. Because of the qualitative nature of the study the small sample size can be used to make statements about the larger social group (Sandelowski , 1995; Hennink & Kaiser, 2022).

4.2. Tie strength in the social network

The raw (anonymised) data that was used for this analysis can be found in appendix 2. The social network had a total of 380 possible connections between the 20 actors that are part of it. As described in paragraph 2.2.1 and 3.5 the ties were subdivided into three types: no tie, weak tie and strong tie. Of these 380 possible connections, a total of 90 did not meet the score threshold for a weak tie and were considered to constitute such a weak connection between two actors that they were classified as having no ties. A total of 217 ties are considered to be a weak tie and the remaining 73 are considered to be strong ties. See Table 10 for a summation of the number and type of ties in the network.

Type of tie	Range	Number of ties
Absence of a tie	0-5	90
Weak tie	5-12	217
Strong tie	12-20	73
Total	-	380

Table 10 Breakdown into different tie types based upon tie strength (own work).

There is a large number of ties in the network, both weak and strong. When determining the social cohesion of the network (see paragraph 2.1.2) all but two nodes have to be removed to completely disconnect the network. This means that there is a high level of cohesion present in the network. Even when the weak ties are taken out of the network so that only the strong remain, half of the actors have to be removed before the network is completely disconnected. This shows that the strong cohesion of the network is generated by both the weak and strong ties. This high cohesion means that actors in the network experience a high sense of belonging to the network. It also means that the quality of the relationships among actors within the network is high.

4.2.1. Central figures

When a degree centrality analysis (see paragraph 2.1.2) is performed on the network the image in Figure 12 can be produced. In this analysis, weak and strong ties are weighted, with strong ties having a value that is twice as high as a weak tie. The actors are sorted into differing radials, with further radials representing less central actors.

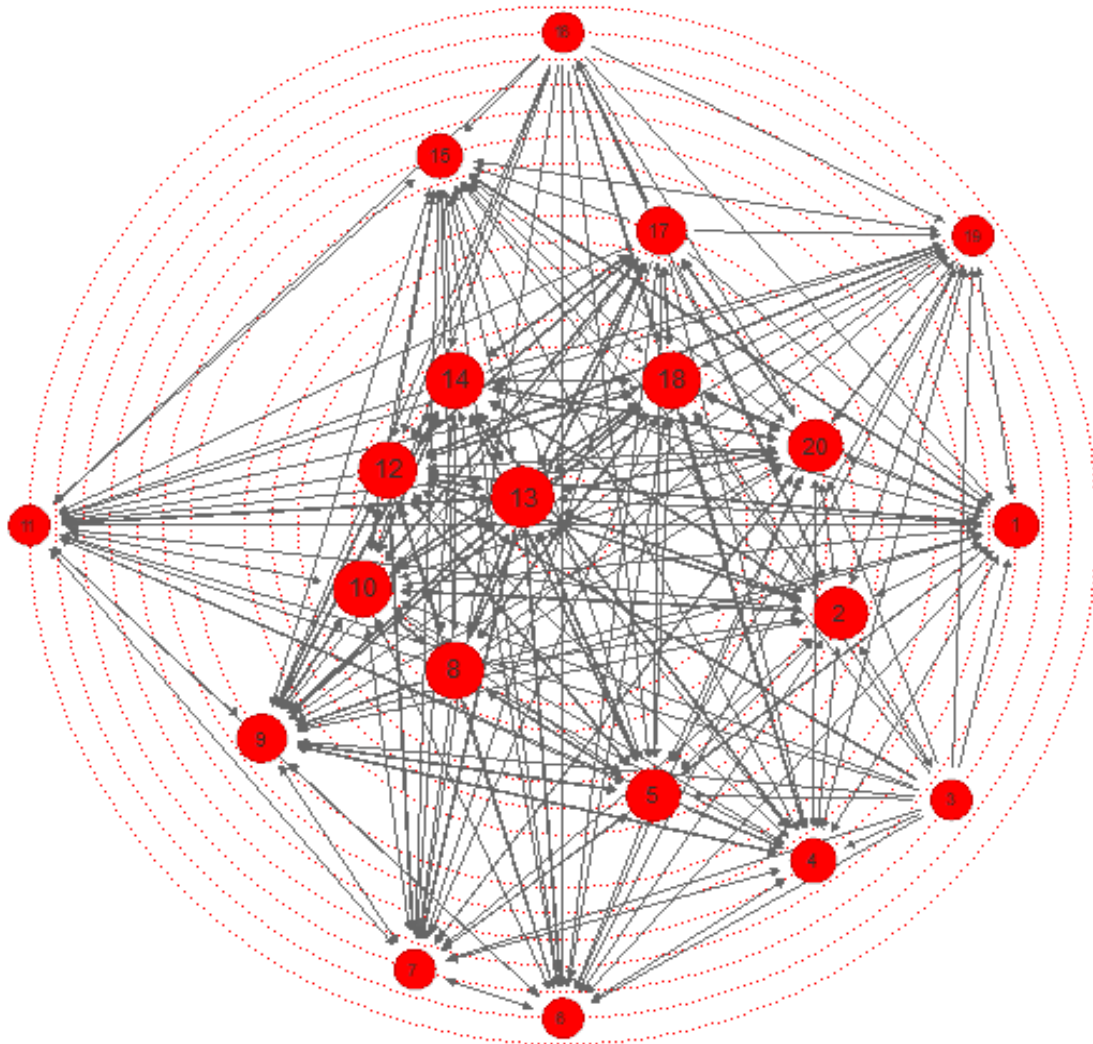


Figure 12 Visualization of the social network based upon degree centrality, with actors further from the center being less central (own work, software used is social network visualizer).

The most central figure in the network is actor 13, with participant 8, 10, 12, 14 and 18 following closely behind. The in and out degree for each actor in the inner circle can be seen in Table 11.

Actor	In degree	In degree weak tie	In degree strong tie	Out degree	Out degree weak tie	Out degree strong tie
Participant 8	12	2	10	26	8	18
Participant 10	26	12	14	25	9	16
Participant 12	34	2	32	36	6	30
Participant 13	24	3	21	31	6	25
Participant 14	26	2	24	26	8	18
Participant 18	27	11	16	26	8	18

Table 11 Degrees of centrality for all actors in the network (own work).

There appears to be a strong inner core of central figures in the network. These figures generally have a large number of strong connections with other actors in the network and each other. In practice this has also been observed with an inner core running activities of the social network while an outer core mostly participates in them. Participant 13 is the most central figure in the network, while not so in absolute numbers (being beaten by participant 12). Participant 13 is best connected to other central figures as he has a strong connection with all of the members of the inner core of the network. A close second central figure in the network is participant 12, who is best connected in absolute numbers but does not share a strong connection with all members of the inner core. Both participant 12 and 13 are founding members of the group and they are often involved in organising activities within the network, so it is not surprising to see them as the central figures in the network. It can be concluded from the centrality degree analysis that there is a strong core in the network of central figures, with participant 13 acting as a central figure for this inner core, as he takes a pseudo leading/steering role in the network.

4.2.2. Bridging figures

When a betweenness centrality analysis is performed on the network, the image below can be created. In this analysis weak and strong ties are weighted, with strong ties having a value that is twice as high as a weak tie. The actors are sorted into differing radials, with further radials representing actors that are less bridging in the network.

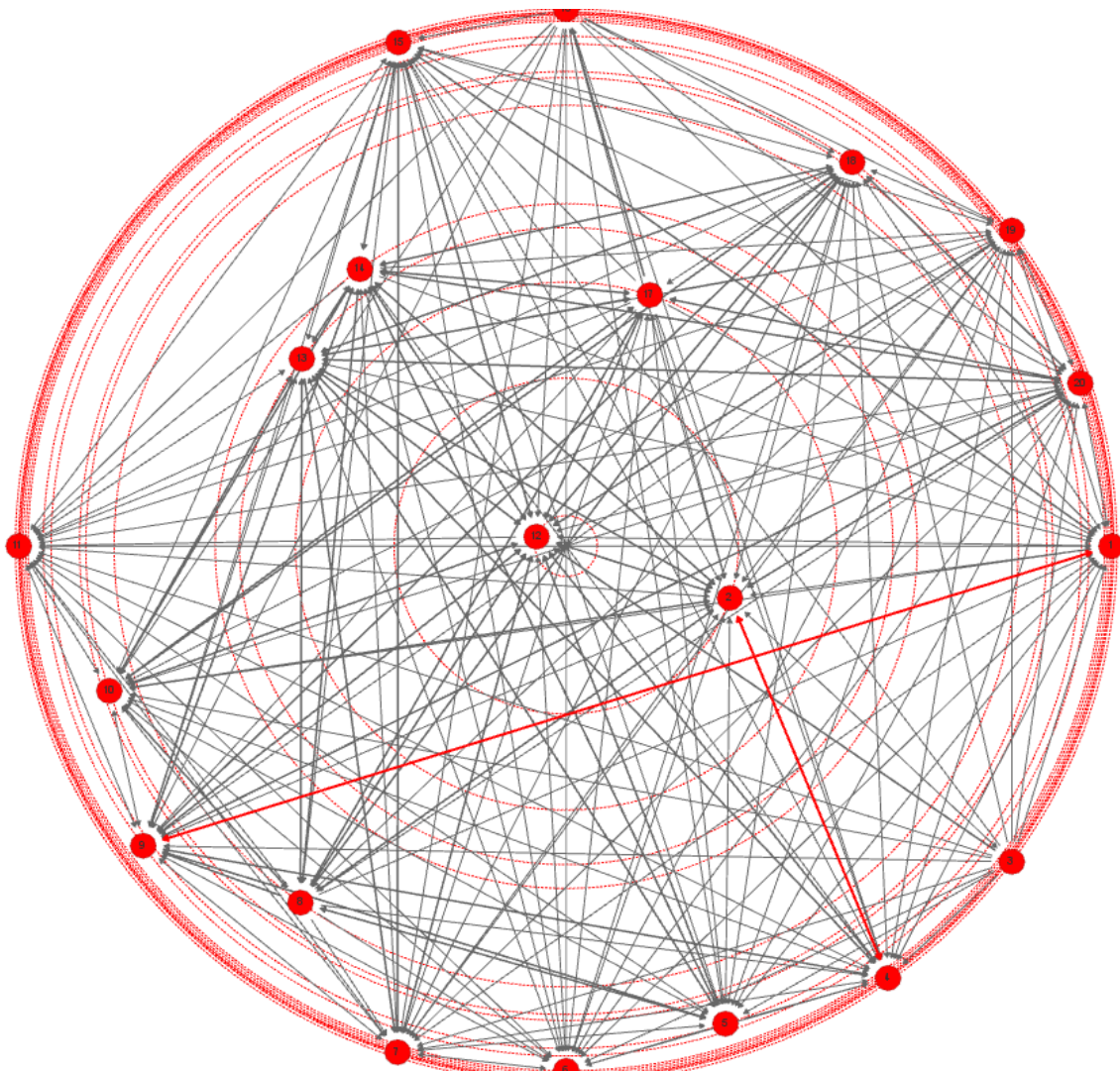


Figure 13 Visualization of the social network based upon betweenness centrality, with actors further from the center being less bridging in the network (own work, software used is social network visualizer).

Participant 12 is by far the most bridging figure within the network. Another important bridging figure is participant 2. Participants 13, 14 and 17 also deliver an important contribution to the bridging within the network. The table below shows the number of times the actor laid in the shortest path between other actors in the network. A higher number means the actor acts more as a bridge within the network.

Actor	Number of times in shortest path
Participant 2	45
Participant 12	61
Participant 13	27
Participant 14	24
Participant 17	33

Table 12 Number of times an actor laid in the shortest part between different other actors.

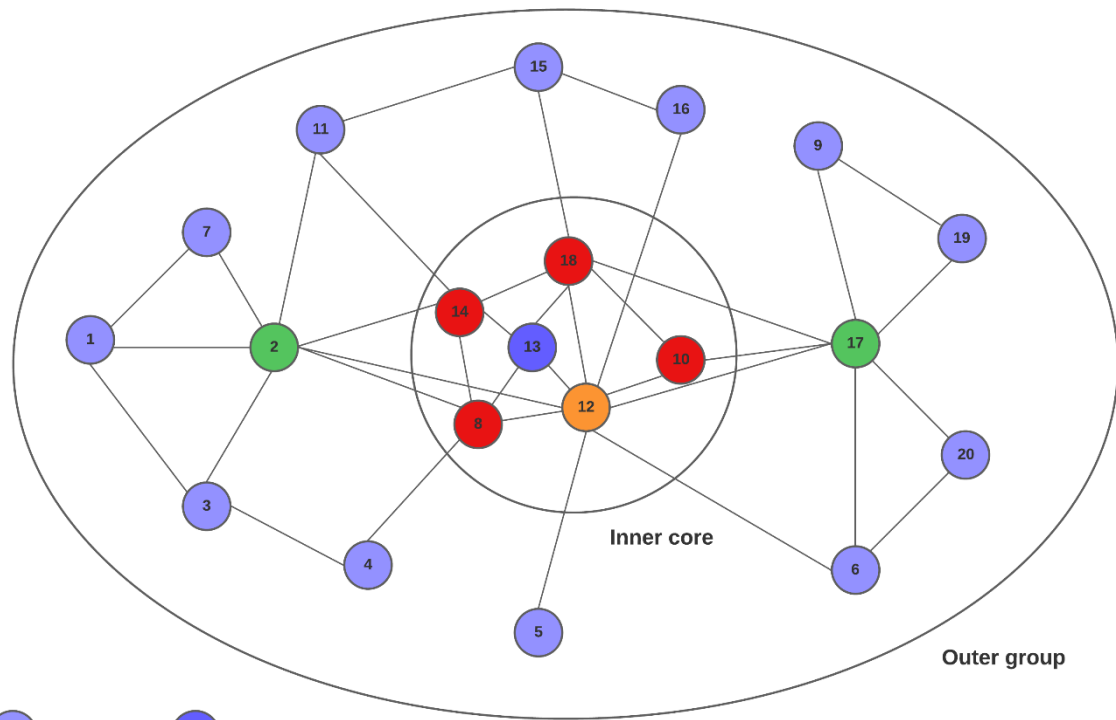
Participant 12 is the most bridging force within the network and also an important central figure (see 4.2.1). Most of the actors in the network that are great bridging figures are also part of the inner core of the network as described in paragraph 4.2.1. There are two exceptions to this rule, that can be found in participant 2 and 17. These actors are not part of the inner core of the network but act as bridges that connect the outer part of the network with the inner core. These actors both are not founding members of the network, but can be classified as a second generation that joined the network not shortly after its inception. They now act as a bridge, which connects the core with the rest of the network.

4.2.3. The network in summation

The network is highly cohesive, with a large number of connections between the actors in the network. There is a central core to the network which consists mostly of founding members of the group. These are very well connected to other actors in the network and within the core. Within the core there is one actor that stands out as sort of a leader of the group, being the most central character. While he does not have the most connections with other actors in the group, participant 13 has by far the strongest connections within the core of the group. Outside the core there is a group of actors that are less well connected and act as an outer layer to the group. This outer layer is connected to the rest of the network through three bridging individuals in the network, namely participant 2, 12 and 17. Participant 12 is part of the core, while participants 2 and 17 are not. These two individuals act as the clearest bridge between the inner and outer parts of the network. Meanwhile participant 12 acts as the social glue of the network, being the best connected of all the actors in the group. The groups that all actors are a part of, and the roles they play within the network, are laid out in Table 13. In Figure 14 a graphical depiction of the working of the network is shown.

Role/group	Actors
Inner core	Participants 8, 10, 12, 13, 14, 18
Outer group	Participants 1,3, 4, 5, 6, 7,9, 11, 15, 16, 19, 20
Leader/central figure	Participant 13
Social glue /most connected	Participant 12
Bridges between outer group and inner core	Participants 2 and 17

Table 13 Overview of groups and roles within the network (own work).



- Outer group
- Leader/central figure
- Bridging figure
- Social glue/ most connected
- Inner core

Figure 14 A simplified view of the social network, the ties within this network are a summation of all ties found in the network (own work).

4.3. Place attachment

The raw anonymised data about place attachment can be found in appendix 3. Participants were asked to provide places they felt a strong attachment to through both their own lens and the lens of the group. Participants were attached to many different places on a personal level. On the group level participants are attached to far more of the same places. There are also attachments to different homes of actors within the network. In Table 14 a summation of all shared place attachment in the network can be seen.

Individual level	
Place	Number of participants that felt a connection
Groningen	9
Home (different places)	13
Parental home (different places)	11
Work (different places)	8
Social meeting places (different places)	21
Central gaming café of network	2
Local music venue	2
Group level	
Place	Number of participants that felt a connection
Central gaming café	19
Local gaming store	4
Commander weekend	3
Participants 13 home	4
Participants 9 home	3

Table 14 Place with the most shared attachment within the network (own work).

Place attachment is analysed in four contexts, namely that of the individual actor, the group of actors, the place, and the mental process. For each of these contexts a link will be made with shared place attachment and the functioning of the network. The paragraph finishes with a summation of shared place attachment within the network.

4.3.1. Individual actors

In the context of the individual actors there is almost no shared attachment to be found within the network. The only major shared place attachment on the individual level can be found in the attachment to the city of Groningen, the city in which the network is located. Minor shared place attachment can be found for two social places within the city, with two actors sharing a connection with each place. Aside from the logical shared connection to Groningen, there is no significant shared place attachment on an individual level within the network. From this it can be concluded that the social network is bound together by their shared hobby. Since there are very few places that actors share a connection with that are important for the shared hobby.

4.3.2. Group of actors

When place attachment is analysed through the context of the group of actors, major shared place attachment can be found to the central gaming café. 19 out of 20 participants report a connection to this place. In this café most of the networks activities and socialising between the members take place. The central gaming café can be seen as the central nexus of the network. There are also a number of secondary locations for which shared place attachment was found. For these places 3 or 4 actors report a connection. These locations are used as secondary locations to play and socialise, to acquire supplies for the hobby or as a once a year event. The secondary locations are the homes of several members in the network, which are used when the central gaming café is not available or when members of the network want to participate in a more intimate gathering.

4.3.3. Place

When place attachment is analysed through the context of the place itself there is the physical and social layer of place to take into account. For the physical layer, it's taken into account how well the physical features of a place are liked by an individual. In this study this liking of physical features is measured by people mentioning the place as being important to them. As described in paragraph 4.3.1. and 4.3.2. there are several places that participants report an attachment to. The places that share such a large number of attachment are the city of Groningen and the central gaming café. There are also places with less shared attachment such as the local gaming store and the house of two of the members of the network. These places have physical features that are liked by the members of the network, resulting in a greater level of shared place attachment. The social layer of place attachment through the context of place can be found by looking at shared interpersonal ties. These will be further analysed in paragraph 4.4.

4.3.4. Mental process

Analysing place attachment through the context of the mental process means looking at the behaviours that actors perform as part of the mental process. For this study has been chosen to look for the behaviour of proximity maintaining within the network. Only one instance of minor shared proximity maintaining was seen in the network, this appeared around the central gaming café. Actors frequent this place semi-often to play games and socialise, but they maintained only a small amount of proximity to the place. Actors in the network displayed the behaviour of proximity maintaining more towards places that hold meaning for them as individuals, such as their house or birth city.

4.3.5. Shared place attachment within the network

As seen in the analysis through four different contexts in the previous paragraphs, shared place attachment is present within the network. This shared place attachment is centralised around a central place with a number of other places having lesser shared place attachment. The place with the most shared place attachment is the central gaming café. Being important through the context of the group of actors as a place to conduct activities and socialise, acting as a hub in which the network congregates. Through the context of place and the mental process the café is also important for the group, since participants reported they liked being there and the existence of minor proximity maintaining was also found around this place. Shared place attachment was also found around a set of secondary places. These act as backups when the central gaming café is not available or when members want to partake in their hobby in a more private or intimate setting. The place attachment around these secondary places is far weaker than that around the central gaming café and comes mostly from the context of the group of actors. The conclusions about shared place attachment from the analysis of different contexts of place attachment are also supported when centrality analysis is used to analyse attachment of actors to places. When this analysis is performed the image in Figure 15 can be produced. This image clearly shows the centrality of the central gaming café and the secondary importance of the other location to which shared place attachment is experienced. Based upon the place attachment of actors, these can be grouped around different places. These groups are shown in Table 15 and are visually represented in Figure 16 *Fout! Verwijzingsbron niet gevonden..* These groups will be used in paragraph 4.4. to draw conclusion about the link between shared place attachment and tie strength.

Place	Attached actors
Central gaming café	All, except participant 6
Local gaming store	Participants 8, 12, 17 and 19
Commander weekend	Participants 8, 10 and 18
Participants 9 home	Participants 13, 18 and 19
Participants 13 home	Participants 4, 9, 10 and 17

Table 15 The place attachment of all actors to places within the network (own work).

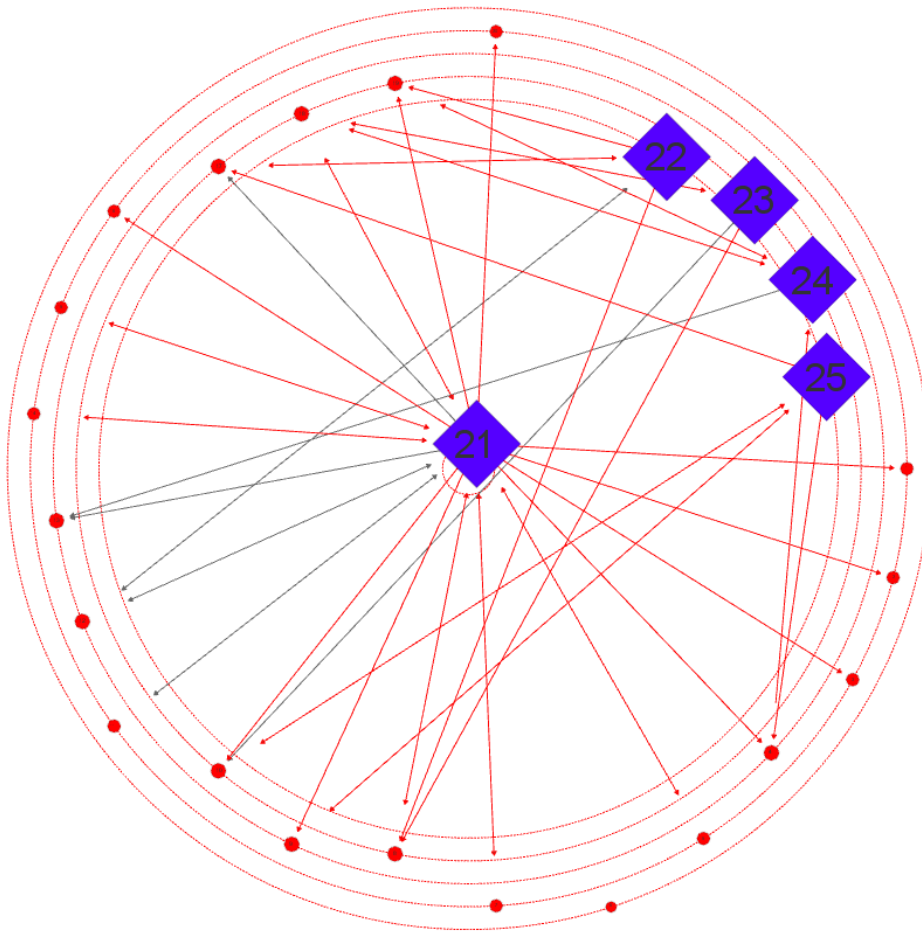


Figure 15 Centrality analysis of the places in the network, set out in a radial. Closer to the centre means a more central place. Places are represented by blue diamonds while actors are represented by red circles. 21=central gaming café, 22=local gaming store, 23=commander weekend, 24=participants 9 home and 25=participants 13 home.

Local game store

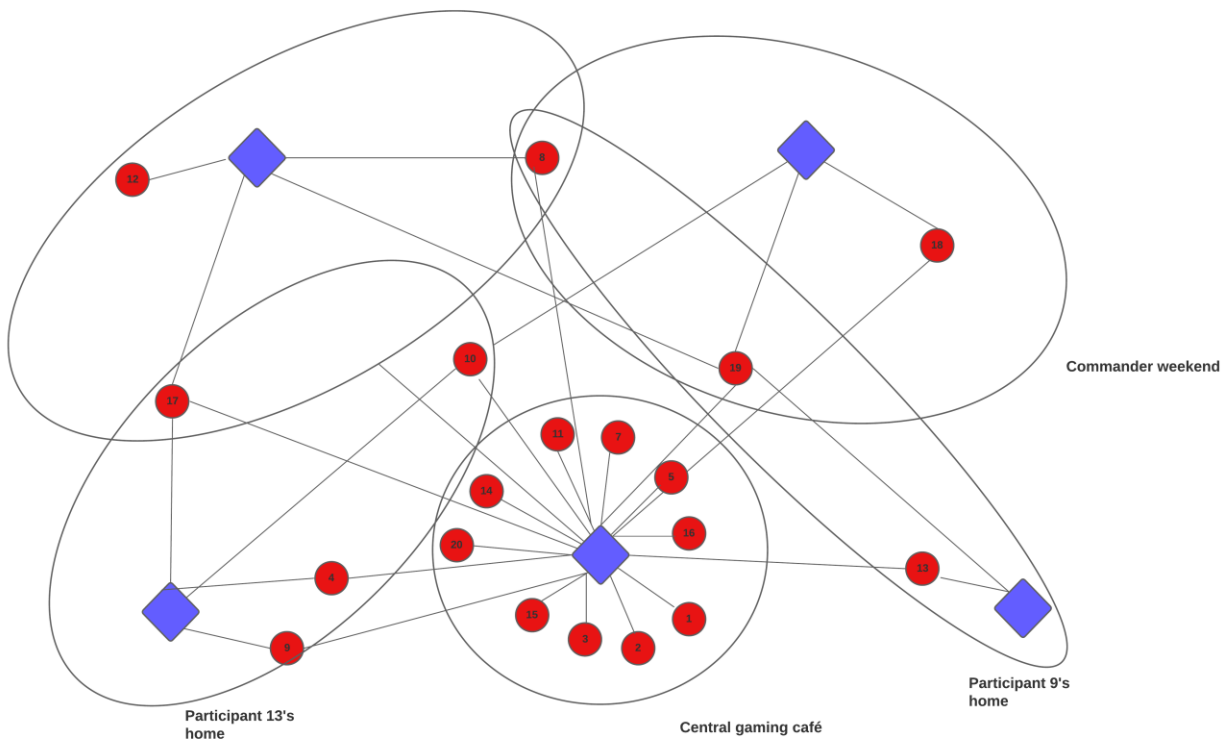


Figure 16 Groups in the network based upon attachment to certain places. Red circles represent actors while blue diamonds represent places (own work)

4.4. Shared place attachment and tie strength in the social network

In paragraph 4.3. five places have been identified where members of the network feel a strong shared place attachment towards. For all of these places an analysis will be performed of the ties between the actors that feel an attachment to these places. With this analysis the link between shared place attachment and the strength of interpersonal connections will be explored. This analysis will also be linked to the roles and working of the network as identified in paragraph 4.2.3.

4.4.1. Central gaming café

The central gaming café is the place that the actors in the network feel the strongest shared attachment to. A total of 19 out of 20 actors within the network have indicated feeling a connection to this place. Shared attachment to this place is created by a number of different factors. The first factor is the hub function of the café in which actors can conduct activities and socialise. The second factor is the attractiveness of the place to the members of the group, this manifests itself in actors exhibiting proximity maintaining behaviour by visiting the café often. The ties between the actors that share place attachment to the central gaming café are strong. Almost the entire network feels a connection to this place and as concluded in paragraph 4.2. the network has a high level of cohesion. The high level of cohesion and connection between the actors that feel connected to the gaming café lends support to the hypothesis of the study. This support is further strengthened by the only actor that does not report having an attachment to this place (participant 6). This actor has very little strong ties within the network and is part of the outer group of the network. This actor is also the second to last central actor. The absence of attachment to the central place and the weak strength of ties with the rest of the network of this actor lead support to the hypothesis that greater tie strength leads to shared place attachment. See Figure 17 for the exact location of actor on the very edge of the network.

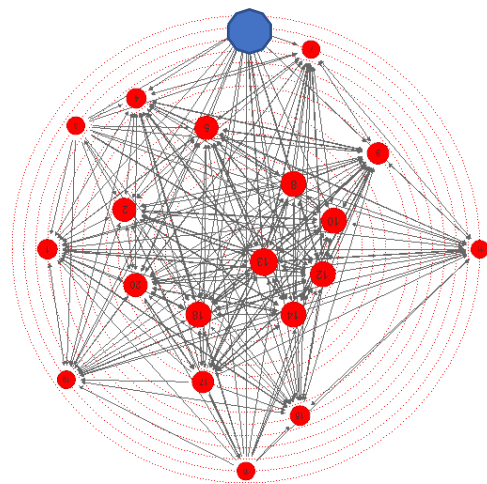


Figure 17 Location of actor 6 on the edge of the network based on centrality and marked with a blue circle.

4.4.2. Local game store

A total of four actors have reported feeling a connection to the local game store. In this game store actors within the network come to get supplies for their hobby and to socialise and sometimes play. Shared place attachment is mostly created by the fact that this place is one of the few ways to get supplies for Magic the gathering in the city, the incidental socialising and playing also helps in this regard. The connection with the game store was reported as being important for the functioning of the network. Participants did not report feeling attracted to this place outside of the network. The connections between the actors that have a shared place attachment to the local game store can be described as being very strong. Most of the actors are connected by mutual strong ties, with participant 19 being the exception. This actor is only connected to the other actors by one way weak and strong ties. Participants 8 and 12 are part of the inner core of the network, with participant 12 and 17 both acting as a bridging character within the network. These actors both connect participant 19 to the wider network. In figure 18 the connections between the actors that share a connection

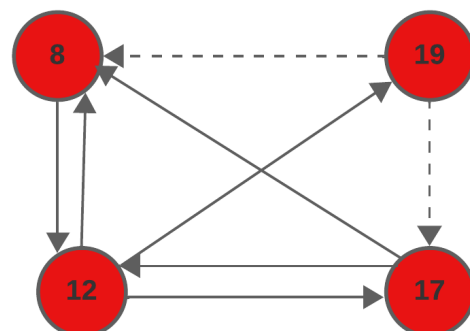


Figure 18 Connections between actors that share an attachment to the local game store. Solid lines represent strong connections and dotted lines represent weak connections (own work).

to the game store have been laid out. The strong ties between these actors lend support to the hypothesis that there is a connection between tie strength and shared place attachment. Another observation that can be made is that the bridging figures in the network may act as a conduit for place attachment. Not only do they connect the outer core to the rest of the network, but they also create shared place attachment within the network.

4.4.3. Commander weekend

A total of three actors reported feeling a connection to the commander weekend. This “place” is an once a year event that is held in the same location every year, in which members of the network gather to play games of Magic the gathering and to socialise for a weekend. The actors that have a shared connection to the commander weekend are all connected by mutual strong ties. They are also all part of the core of the network. The connections of these actors with this place are logical, because they are the group that usually organises this weekend. The strong ties between these actors lend support to the hypothesis that there is a connection between tie strength and shared place attachment. Because all members of the network are part of the core of the network, there might be a connection between membership of the core of the network and the existence of shared place attachment. In Figure 19 the connections between the actors that share an attachment to the commander weekend can be seen.

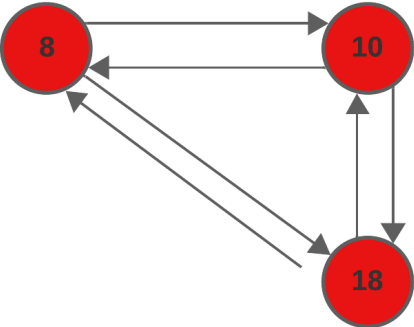


Figure 19 Connections between actors that share an attachment to the commander weekend (own work). Solid lines represent strong connections and dotted lines represent weak connection

4.4.4. Participant 9’s home

Three of the participants in the study reported feeling a connection to the home of participant 9. This connection stems from the time that is spent here playing games of Magic the gathering. This is done when the central gaming café is not available or when a more intimate setting for playing games is desired. The ties between the actors that share a connection with participant 9’s home are not as strong as the ties that were observed in the previous two paragraphs. There is one mutual strong tie, one mutual weak tie and a one-way weak tie between the actors. Participants 13 and 18 are both part of the core group, while participant 19 is part of the outer part of the network. Although the network is well connected, the strength of the connections is significantly weaker than the other places that have been analysed. Thus supporting the link between tie strength and share place attachment less. In Figure 20 the connections between the actors that share an attachment to participant 9’s house can be seen.

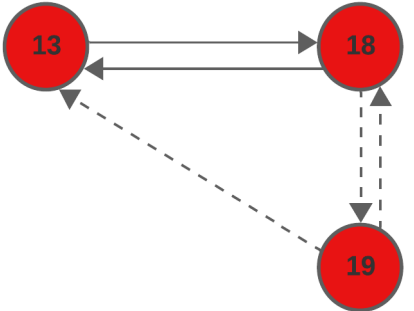


Figure 20 Connections between actors that share an attachment to participant 9’s home. Solid lines represent strong connections and dotted lines represent weak connection (own work).

4.4.5. Participant 13's home

The group of actors that share a connection with participant 13's home share a number of different ties with each other. Most of the ties in the network are mutual, with only the ties between participants 9 and 10 and participants 9 and 17 not being mutual. Participant 10 is part of the core, while participants 4 and 10 are part of the outer group. Participant 17 is a bridging character between the core and the outer group of the network. The strength of the ties varies equally between being strong and weak. The strength of the ties lends support to the hypothesis in a lesser degree than other analysed places, because the tie strength is lower around this place. The observation that bridging figures in the network may act as a conduit for place attachment is also made here. With participant 17 connecting participant 4 and 9 to other parts of the network. The place where a shared connection is felt to be of one of the members of the inner core of the network also leads support to this observation. The fact that this place is owned by a member of the core also lends further support to the observation that place attachment might originate from the core of the network. In Figure 20 the connections between the actors that share an attachment to participant 13's house can be seen.

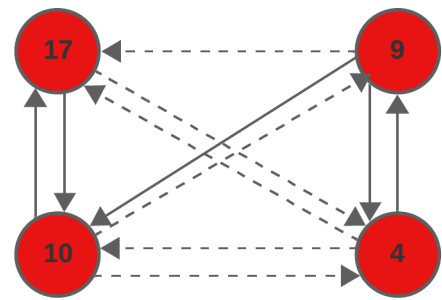


Figure 16 Connections between actors that share an attachment to participant 13's home. Solid lines represent strong connections and dotted lines represent weak connection (own work).

4.4.6. Observed trends

A number of trends have been observed when analysing the link between shared place attachment and tie strength. These trends are as follows:

1. When shared place attachment was found within the study, strong interpersonal connections between actors that felt a connection to the place were also observed.

This trend was mostly observed around the central gaming café, the local gaming store and the commander weekend. This trend was observed to a lesser degree around the homes of participant 9 and 13. The fact that this trend was observed to a lower degree at these two places can be explained by the intimate setting of participants 9 and 13's homes. Most gatherings in these places are of a more intimate nature, which means some meetings of the network will be conducted on a one on one or in a 3-person setting. Because of this strong interpersonal connections might not exist between actors that share a connection, they might simply never meet. The existence of this trend lends support to the hypothesis.

2. When shared place attachment was found within the study, actors of the core group were present.

For all the places around which place attachment was reported, one or more members of the core of the network were present. This is logical since these members of the network are responsible for organising a large percentage of the activities. This trend could be an indication that members of the core network are needed to create shared attachment to a place. Acting as a catalyst or trendsetter which the rest of the network follows in their attachment.

3. Bridging characters play a limited role in the creation of shared place attachment in the network

There are only two instances in the study in which bridging characters are connected to the actors that share attachment to a place. This was observed around the local game store and participant 13's home. Because of this it can only be stated that bridging characters play a limited role in the creation of shared place attachment in the network.

Based on these trends a number of conclusions can be drawn and the main research question can be answered, this is done in the next chapter.

5. Conclusion and discussion

In this chapter the findings of the study are summarised, and the research questions will be answered. This chapter also contains a discussion on the results of the research and directions for possible further research.

5.1. Conclusion

The main aim of the study is to seek if there is a positive correlation between a higher level of interpersonal connections and shared place attachment in a social network. Evidence was found for a positive link between tie strength and shared place attachment, this evidence was however not completely conclusive. For most of the places where shared place attachment was observed in the study strong interpersonal connections were also found. In some instances this connection was observed to a lesser degree however. The hypothesis that more interpersonal connections lead to more shared place attachment can thus be seen as being partially proven to be correct. The shared place attachment in the study was mostly created through the group of actors and the connections that they shared. The attachment to places of individual actors contributed very little to the shared place attachment in the network. From this it can be concluded that there is a difference between place attachment as seen through an individual perspective versus a group perspective. This finding is a further strengthening of the tripartite model by Scannel & Gifford (2010), which split place attachment in personal and group dimensions. Another contribution to shared place attachment is the physical aspects of the place and the feelings that people experience to these physical aspects. This was observed in the study by the existence of proximity maintaining to some of the places where shared place attachment was observed. A number of different roles within the network were identified during the study. The network was found to consist of a core of central well-connected actors, around this core there exists an outer group of less well-connected actors. The core and the outer group are connected by so called bridging actors, that have both connections with the inner core and the outer network. It has been observed that when shared place attachment was strong, actors of the core group were always present. This could indicate that these core members of the network act as a catalyst for the creation of shared place attachment, just as they act as a catalyst for the organisation of shared activities within the network. Bridging characters were observed to be mostly absent when shared place attachment was found in the study. It was thus concluded that they play a limited role in the creation of shared place attachment. For the discipline of planning the conclusion that more interpersonal connections lead to more shared place attachment can be used in practice. An example of this could be the better facilitating of places or events to create interpersonal connections and thus creating better shared place attachment. Another way in which the results of the research can be used in practice is by specifically facilitating the activities of core members of a network. By facilitating the activities of the core of the network, shared place attachment can be spread to the outer parts of the network. An example of this would be regular talks with active community members to see what they need and to hear their ideas out.

5.2. Discussion

While the study has many strong points, there are a few weak ones as well. The biggest weakness of the study is the limited sample size that was used, which makes the validity of the study lower. Although the sample size was large enough for the case study, a bigger sample size would have likely allowed for a stronger conclusion to be drawn from the study. For the study it was chosen to use a more qualitative approach in the analysis of the network. This approach was chosen to make the most use of the limited data that was available. Use of a more quantitative approach, especially the use of statistical methods could yield more insight into the relation between interpersonal connections and place attachment. It could also provide stronger evidence than was found in the current study. For the use of statistical methods more data is needed however. Another avenue for further research can be found into the roles that central characters play in the creation of shared place attachment in social

networks. For this research a more qualitative approach will be needed, since this goes further into the role people play in a network. This further exploration of roles calls for research on a more personal level, through for instance one on one interviews. The group that was chosen for the social network analysis, was tightly linked together. Because of this the link between connections and shared place attachments could be explored well. The response to the questionnaire was not as large as hoped, but enough responses were gathered to conduct the analysis. There are many other groups that are like the group that was studied, think of sporting groups, café patrons or any other informal place bound group. In further research groups like these can be studied to verify the results of this study. In this thesis the studied network was regarded as one closed system, no attention was paid to external factors that could impact the network or shared place attachment. This is another avenue for further research. The definition of shared place attachment and its positive effects on places can also be further explored. This was not the focus of this study and because of this is one of the weaker parts of it.

6. Bibliography

- Adiwijaya, W. M. & Gozali, A. A., 2014. *Degree centrality and eigenvector centrality in twitter*. Kuta, 8th International Conference on Telecommunication Systems Services and Applications.
- Allen, J., James, A. D. & Gamlen, P., 2007. Formal versus informal knowledge networks in R&D: a case study using social network analysis. *R&D Management*, 37(3), pp. 179-196.
- Andrea, P., Nepusz, T. & Bazsó, F., 2007. Measuring tie-strength in virtual social networks. *Connections*, 27(2), pp. 39-52.
- Bapna, R., Gupta, A., Rice, S. & Sundararajan, A., 2017. Trust and the Strength of Ties in Online Social Networks. *MIS Quarterly*, 41(1), pp. 115-130.
- Basaraba, N., 2021. The emergence of creative and digital place-making: A scoping review across disciplines. *New Media & Society*, 25(6), pp. 1470-1497.
- Borgatti, S. P. & Everet, M. G., 2000. Models of core/periphery structures. *Social networks*, 21(4), pp. 375-395.
- Breiger, R. L., 2011. The Analysis of Social Networks. In: M. H. & A. Bryman, red. *Handbook of Data Analysis*. sl:SAGE Publications, Ltd, pp. 1-42.
- Breiger, R. L., 2011. The Analysis of Social Networks. In: M. H. & A. Bryman, red. *Handbook of Data Analysis*. sl:SAGE Publications, Ltd, pp. 2-3.
- Bretagnolle, A., Pumain, D. & Rozenblat, C., 1997. Space-time contraction and the dynamics of urban systems. *European journal of geography*, Volume 61, pp. 50-67.
- Brons, L. L., 2015. Othering, an analysis. *Transcience, a Journal of Global Studies*, 6(1), pp. 69-90.
- Brown, G., Raymond, C. M. & Corcoran, J., 2015. Mapping and measuring place attachment. *Applied Geography*, Volume 57, pp. 43-53.
- Brown, B. B. & Perkins, D. D., 1992. Disruptions in place attachment. In: I. L. Altman, red. *Place Attachment. Human Behavior and Environment*. Boston: Springer.
- Brown, B., Perkins, D. D. & Brown, G., 2003. Place attachment in a revitalizing neighborhood: Individual and block levels of analysis. *Journal of Environmental Psychology*, 23(3), pp. 259-271.
- Canales, M. K., 2000. Othering: Toward an Understanding of Difference. *Advances in Nursing Science*, 22(4), pp. 16-31.
- Cleemput, K. V., 2011. friendship type, clique formation and the everyday use of communication technologies in a peer group. *A social network analysis*, 15(8), pp. 1258-1277.
- Codó, E., 2008. Interviews and Questionnaires. In: L. W. a. M. Moyer, red. *The Blackwell Guide to Research Methods in Bilingualism and Multilingualism*. sl:Blackwell Publishing, pp. 158-176.
- Das, K., Samantha, S. & Pal, M., 2018. Study on centrality measures in social networks: a survey. *Social Network Analysis and Mining*, Volume 8, pp. 1-11.
- Disney, A., 2020. *Social network analysis 101: centrality measures explained*. [Online] Available at: <https://cambridge-intelligence.com/keylines-faqs-social-network-analysis/> [Geopend 3 oktober 2023].

- Doreian, P., 1999. An Intuitive Introduction to Blockmodeling with Examples. *Bulletin of Sociological Methodology/Bulletin de Méthodologie Sociologique*, 61(1), pp. 1-34.
- Dorian, P. & Stokman, F. N., 1997. The dynamics and evolution of Social networks . In: P. Dorian & F. N. Stokman, red. *Evolution of social networks*. Amsterdam: OPA Amsterdam , pp. 1-19.
- Editorial Springer Nature, 2022. *Research must do no harm: new guidance addresses all studies relating to people*. [Online]
Available at: <https://www.nature.com/articles/d41586-022-01607-0>
[Geopend 15 november 2023].
- Falk, A. & Fischbacher, U., 2006. A theory of reciprocity. *Games and Economic Behavior*, Volume 54, pp. 293-315.
- Firouzmakan, S. & Daneshpour, S. A., 2015. Promotion Quality of Life by Increasing Place Attachment in Public Places. *Procedia - Social and Behavioral Sciences*, Volume 201, pp. 418-428.
- Florek, M., 2011. No place like home: Perspectives on place attachment and impacts on city management. *Journal of Town & City Management*, 1(4), pp. 346-354.
- Francaviglia, R. V., 1978. Xenia Rebuilds: Effects of Predisaster Conditioning on Postdisaster Redevelopment. *Journal of the American Institute of Planners* , Volume 44, pp. 13-24.
- Freeman, L. C., 1979. Centrality in Social Networks conceptual clarification. *Social Networks*, Volume 1, pp. 215-239.
- Freeman, L. C., 2004. The Renaissance at Harvard . In: *The development of social network analysis*. North Charleston: BookSurge, LLC, pp. 121-129.
- Freeman, L. C., Roeder, D. & Mulholland, R. R., 1980. Centrality in Social networks: II. Experimental results. *Social Networks*, Volume 2, pp. 119-141.
- Friedmann, J., 2010. Place and Place-Making in Cities: A Global Perspective. *Planning Theory & Practice*, 11(2), pp. 149-165.
- Gaia, A. C., 2002. Understanding emotional intimacy: a review of conceptualization, assessment and the role of gender. *International Social Science Review*, 77(3), pp. 151-170.
- Goh, K.-I., Oh, E., Kahng, B. & Kim, D., 2003. Betweenness centrality correlation in social networks. *Physical Review E*, 67(1), p. 017101.
- Granovetter, M. S., 1973. The strength of weak ties. *American journal of sociology*, 78(6), pp. 1360-1380.
- Hamamura, T., 2012. Are Cultures Becoming Individualistic? A Cross-Temporal Comparison of Individualism–Collectivism in the United States and Japan. *Personality and Social Psychology Review*, 16(1), pp. 3-24.
- Hanneman, R. & Riddle, M., 2005. *Introduction to social network methods*. [Online]
Available at:
https://wiki.gonzaga.edu/dpls707/images/6/6e/Introduction_to_Social_Network_Methods.pdf
[Geopend 5 Januari 2024].

- Hashemi, S. et al., 2023. Exploring the effects of place attachment and positive emotions on place satisfaction and intentional behaviour in Iranian ski resort: a perspective from S-O-R model. *Journal of Sport & Tourism*, 27(2), pp. 161-186.
- Hellmann, T. & Staudigl, M., 2014. Evolution of social networks. *European Journal of Operational Research*, 234(3), pp. 583-596.
- Hennink, M. & Kaiser, B. N., 2022. Sample sizes for saturation in qualitative research: A systematic review of empirical tests. *Social Science & Medicine*, Volume 292.
- Hidalgo, M. C. & Hernández, B., 2001. Place attachment: conceptual and empirical questions. *Journal of environmental psychology*, Volume 21, pp. 273-281.
- Hidalgo, M. C. & Hernández, B., 2001. Place attachment: Conceptual and empirical questions. *Journal of Environmental Psychology*, 21(3), p. 273–281.
- Husztí, É., Dávid, B. & Vajda, K., 2013. Strong Tie, Weak Tie and In-Betweens: A Continuous Measure of Tie Strength Based on Contact Diary Datasets. *Social and Behavioral Sciences*, Volume 79, p. 38 – 61.
- Jinhu, Y. & Xiaoting, Y., 2022. Adolescents' interpersonal relationships, self-consistency, and congruence: Life meaning as a mediator. *Humanities and social sciences communications*, 48(11), pp. 1-11.
- Kadushin, C., 2012. *Understanding social networks: Theories, concepts, and findings*. Oxford: Oxford university press.
- Kastenholz, E., Marques, C. P. & Carneiro, M. J., 2020. Place attachment through sensory-rich, emotion-generating place experiences in rural tourism. *Journal of Destination Marketing & Management*, Volume 17.
- Kazuya, O., Chen, W. & Li, X.-Y., 2008. *Ranking of Closeness Centrality for Large-Scale Social Networks*. Berlin, Heidelberg, Springer Berlin Heidelberg, p. 186–195.
- Krackhardt, D., 1992. The strength of strong ties: the importance of Philos in organisations. In: R. Cross, red. *Networks in the knowledge economy*. Harvard: Harvard Business School Press, pp. 82-205.
- Lewicka, M., 2010. Place attachment: How far have we come in the last 40 years?. *Journal of Environmental Psychology*, Volume 31, pp. 207-230.
- Liu, W., Anupreet, S., Beacom, A. M. & Valente, T. W., 2017. Social Network Theory. *The international encyclopedia of media effects*, pp. 1-12.
- Lomas, M. J., Ayodeji, E. & Brown, P., 2021. Experiences of place attachment and mental wellbeing in the context of urban regeneration. *Health & Place*, Issue 70.
- Manca, A. R., 2014. Social Cohesion. In: A. C. Michalos, red. *Encyclopedia of Quality of Life and Well-Being Research*. Manhattan, New York City: Springer Link, p. 6026–6028.
- Manzo, L. C., 2005. For better or worse: Exploring multiple dimensions of place meaning. *Journal of Environmental Psychology*, 25(1), pp. 67-86.
- Marsden, P. V. & Campbell, K. E., 1984. Measuring Tie Strength. *Social Forces*, 63(2), p. 482–501.
- Mathers, N., Joseph, N., Fox, J. & Hunn, A., 1998. What is a survey?. In: N. J. Mathers, red. *Surveys and questionnaires*. Trent: NHS executive, pp. 8-15.

- Maxwell, G. & Beattie, R., 2004. The Ethics of In-company Research: An Exploratory Study. *Journal of Business Ethics*, Volume 52, p. 243–256.
- Milgram, S., 1967. The small world problem. *Psychology today*, 2(1), pp. 60-67.
- Monsour, M., 1992. Meanings of Intimacy in Cross- and Same-Sex Friendships. *Journal of Social and Personal Relationships*, 9(2), pp. 277-295 .
- Moody, J. & White, D. R., 2003. Structural Cohesion and Embeddedness: A Hierarchical Concept of Social Groups. *American Sociological Review*, 68(1), pp. 103-127.
- Newman, M. E. J., 2000. Models of the Small World. *Journal of Statistical Physics*, 101(3), p. 819–841.
- Palmer, M., sd *Distance-based Ordination Methods*. [Online]
Available at: <https://ordination.okstate.edu/distance.htm>
[Geopend 7 November 2023].
- Parks, M. R. & Floyd, K., 1996. Meanings for Closeness and Intimacy in Friendship. *Journal of Social and Personal Relationships*, 13(1), pp. 85-107.
- Prell, C., 2011. A brief history of social network analysis. In: *Social Network Analysis: History, Theory and Methodology*. London: SAGE Publications Ltd., pp. 19-59.
- Putnam, R. D., 2000. *Bowling alone*. New York: Simon and Schuster Paperbacks .
- Rademacher, M. A. & Wang, K. Y., 2014. Strong-Tie Social Connections Versus Weak-Tie Social Connections. *Scholarship and Professional Work - Communication*, Volume 103, pp. 1213-1216.
- Rank, O. N., 2008. Formal structures and informal networks: Structural analysis in organizations. *Scandinavian Journal of Management*, 24(2), pp. 145-161.
- Raymond, C. M., Brown, G. & Weber, D., 2010. The measurement of place attachment: Personal, community, and environmental connections. *Journal of Environmental Psychology*, Volume 30, pp. 422-434.
- Regmi, P. R. et al., 2016. Guide to the design and application of online questionnaire surveys. *Nepal journal of epidemiology*, 6(4), pp. 640-644.
- Reis, H. T. & Shaver, P., 1988. Intimacy as an interpersonal proces. In: S. W. Duck, red. *Handbook of personal relationship*. Chichester: Wiley, pp. 367-389.
- Rollero, C. & De Piccoli, N., 2010. Does place attachment affect social well-being?. *Revue européenne de psychologie appliquée*, Volume 60, pp. 233-238.
- Sandelowski, M., 1995. Sample size in qualitative research. *Research in Nursing & Health*, 18(2), pp. 179-183.
- Santos, H. C., Varnum, M. E. W. & Grossmann, I., 2017. Global Increases in Individualism. *Psychological Research*, 28(9), pp. 1228-1239.
- Scannell, L. & Gifford, R., 2010. Defining place attachment: A tripartite organizing framework. *Journal of Environmental Psychology*, Volume 30, pp. 1-10.
- Schipper, D. & Spekkink, W., 2015. Balancing the Quantitative and Qualitative Aspects of Social Network Analysis to Study Complex Social Systems. *Complexity, Governance & Networks*, 2(1), pp. 5-22.

- Scott, J., 2017. What is Social Network Analysis?. In: *Social Network Analysis*. sl:SAGE Publications Ltd, pp. 2-10.
- Simundic, A.-M., 2013. Bias in research. *Biochemia Medica*, 23(1), pp. 12-15.
- Smith, J. & Noble , H., 2014. Bias in research. *Evidence-Based Nursing*, Volume 17, pp. 100-101.
- Streeck, J., 2013. Transforming Space into Place: Some Interactions in an Urban Plaza. In: Y. Motomura, A. Butler & D. Bekki, red. *New Frontiers in Artificial Intelligence*. Berlin: Springer, p. 217–232.
- Telesford, Q. K. et al., 2011. The Ubiquity of Small-World Networks. *Brain Connect*, 1(5), p. 367–375.
- Terry, M., Mynatt, E. D., Ryall, K. & Leigh, D., 2002. *Social net: using patterns of physical proximity over time to infer shared interests*. Minneapolis , Association for Computing Machinery.
- Tönnies, F., 1957. General statements of the main concepts. In: C. P. Loomis, red. *Community and Society*. Mineola: Dover Publications, inc. , pp. 35-37.
- University of Virginia, 2023. *Types of Harm*. [Online]
Available at: <https://research.virginia.edu/types-harm>
[Geopend 15 Novmeber 2023].
- Van Kempen, C., 2015. *The definition and difference between formal and informal networks..* [Online]
Available at: <https://www.linkedin.com/pulse/definition-difference-formal-informal-networks-chantal-van-kempen/>
[Geopend 25 October 2023].
- Vaquera , E. & Kao, G., 2008. Do You Like Me as Much as I Like You? Friendship Reciprocity and Its Effects on School Outcomes among Adolescents. *Social Science Research*, 37(1), pp. 55-72.
- Wang, F., Xu, K. & Wang, H., 2012. *Discovering Shared Interests in Online Social Networks*. Macau, China, IEEE.
- Weijjs-Perrée , M., Van den Berg , P., Arentze, T. & Kemperman , A., 2017. Social networks, social satisfaction and place attachment in the neighborhood. *The Journal of ERSA*, 4(3), p. 133–151.
- Weijjs-Perrée, M., Van den Berg, P., Arentze, T. & Kemperman, A., 2017. Social networks, social satisfaction, and place attachment. *Region*, 4(3), p. 133–151.
- White, H. C., Boorman, S. C. & Breiger, R. A., 1976. Social structure from multiple networks: I. Blockmodels of roles and positions. *Journal of Sociology*, 81(4), pp. 730-780.
- Williams, D. R., 2014. Making sense of “place”: reflections on pluralism and positionality in place research. *Landscape and Urban Planning*,, Volume 131, pp. 74-82.
- Zhang, M., 2010. Social network analysis: history, concepts and research. In: B. Furht, red. *Handbook of social network technologies and applications*. London: Springer, pp. 3-23.

7. Appendixes

Appendix 1: list of questions for the questionnaire

Questions were distributed to participants through a link to a google forms.

Part 1 : Social network analysis

In this section you will be asked to rate your connection with different members of the social network "Commander Groningen". For every person you will be asked to rate your connection through answering five multiple choice questions with a score from 0-4 (with 0 being the lowest and 4 the highest). **If you are asked to rate questions about yourself, please fill in the answer with a 0 before it.**

Participants were asked to answer the following set of questions for all participants in the study(20 sets questions in total).

Q: Do you trust this person, and do you feel like you can share intimate details with them?

A: 0 - Strongly disagree, 1 – Disagree, 2 - Neither disagree/nor agree, 3 – Agree, 4 - Strongly agree

Q: I interact often with this with this person (both physically and online)?

A: 0 - Strongly disagree, 1 – Disagree, 2 - Neither disagree/nor agree, 3 – Agree, 4 - Strongly agree

Q: I spend much time on an average interaction with this person

A: 0 - Strongly disagree, 1 – Disagree, 2 - Neither disagree/nor agree, 3 – Agree, 4 - Strongly agree

Q: Do you feel like this person would do something for you, if you did something for them?

A: 0 - Strongly disagree, 1 – Disagree, 2 - Neither disagree/nor agree, 3 – Agree, 4 - Strongly agree

Q: I share many interest with this person

A: 0 - Strongly disagree, 1 – Disagree, 2 - Neither disagree/nor agree, 3 – Agree, 4 - Strongly agree

Part 2: Place attachment

A majority of the questions is now done, this section contains two questions about places you feel attachment to.

Q: Name 5 places that you personally feel an (emotional) attachment to

A: -

Q: Name places in connection to commander Groningen that you feel a connection with.

A: -

Appendix 2: raw data tie strength

Data is available in excel format upon request.

Scores shared trust

		Emotional intimacy																						
		Participant 1	Participant 2	Participant 3	Participant 4	Participant 5	Participant 6	Participant 7	Participant 8	Participant 9	Participant 10	Participant 11	Participant 12	Participant 13	Participant 14	Participant 15	Participant 16	Participant 17	Participant 18	Participant 19	Participant 20			
Participants	Participant 1	x		4	4	4	4	2	4	4	4	4	4	4	4	4	4	4	4	4	4			
	Participant 2		2	x		2	2	2	2	3	2	4	2	3	3	4	2	2	3	2	2	3		
	Participant 3		2	2	x	2	2	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2		
	Participant 4		2	2		2	x	2	2	2	3	2	2	2	3	2	2	2	3	2	2	2		
	Participant 5		3	3	3	3		x	1	3	4	3	3	3	3	3	3	3	3	3	3	3		
	Participant 6		2	2	2	2	2		x	2	2	2	3	2	2	4	2	2	2	2	2	2	3	
	Participant 7		2	2	2	2	2	2		x	2	2	3	2	3	3	2	3	2	2	2	2	2	
	Participant 8		2	3	2	2	2	4	1		x	2	3	2	4	3	2	2	2	3	2	2	2	
	Participant 9		2	3	2	3	3	2	2	2		x	3	2	3	3	3	2	2	2	4	2	3	
	Participant 10		2	3	2	2	2	2	2	2	3	2		x	2	3	3	2	2	3	3	2	2	
	Participant 11		3	3	3	3	3	3	3	3	2	3			x	3	4	3	3	3	3	3	3	
	Participant 12		4	4	4	4	4	4	4	4	4	4	0			x	4	4	4	4	4	4	4	
	Participant 13		2	3	3	3	3	2	1	3	2	4	3				x	4	4	4	0	4	4	
	Participant 14		3	3	3	3	3	3	3	3	3	3	3	4				x	4	4	4	3	3	
	Participant 15		3	3	2	2	2	2	2	2	3	2	2	3	3	2			x	2	3	2	3	
	Participant 16		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2			x	2	2	2	
	Participant 17		2	2	2	2	2	2	2	2	2	3	2	3	4	4	2	0			x	3	3	
	Participant 18		2	3	2	2	2	2	2	3	3	3	2	3	4	4	2	2	3			x	2	3
	Participant 19		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		x	4
	Participant 20		2	2	2	2	2	2	2	2	2	2	2	3	3	3	2	2	2	2	4	2		x

Scores interaction often

		Frequency of interaction																					
		Participant 1	Participant 2	Participant 3	Participant 4	Participant 5	Participant 6	Participant 7	Participant 8	Participant 9	Participant 10	Participant 11	Participant 12	Participant 13	Participant 14	Participant 15	Participant 16	Participant 17	Participant 18	Participant 19	Participant 20		
Participants	Participant 1	x		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
	Participant 2		1	x	0	1	0	2	1	2	3	3	1	3	4	4	1	0	1	0	0	3	
	Participant 3		0	3	x	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	
	Participant 4		0	1		0	x	0	0	0	2	0	0	1	2	1	0	0	0	1	0	0	
	Participant 5		0	0	0	0		x	0	0	4	0	0	0	3	3	1	0	0	0	0	0	
	Participant 6		2	2	2	2	2		x	2	2	1	2	2	3	2	2	2	2	2	2	1	
	Participant 7		2	2	2	2	2	2		x	2	2	2	2	2	2	3	2	2	2	2	2	
	Participant 8		0	2	0	0	4	0	0		x	0	2	0	3	3	2	0	0	0	3	0	
	Participant 9		2	1	2	3	2	2	2	3		x	2	2	3	3	2	2	2	3	2	3	
	Participant 10		0	2	0	0	0	2	0	2	1		x	0	2	3	2	0	2	2	0	1	
	Participant 11		0	0	0	0	0	0	0	0	0	0		x	0	2	0	0	0	0	0	0	
	Participant 12		2	3	2	2	4	2	2	3	3	2	0		x	4	4	2	2	2	2	3	
	Participant 13		1	2	0	1	2	1	1	2	2	2	1	3		x	4	1	0	3	3	0	
	Participant 14		0	3	0	3	3	0	1	3	2	3	0	4	4		x	2	4	4	0	3	
	Participant 15		3	0	0	0	0	0	0	0	1	0	0	1	1	0		x	0	0	1	1	
	Participant 16		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		x	0	0	0	
	Participant 17		0	1	0	0	1	1	0	2	1	1	0	2	3	4	0	0		x	2	0	
	Participant 18		0	2	0	0	0	2	0	3	3	1	0	3	4	4	0	0	3		x	0	
	Participant 19		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		x	0
	Participant 20		2	1	2	2	2	2	2	2	2	2	2	1	3	3	0	2	2	4	2		x

Scores interaction time

		Time spend on interaction																			
		Participant 1	Participant 2	Participant 3	Participant 4	Participant 5	Participant 6	Participant 7	Participant 8	Participant 9	Participant 10	Participant 11	Participant 12	Participant 13	Participant 14	Participant 15	Participant 16	Participant 17	Participant 18	Participant 19	Participant 20
Participants	Participant 1	x																			
	Participant 2	2	x																		
	Participant 3	0	1	x																	
	Participant 4	0	3	0	x																
	Participant 5	0	0	0	0	x															
	Participant 6	2	2	2	2	2	x														
	Participant 7	2	2	2	2	2	2	x													
	Participant 8	0	0	0	0	4	0	0	x												
	Participant 9	2	2	2	3	2	2	2	2	x											
	Participant 10	2	2	2	2	2	2	2	3	2	x										
	Participant 11	0	0	0	0	0	0	0	0	0	0	x									
	Participant 12	3	3	2	2	3	2	2	3	3	3	0	x								
	Participant 13	1	2	0	2	3	1	1	2	1	2	1	3	x							
	Participant 14	0	2	0	3	3	0	1	2	2	3	0	3	4	x						
	Participant 15	4	0	0	0	0	0	0	0	2	0	0	0	0	0	x					
	Participant 16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x				
	Participant 17	0	0	0	0	1	1	0	2	1	3	0	2	4	4	0	0	x			
	Participant 18	2	3	2	2	2	2	2	3	3	2	2	2	4	4	0	2	3	x		
	Participant 19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x	
	Participant 20	2	1	2	2	2	2	2	2	2	2	2	2	1	3	3	0	2	2	4	x

Scores reciprocity

		Reciprocity																			
		Participant 1	Participant 2	Participant 3	Participant 4	Participant 5	Participant 6	Participant 7	Participant 8	Participant 9	Participant 10	Participant 11	Participant 12	Participant 13	Participant 14	Participant 15	Participant 16	Participant 17	Participant 18	Participant 19	Participant 20
Participants	Participant 1	x																			
	Participant 2	3	x																		
	Participant 3	0	2	x																	
	Participant 4	2	2	2	x																
	Participant 5	2	2	2	2	x															
	Participant 6	2	2	2	2	2	x														
	Participant 7	2	2	2	2	2	2	x													
	Participant 8	2	3	2	2	4	2	2	x												
	Participant 9	2	3	2	4	3	2	2	4	x											
	Participant 10	2	3	2	2	2	2	2	3	3	x										
	Participant 11	3	3	3	3	3	3	3	3	3	3	x									
	Participant 12	2	2	2	2	3	2	2	3	2	3	0	x								
	Participant 13	1	2	0	2	3	2	1	3	1	2	3	3	x							
	Participant 14	0	2	0	2	3	0	1	2	2	2	0	3	4	x						
	Participant 15	3	2	2	2	2	2	2	2	2	2	2	3	2	2	x					
	Participant 16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	x				
	Participant 17	0	1	0	0	1	1	0	3	0	3	0	3	4	4	0	0	x			
	Participant 18	3	3	3	1	3	3	3	3	3	3	3	3	4	4	3	3	4	x		
	Participant 19	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	x	
	Participant 20	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	2	2	2	4	x

Scores shared interest

		Shared interests																				
		Participant 1	Participant 2	Participant 3	Participant 4	Participant 5	Participant 6	Participant 7	Participant 8	Participant 9	Participant 10	Participant 11	Participant 12	Participant 13	Participant 14	Participant 15	Participant 16	Participant 17	Participant 18	Participant 19	Participant 20	
Participants	Participant 1	x	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
	Participant 2	2	x	2	2	2	2	2	2	3	2	2	3	3	4	2	2	2	2	2	2	3
	Participant 3	0	0	x	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Participant 4	2	2	2	x	2	2	2	2	2	3	2	2	2	3	2	2	2	2	3	2	2
	Participant 5	1	1	1	0	x	1	1	1	4	1	1	1	3	3	3	1	1	1	1	1	1
	Participant 6	2	2	2	2	2	x	2	2	2	2	3	2	2	3	2	2	2	2	2	2	3
	Participant 7	2	2	2	2	2	2	x	2	2	2	3	2	2	3	2	2	3	2	2	2	2
	Participant 8	1	2	1	1	4	1	1	x	1	3	1	3	3	1	1	1	1	1	3	1	1
	Participant 9	2	2	2	4	3	2	2	2	4	x	3	2	3	3	3	2	2	2	3	2	3
	Participant 10	2	2	2	2	2	2	2	3	2	x	2	2	3	3	2	2	2	3	3	2	2
	Participant 11	3	3	3	3	3	3	3	3	3	3	x	3	4	3	3	3	3	3	3	3	3
	Participant 12	2	2	2	2	3	2	2	2	3	2	2	0	x	3	3	2	2	3	2	2	2
	Participant 13	1	3	0	2	3	2	1	3	2	4	3	4	x	4	1	0	4	4	4	0	3
	Participant 14	2	3	0	3	3	3	3	3	3	3	2	3	4	x	4	2	4	4	4	2	3
	Participant 15	2	2	2	2	2	2	2	2	2	2	2	2	2	2	x	2	2	2	2	2	2
	Participant 16	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	0	x	2	2	2	2
	Participant 17	0	1	0	0	1	2	0	3	0	3	0	3	3	4	0	0	0	x	3	0	3
	Participant 18	2	2	2	2	2	2	2	2	3	3	3	2	4	4	2	2	2	4	x	2	4
	Participant 19	2	2	2	2	2	2	2	2	2	2	2	2	0	2	2	2	2	2	2	x	2
	Participant 20	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	2	2	3	2	x

Scores total

		Total connection																				
		Participant 1	Participant 2	Participant 3	Participant 4	Participant 5	Participant 6	Participant 7	Participant 8	Participant 9	Participant 10	Participant 11	Participant 12	Participant 13	Participant 14	Participant 15	Participant 16	Participant 17	Participant 18	Participant 19	Participant 20	
Participants	Participant 1	x	10	10	10	10	8	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
	Participant 2	10	x	8	9	8	10	9	16	12	19	10	16	18	20	10	8	10	8	8	15	
	Participant 3	2	8	x	2	2	0	2	2	2	2	2	2	5	2	2	2	2	2	2	2	
	Participant 4	6	10	6	x	6	6	6	6	15	6	6	10	15	11	7	6	6	12	6	6	
	Participant 5	6	6	6	5	x	4	6	20	6	6	6	16	15	13	6	6	8	6	6	6	
	Participant 6	10	10	10	10	10	x	10	10	10	10	11	10	10	16	10	10	10	10	10	10	
	Participant 7	10	10	10	10	10	10	x	10	10	10	11	10	14	14	10	15	10	10	10	10	
	Participant 8	5	10	5	5	20	4	5	x	5	14	5	17	17	8	5	5	5	16	5	5	
	Participant 9	10	11	10	17	13	10	10	16	x	14	10	15	16	13	10	10	10	10	17	10	
	Participant 10	8	12	8	8	8	10	8	14	10	x	8	13	15	14	8	8	14	14	8	9	
	Participant 11	9	9	9	9	9	9	9	9	8	9	x	9	17	9	9	9	9	9	9	9	
	Participant 12	13	14	12	12	17	10	12	16	14	14	0	x	19	19	13	10	15	14	12	14	
	Participant 13	6	12	3	10	14	8	5	13	8	14	11	17	x	20	7	0	19	19	0	16	
	Participant 14	5	13	3	14	15	6	9	13	12	14	5	17	20	x	12	4	20	20	5	15	
	Participant 15	15	7	6	6	6	6	6	6	10	6	6	9	8	6	x	6	11	6	6	10	
	Participant 16	4	4	4	4	4	4	4	4	4	4	4	4	4	4	2	x	4	4	4	4	
	Participant 17	2	5	2	2	6	7	2	12	4	13	2	13	18	20	2	0	x	14	2	15	
	Participant 18	9	13	9	7	9	11	9	15	15	12	9	13	20	20	7	9	17	x	9	18	
	Participant 19	7	7	7	7	7	5	7	7	7	7	7	5	7	7	7	7	7	7	7	x	7
	Participant 20	10	8	10	10	10	10	10	10	10	10	10	10	11	15	15	7	10	10	19	10	x

Type and number of ties

		Strong, weak and no ties																			
		Participant 1	Participant 2	Participant 3	Participant 4	Participant 5	Participant 6	Participant 7	Participant 8	Participant 9	Participant 10	Participant 11	Participant 12	Participant 13	Participant 14	Participant 15	Participant 16	Participant 17	Participant 18	Participant 19	Participant 20
Participants	Participant 1		10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
	Participant 2	10		8	9	8	10	9	16	12	19	10	16	18	20	10	8	10	8	10	8
	Participant 3	2	8		2	2	0	2	2	2	2	2	2	2	5	2	2	2	2	2	2
	Participant 4	6	10	6		6	6	6	6	15	6	6	10	15	11	7	6	6	12	6	6
	Participant 5	6	6	6	5		4	6	20	6	6	16	15	13	6	6	8	6	6	6	6
	Participant 6	10	10	10	10	10		10	10	10	11	10	10	16	10	10	10	10	10	10	10
	Participant 7	10	10	10	10	10	10		10	10	11	10	14	14	10	15	10	10	10	10	10
	Participant 8	5	10	5	5	20	4	5		5	14	5	17	17	8	5	5	5	5	16	5
	Participant 9	10	11	10	17	13	10	10	16		14	10	15	16	13	10	10	10	10	17	10
	Participant 10	8	12	8	8	8	10	8	14	10		8	13	15	14	8	8	14	14	14	8
	Participant 11	9	9	9	9	9	9	9	9	8	9		9	17	9	9	9	9	9	9	9
	Participant 12	13	14	12	12	17	10	12	16	14	14	0		19	13	10	15	14	14	12	14
	Participant 13	6	12	3	10	14	8	5	13	8	14	11	17		20	7	0	19	19	0	16
	Participant 14	5	13	3	14	15	6	9	13	12	14	5	17	20		12	4	20	20	5	15
	Participant 15	15	7	6	6	6	6	6	6	10	6	6	9	8	6		6	6	11	6	10
	Participant 16	4	4	4	4	4	4	4	4	4	4	4	4	4	4	2		4	4	4	4
	Participant 17	2	5	2	2	6	7	2	12	4	13	2	13	18	20	2	0		14	2	15
	Participant 18	9	13	9	7	9	11	9	15	15	12	9	13	20	20	7	9	17		9	18
	Participant 19	7	7	7	7	7	5	7	7	7	7	7	5	7	7	7	7	7	7		7
	Participant 20	10	8	10	10	10	10	10	10	10	10	10	11	15	15	7	10	10	10	19	10

Total strong ties	73	
Total weak ties	217	
Total non ties	90	

Appendix 3: raw data place attachment

Personal attachment

	Groninger	Utrecht	Breda	Emmen	Antwerpen	Home	Hooghoudt	Cleopatra A.S.G	Rabobank, Hemmingways	umcg	emmeloor	eurborg	aduard	paddepoe	Parental home	Clubhouse rowing association	Clubhouse hockeyclub
Participant 1	1	1	1	1	1												
Participant 2						1	1	1	1								
Participant 3										1	1	1	1	1			
Participant 4						1									1	1	1
Participant 5						1											
Participant 6						1									1		
Participant 7																	
Participant 8	1					1										1	
Participant 9	1					1										1	
Participant 10	1					1										1	
Participant 11	1																
Participant 12	1					1											
Participant 13						1	1									1	
Participant 14	1					1											
Participant 15	1					1											
Participant 16																	
Participant 17	1																
Participant 18																	
Participant 19						1											
Participant 20						1										1	

	VERA	Faculty of Philosophy	Kult	Olijfboom	The office	Little sisters home	Big sisters home	Pacific/omalleys	Wirwar	Jimmy's groningen	Amsterda	Girlfriends house	Westerdorp	Work	veendam	Leeuwarden	Brothers home
Participant 1																	
Participant 2																	
Participant 3																	
Participant 4																	
Participant 5	1		1	1	1												
Participant 6					1	1	1										
Participant 7								1	1	1							
Participant 8	1										1	1					
Participant 9													1	1			
Participant 10																	
Participant 11											1				1	1	
Participant 12																	1
Participant 13														1			
Participant 14																1	
Participant 15																	
Participant 16																	
Participant 17																	
Participant 18																	
Participant 19																	
Participant 20																	

	nature on	Vaassen	Japan	Newton A	Darlington	Old schoo	Noorderp	Bolonga	Radio koo	Rome	Forum	Harlingen	Vlieland	Beach	Melbourn	Hoornsem
Participant 1																
Participant 2																
Participant 3																
Participant 4																
Participant 5																
Participant 6																
Participant 7																
Participant 8																
Participant 9																
Participant 10																
Participant 11																
Participant 12	1	1														
Participant 13																
Participant 14			1													
Participant 15				1	1	1										
Participant 16							1	1	1	1						
Participant 17																
Participant 18											1	1	1			
Participant 19														1		
Participant 20															1	1

Summation of personal attachment

Groningen	9
Other dutch cities	11
Foreign cities/places	7
Home	13
Work	8
Parental/family home	11
Hooghoudt	2
Other social places in Groningen	19

Group attachment

	Hooghoudt	Participant 2 apartment	Other group member appartment	Cafe MR. Bakkels	Apartment participant 6	Commander weekend	Purperen draak	Participant 9 appartment	Lager der A	piccadely	participant 12 appartment	participant 18 appartment	Libary Appignedam	Participant 13 appartment	Participant 18 appartment	
Participant 1	1															
Participant 2	1															
Participant 3	1															
Participant 4	1	1	1	1											1	
Participant 5	1															
Participant 6	1				1											
Participant 7																
Participant 8	1		1			1										
Participant 9	1						1	1								
Participant 10	1					1		1	1	1						
Participant 11	1															
Participant 12	1		1				1				1					
Participant 13	1											1	1	1		
Participant 14	1															
Participant 15	1												1			
Participant 16	1															
Participant 17	1						1	1								
Participant 18	1					1									1	1
Participant 19	1						1								1	
Participant 20	1															
total	19	1	3	1	1	3	4	3	1	1	1	1	2	4	1	1