First Steps Towards Measuring Social Capital in Online Social Media Networks

A Design Approach Using Online Social Media Networks of LinkedIn and Twitter

First Steps Towards Measuring Social Capital in Online Social Media Networks

A Design Approach Using Online Social Media Networks of LinkedIn and Twitter

Master´s Thesis

Communication Studies
Faculty of Behavioural, Management and Social Sciences
University of Twente

in Partial Fulfillment of the Requirements for the Degree of
Master of Science

Anna Schmalöer

1st supervisor: Dr. Lidwien van de Wijngaert
2nd supervisor: Dr. Sjoerd de Vries

July 01, 2015

UNIVERSITY OF TWENTE.

Abstract

Social media have become an important tool for online communication and the creation of online social networks. Individuals, groups, and organizations have begun using social media for multiple purposes. This research focuses on the potential of building social capital through the use of different social media. The main question of this investigation is how to measure social capital in an online social networking environment. Existing methods for measuring social capital are primarily used in offline contexts. The research objective is to identify practical indicators, to implement and evaluate them in different analysis techniques, and to reflect on them afterwards regarding their applicability and their appropriateness in an online social networking context.

Based on scientific literature, the researcher proposes an adapted an integrated conceptualization of social capital in online social media networks. A triangulation of analysis methods is applied. A social network analysis investigates the network structure and identifies important individuals within the networks. The triad census describes underlying communication patterns. A thorough content analysis focuses on the communication contents of the networks. For the purpose of this fundamental and practical approach, the researcher executes a case study of a citizen´s initiative which uses two social media tools for their online communication: the social networking site LinkedIn and the microblogging site Twitter. Results show that adaptation and a continuous elaborated reflection on the methodology is essential during the implementation process, but that it actually is feasible to use existing analysis techniques for investigating social capital in online social media networks.

Keywords: social capital, social media, social networks, social network analysis, triad census, content analysis, LinkedIn, Twitter

Declaration of authenticity

I declare that this master´s thesis is my own work and that I did not use any other sources or additional materials than listed under Literature. All passages, wherever literally cited or analogously adapted from other sources, are labeled as such.

Borken Weseke, July 01, 2015

Content

Abstract ..... **III**
Declaration of authenticity ..... **IV**
1. Introduction **8**
1.1. Problem analysis 8
1.2. Research questions 9
1.3. Scientific relevance 11
1.4. Practical relevance 12
1.5. Outline 12
2. Theoretical foundation **14**
2.1. Network theory 14
2.1.1. The network society 15
2.1.2. Building social networks and creating social capital 15
2.2. Introductory social capital theory 16
2.2.1. Definitions of social capital 16
2.2.2. Dimensions of social capital 18
2.2.3. Strength of relationships 18
2.2.4. Types of relationships 19
2.3. Theory about new and online social media 20
2.3.1. Communication capacities of new media 21
2.3.2. Definitions of online social media 22
2.3.3. Social networking sites 24
2.3.4. Microblogging sites 25
2.3.5. Medium characteristics of LinkedIn 26
2.3.5.1. LinkedIn profiles 26
2.3.5.2. LinkedIn connections 27
2.3.5.3. LinkedIn groups 27
2.3.5.4. Communication on LinkedIn 28
2.3.6. Medium characteristics of Twitter 28
2.3.6.1. Twitter profile 29
2.3.6.2. Twitter hashtag 29
2.3.6.3. Twitter following 30
2.3.6.4. Communication on Twitter 30
2.3.7. Medium choice 31
2.4. Social capital in the era of online social media 32
2.4.1. Communicating via online social media 33
2.4.2. Knowledge sharing via online social media 33
2.5. Conceptualization of social capital in this research 34

3. Current measurement methods for social capital 37
3.1. Measuring social capital in online social media networks 37
3.1.1. Online social network analysis method 38
3.1.1.1. Statistics 38
General network metrics 38
Edge metrics 39
Node metrics 39
3.1.1.2. Layouts 40
3.1.1.3. Filters 40
3.1.2. Analysis method of network triad configurations 41
3.1.2.1. Dyad census 42
3.1.2.2. Triad census 42
3.1.3. Content analysis method 44

4. The case study: Implementation of the methods 46
4.1. Case description 46
4.1.1. The Onder-Tussen initiative 46
4.1.2. The Google map of wastelands 47
4.1.3. Online social media usage of the Onder-Tussen initiative 48
4.2. Data collection on LinkedIn and Twitter 48
4.2.1. The LinkedIn data set 49
4.2.2. The Twitter data set 50
4.3. Online social network analysis using Gephi 50
4.3.1. Running statistics in Gephi 51
4.3.2. Applying layout settings in Gephi 51
4.3.3. Using filters in Gephi 51
4.4. Analysis of network triad configurations 52
4.5. Content analysis 52
4.6. Practical considerations and recommendations 55

5. The case study: Evaluation of the findings 57
5.1. LinkedIn 57
5.1.1. Content of the LinkedIn discussions 57
5.1.2. The LinkedIn network 59
5.1.2.1. Graphical representation of the LinkedIn network 59
5.1.2.2. Network metrics of the LinkedIn network 60
5.1.3. Important persons in the LinkedIn network 61
5.1.3.1. Network metrics of the three central persons on LinkedIn 61
LIPerson1 61
LIPerson2 61
LIPerson3 62
5.1.3.2. Content analysis of the three central persons on LinkedIn 63
LIPerson1 63
LIPerson2 65
LIPerson3 67

5.2. Twitter ... 69
5.2.1. Content of the Twitter tweets ... 69
5.2.2. The Twitter network ... 72
5.2.2.1. Graphical representation of the Twitter network ... 73
5.2.2.2. Network metrics of the Twitter network ... 74
5.2.3. Important persons in the Twitter network ... 74
5.2.3.1. Network metrics of the three central persons on Twitter ... 75
TWPerson1 ... 75
TWPerson2 ... 75
TWPerson3 ... 75
5.2.3.2. Content analysis of the three central persons on Twitter ... 76
TWPerson1 ... 76
TWPerson2 ... 80
TWPerson3 ... 83
5.3. LinkedIn and Twitter ... 86
5.3.1. Direct comparison of the LinkedIn and Twitter networks ... 86
5.3.2. Triad census of the LinkedIn and Twitter networks ... 89
5.4. Concluding evaluations ... 91

6. Reflection on the method design ... 93
6.1. The case ... 93
6.2. Sources of research data and ethical considerations ... 93
6.3. Data collection and formatting ... 94
6.4. Development and implementation of practical indicators ... 95
6.5. Reliability and validity of the analysis methods ... 98
6.6. Potential of online social media networks ... 98

7. Conclusions ... 100
7.1. Conceptualization of social capital ... 100
7.2. Indicators for measuring social capital ... 100
7.3. Social capital of the citizen´s initiative ... 102
7.4. Practical method for measuring social capital ... 103
7.1. Future research ... 103

Literature ... 105
List of Tables ... 119
List of Figures ... 120
Appendices ... 121
I. LinkedIn coding scheme ... 121
II. Twitter coding scheme ... 122

1. Introduction

We are living in a network society, and new social media foster human communication within online social networks. If we acknowledge the recent shift from the former mass society to a more interconnected and interactive network society, we will discover new ways of communication. We might even experience positive effects from using online social media, for instance, enhanced social capital. Networks of social relationships can create advantages for individuals in these networks, for whole or parts of networks, or between networks. For instance, access to resources such as information, knowledge, and expertise can be gained through communication via social structures.

This research focuses on the implementation and evaluation of, and the reflection on different measurement techniques for investigating the concept of social capital in online social media networks. The researcher applied a case study of a citizens´ initiative using online social network data retrieved from the online social media tools LinkedIn and Twitter.

1.1. Problem analysis

In times of a network society, individuals can be described as nodes which are connected to other nodes via relationships. These interconnected nodes build a network. Individuals build networks of existing relationships and may expand them with new ones. People do this for many different purposes or just for fun. Sometimes, they do not even consciously recognize that they are part of certain networks. Individuals, groups, and organizations may try to make use of their networks to pursue a specific goal. People within these networks may profit from their relationships to others, and some kind of value may be created.

The internet and new technologies allow people all over the world to connect online. They transpose their offline networks to the online context and may encounter new opportunities online communication offers. Specifically, online social media are widely used networking tools. Former barriers for building networks have been reduced to a minimum within online social media. One does no longer have to meet face-to-face at the same time at the same place to communicate with each other. Developments within the media landscape especially during the last century have made this possible. As many new technologies foster inter-personal communication through different features, online social media tools do provide capacities for the creation of online social networks. These tools can be evaluated as rather open and accessible platforms for human communication. Via these platforms, online social media networks may also be able to create some form of value.

Networks, offline or online, may create social capital to pursue a common goal. When it comes to measuring social capital, there are several indicators which can be investigated to evaluate the social capital of a specific network. Specific statistical metrics facilitate the analysis of social network structures. Other rather qualitative indicators can

be used for content analysis methods. These indicators are widely used within the context of offline networks. Offline relationships are analyzed and communication via these offline relationships is interpreted. There is little scientific evidence that these indicators are appropriate for investigating online social networks and communication online. The focus of this research is to evaluate the practical suitability of social capital measurement indicators for the investigation of online social media networks. For this purpose, a case of a citizens´ initiative is chosen to provide useful data for an in-depth investigation of the social capital indicators. This initiative uses the online social media tools LinkedIn and Twitter to organize and communicate within their networks. Social initiatives already have begun using the opportunities which online communication tools or online social media provide for building and possibly strengthening their networks. This case allowed for a very detailed data analysis and was, therefore, eligible for this kind of practical research.

One central challenge of this research is to evaluate and reflect on existing measurement methods for social capital regarding their practical appropriateness for online social media network data. The second central objective is the development of a practical measurement method for this purpose. Therefore, this thesis follows a design approach which summarizes relevant theoretical background, introduces current analysis methods, and which then takes first steps towards a practical measurement method for social capital in online social media networks. Finally, this measurement method is practically applied to a case and the implementation is evaluated regarding its suitability for the online social media context. The following sections formulate relevant research questions for this thesis.

1.2. Research questions

Although there are several methods for measuring social capital in social networks, they are mostly used in an offline context. There seems to be no appropriate measurement method for social capital in online social media networks. One goal of this research is to investigate to what degree those analysis techniques used for offline social network analyses are useful for the measurement of social capital in online social networks. Further challenges are to identify, implement, and evaluate the different social capital indicators for online social networks. The main research objective is to develop an appropriate measurement method for measuring social capital in online social media networks. Thus, the main research question was formulated as follows:

What is a practical method for measuring social capital in online social media networks?

This question functions as the central theme of this research project. The character of this question is rather global due to the term “practical method”. This thesis follows a design approach in which the term “method” does not refer to one single analysis method, but rather to an integration of three research methods adapted and further developed to

measure social capital in online social media networks. In this research, a triangulation of analysis methods is applied. Furthermore, it is important to be clear about the adjectival use of "practical". In this research context, the definition of "practical" includes qualitative features of the method regarding its suitability, reliability, and validity to measure the concept of social capital in online social media networks. The reflection deliberates on these qualitative features in more detail.

To be able to answer this main research question, three sub-questions were formulated. These are presented in the following paragraphs. First of all, a clear conceptualization of the term "social capital" within the context of online social media networks is crucial. A thorough literature review shows that many different definitions of social capital actually do exist. Most of them apply to the offline context, which is one reason why this research proposes an adapted conceptualization translated into the context of online social media networks. Furthermore, as several definitions of social capital share similar predicates, an accurately integrated definition of social capital is essential for this research. Therefore, a sub-question was formulated as follows:

What is an accurate conceptualization of "social capital" in online social media networks?

The conceptualization of "social capital" has to be accurate with regard to the integration of existing definitions and to its measurability in the context of online social networks. Furthermore, different indicators for measuring social capital are investigated in this research. A triangulation of three different analysis methods, each with multiple measurement indicators, is applied in this research. Therefore, another sub-question was formulated to identify and evaluate those indicators:

Which indicators for measuring social capital are applicable to online social media?

Within this research, the measurement method for social capital in online social media networks is designed to use real data gathered from the case of a citizens´ initiative. As a triangulation with various measurement indicators is applied, the actual implementation of these indicators is evaluated based on the results of the case study. Therefore, another sub-question to be answered during this research was formulated as follows:

What is the social capital of the online social media networks of the citizens´ initiative?

This sub-question is answered by presenting the results of the case study produced by the different measurement techniques. Central persons within the online social networks are identified, the content of the communication within these networks is presented, and structural differences between the networks are highlighted. On the basis of these findings, the social capital indicators are evaluated regarding their suitability for measuring social capital of online social networks.

The following two sections summarize in how far this research is relevant for scientific as well as practical purposes. Furthermore, potential relevance for future research or practical use is indicated.

1.3. Scientific relevance

This research actually was part of a bigger scientific research project of the Wageningen University. Alterra, Research Institute for the Green Living Environment at Wageningen University and Research Centre was the initiator of this project. Alterra Wageningen UR chose to assemble the researcher from the University of Twente for this particular case study. Main focus of the multidisciplinary research project of Alterra Wageningen UR was to investigate the mobilization of social capital through the online social networking sites LinkedIn and Twitter (Salverda, Van der Jagt, Willemse, Onwezen & Top, 2013). Alterra Wageningen UR and the researcher of the University of Twente used the same case to pursue their specific scientific objectives. They did not use the same methodology, as Alterra Wageningen UR used qualitative document analysis methods and semi-structured interviews, and the researcher of the University of Twente used quantitative methods complemented with some qualitative analyses which are described in more detail in the following chapters. To place this research in its bigger context, the results of these quantitative analyses were partially used as basis for and in combination with the qualitative research that Alterra Wageningen UR executed by document analyses and interviews. Findings of the social network analyses indicated which persons were important within the networks, Alterra Wageningen UR chose their interview respondents based on these findings. The content analysis of the online social networks revealed interesting findings which were used to formulate various interview questions. Graphical visualizations of the online social networks were used to discuss social structures of these networks with the interview respondents. The particular researches were integrated to provide an in-depth analysis about the generation and mobilization of social capital by online social networks for societal cooperation via social media.

On the one hand, this research presents the results of the case study. Therefore, it is relevant for the scientific research project of Alterra Wageningen UR. On the other hand, it is not restricted to this particular case. As the objective of this research is to provide a practically useful measurement method for investigating social capital in online social media networks, the methodology may be adapted to or implemented in other cases. Therefore, this research is scientifically relevant for future research referring to different cases as well. As a further enhancement, this research translates social capital indicators for investigating offline social networks into a fundamental scientific operationalization of measuring social capital in online social media networks. Furthermore, this research provides and adds a missing integrated definition of social capital in online social media networks, which was developed based on scientific social capital conceptualizations from the past decades and new and online social media theory.

1.4. Practical relevance

Primarily, this research is practically relevant for the citizens´ initiative which provided the case data for this study. The social capital of its online social media networks is presented in detail during the following chapters. Initiators may profit from this in-depth investigation of their networks to gain knowledge about how their networks are structured, how they developed, and how people communicate within these networks. Central persons can be identified and their structural importance and communicative content can be analyzed. This practically helps to understand how social capital in these online social networks is built and how it might be enhanced by different structural or communicative patterns. Initiators come to know which individuals are important within the online social networks and whom they might wish to address when it comes to profit from their connections, or to motivate them to consciously act as some kind of intermediaries between them and others.

This research may also have practical relevance for other initiatives, or maybe even for organizations and businesses. As this study and its methodology are applicable to other cases – and not only for the particular citizens´ initiative chosen here – other stakeholders´ online social media networks may be analyzed as well. Even data from other social media tools than LinkedIn and Twitter may be investigated by using the same indicators, although the methodology would probably have to be slightly adapted, due to different medium characteristics or with regard to form and contents of the data. The researcher does not exclude the possibility of translation and adaptation of this research to other implementations, such as organizational or business-related online social media networks. This would have to be investigated in future research, as this study provides a first fundamental investigation of social capital in online social media networks. The following section outlines the structure of this thesis.

1.5. Outline

The introduction to this thesis provided the problem analysis, asked relevant research questions, and described the scientific as well as the practical relevance of this research. This study follows a design approach, presenting first steps towards the development of a method for measuring social capital in online social media networks. This thesis is structured as follows.

Chapter 2 summarizes the theoretical foundation of this research project. The beginning of this chapter introduces network theory as basic theoretical background for this research and it provides a thorough overview about existing scientific literature and definitions of social capital. Chapter 2 illustrates theory about online social media, and more specifically, presents LinkedIn and Twitter as such online social media tools. At the end of Chapter 2, an integrated conceptualization of social capital within the context of online social networks is proposed.

Chapter 3 describes current measurement methods for investigating social capital in social networks. This chapter establishes a connection between offline and online data analysis methods. The beginning of this chapter introduces the research method of online social network analysis. Furthermore, the triad census is described. Finally, Chapter 3 explains current content analysis methods.

Based on the theoretical foundations delineated in Chapter 2 and the introduction to current research methods in Chapter 3, the researcher takes first steps towards the development of the method design for this research to measure social capital in online social media networks in Chapter 4. This chapter describes the triangulation of three measurement methods: online social network analysis, network triad census, and content analysis. Furthermore, the case chosen for this study is introduced and the implementation of the research methods is illustrated.

Chapter 5 presents the findings of the evaluation of the three research methods. This chapter is divided into three main parts. The first part summarizes the results regarding the social networking site LinkedIn, whereas the second part illustrates the results referring the microblogging site Twitter. The third main part of Chapter 5 closes with a comparison of both online social networks and describes the findings of the triad census method.

In Chapter 6, the researcher reflects on the methods developed and applied in this design study. A detailed consideration of the implementation, the feasibility, and the reliability and validity of the research method design is presented. Chapter 6 closes with an overview of the potential of online social media.

The last chapter of this thesis, Chapter 7, answers the research questions formulated in Chapter 1 and provides relevant conclusions which can be drawn from this research. Furthermore, an outlook on future research is provided.

2. Theoretical foundation

This chapter introduces the theory behind this research project. Within this chapter, the first sub-question of this research is answered: *What is an accurate conceptualization of "social capital" in online social media networks?* The foundation for social capital theory relied on the network theory, and was amended with recent theory about online social media networks. Chapter 2 is divided into five parts. The first part of this chapter introduces the reader to the network theory. Social networks build the infrastructures of the network society. The second part presents relevant scientific literature about social capital theory. Within these sections, existing definitions of social capital are summarized and different types of social capital as well as the characteristics of social relationships in social capital theory are described. The third part of Chapter 2 focuses on theory about new and online social media. These sections present the characteristics of new media in general and define online social media more narrowly. Furthermore, they introduce LinkedIn as social networking site and Twitter as microblogging site. The third part of Chapter 2 closes with the medium characteristics of these online social media tools and explains potential reasons for choosing specific media tools based on medium choice theory. The fourth part of Chapter 2 establishes the connection between the social capital and online social media. This part focuses on the communication in online social media as means for building social capital in online social media networks. Based on the theoretical foundations described earlier, the fifth and last part of Chapter 2 proposes an adapted and integrated conceptualization of social capital.

2.1. Network theory

This sub-chapter illustrates the scientifically relevant theoretical background of this design study. The theoretical foundation of this research was based on the network theory. A network consists of "*a collection of links between elements of a unit*" (Van Dijk, 2012, p. 28.). Those elements are called nodes, whereas units are often referred to as systems. A link is the relationship between single nodes. Within this research, the links or relationships were also referred to as edges. These relationships are central in the process of creating social capital.

Networks can be found at different levels, ranging from individual networks, via group or organizational networks and societal networks, to even global networks. There are different types of networks which serve as mode of organization in complex systems. Networks can be found in nature, technology, society and media, characterizing different complex systems (Van Dijk, 2012). Furthermore, different types of networks can be identified which together build the infrastructures of the network society. In the following sections (see sub-chapters 2.1.1 and 2.1.2), the network society as a modern conceptualization of society built on social networks is further described and the link between the processes of building social networks and creating social capital is established (Van Dijk, 2012).

2.1.1. The network society

Van Dijk (2012) focused on the development of the network society as a modern society in which the infrastructure of social, technological, and media networks defines how individuals, groups or organizations are linked to each other. He identified a shift from the mass society to a network society. In this theory, the network society does not mean the same as information society, as all societies are basically built on information (Castells, 2000a, 2000b; Van Dijk, 2012). The term “network society” is preferably used because information and communication are central in all sorts of societies and not specific for any of them in particular.

In the network society, technical developments allow for transferring more information within a shorter period of time and less space. Information can be easily passed on, by just copying and pasting it and spreading it via the internet. Castells (2000a, 2000b) described a new economy which is informational, global, and networked. In the information economy, knowledge and information management are crucial factors for productivity. Globalization processes allow for working not just locally but all around the world. Space and time are still important and seem to become even more important in the network society (Van Dijk, 2012). In a networked economy, the global economy is combined with informational flexibility. This creates a new way of working in which not the organization is central but the project one is working on (Castells, 2000a, 2000b). This section concentrated on the concept of the network society in general. As the character of this concept is rather global, it is important to understand the infrastructures of this network society in detail. The following section introduces the connection between these infrastructures and the creation of social capital.

2.1.2. Building social networks and creating social capital

Social networks build the infrastructures of the network society. It is important to understand in how far these networks can create competitive advantages for individuals within these networks, for whole or sub-networks, and between networks. Individuals build social networks by creating relationships with others. This is a process which can be explicit, or might be implicit. If people explicitly create relationships with others, they might hope to profit from those relationships in one or another way, for instance, by sharing and exchanging information and knowledge. Others might want to maintain or cultivate their social relationships for emotional reasons. Social networks are the basis for human interactive communication and the organization of collective action (Castells, 2012; Shirky, 2008, 2010). The use of online social media might affect and even enhance people´s sociability (Van Dijk, 2012). People ultimately might be able to create some kind of social capital through their networks. As this section introduced the global processes behind the creation of social capital, it is now crucial to narrow the focus on what social capital is. Therefore, the following sub-chapter 2.2 illustrates relevant scientific literature about social capital.

2.2. Introductory social capital theory

This sub-chapter summarizes relevant information about social capital. It describes existing definitions of the concept and presents different types of social capital, the strength of relationships, and different types of relationships. Later in this chapter (see sub-chapter 2.5), an adapted and integrated conceptualization of social capital in this research is proposed.

Social capital is acknowledged as crucial factor which encourages people to work collectively in their networks (Poortinga, 2012; Woolcock & Narayan, 2000). Networks create social capital to act collectively for a shared social goal. The conceptualization of "social capital" was developed by Bourdieu (1983, 1986) and Coleman (1988, 1990, 1994). The next section presents existing definitions of social capital, following a rather chronological order. This overview is important for establishing a scientific theoretical basis for an adapted and integrated conceptualization of social capital for this research, which is finally provided in sub-chapter 2.5.

2.2.1. Definitions of social capital

This section focuses on the presentation of former and more recent definitions of social capital. After introducing the various definitions, this section ends with a summary of aspects of social capital which were commonly mentioned throughout the different definitions. This summary helps forming the basis for the adapted and integrated conceptualization of social capital in sub-chapter 2.5.

There are many definitions of social capital. One of the first researchers investigating this concept was Bourdieu (1983). Bourdieu (1983) describes social capital as the resources resulting from social structure (Burt, 2000). In Bourdieu´s (1983) view, "[s]*ocial capital is the 'the aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition"* (p. 249).

As Coleman (1990, 1994) puts it, *"*[s]*ocial capital is defined by its function. It is not a single entity, but a variety of different entities, having two characteristics in common: they all consist of some aspect of a social structure, and they facilitate certain actions of individuals who are within the structure"* (p. 302).

Putnam, Leonardi and Nannetti (1993) define social capital as follows: *"Social capital here refers to features of social organization, such as trust, norms, and networks, that can improve the efficiency of society by facilitating coordinated actions"* (p. 167). In 1996, Putnam added participation to his definition of social capital: *"By* "social capital"*, I mean features of social life-networks, norms and trust – that enable participants to act together more effectively to pursue shared objectives."* (p. 664). What people need for civic engagement is trust. People who better connect in their communities, are supposed to trust each other more, and vice versa (Putnam, 1996).

Burt (2000) defines social capital as a *"metaphor in which social structure is a kind of capital that can create for certain individuals or groups a competitive advantage in pursuing their ends. Better connected people enjoy higher returns."* (p. 348). Burt (2000) grounded his view on social capital work by Coleman (1990) and Putnam (1995, 1996, 2000), who both stated that social capital creates advantages.

Nahapiet and Ghoshal (1998) formulated a definition of social capital. Social capital is described "*as the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit.*". The perceived value of people within a social network might enhance the probability of a collective identity. Networks are recognized as powerful assets for individuals and communities (Helliwell & Putnam, 2004).

Chang and Chuang (2011) focused on the relationships in creating social capital: *"Social capital has been conceptualized as the sum of the assets or resources embedded in the networks of relationships between individuals, communities, networks, or societies. It exists through interpersonal relationships among individuals. Therefore, social capital is embedded in the relationships between individuals and their connections with their communities."* (p. 9).

As this overview of existing definitions shows, some aspects of social capital were commonly mentioned throughout the social capital definitions. The following items summarize these aspects:

- social structures or networks are built on relationships between individuals;
- these structures offer a certain competitive advantage for individuals within these networks, for whole or sub-networks, and between networks;
- these structures facilitate access to potential or actual resources and enhance certain coordinated actions;

In general, the definitions acknowledged a potential power of relationships between individuals. This aggregation of common aspects within the definitions delineated above was one first step towards the conceptualization of social capital for this research (see sub-chapter 2.5). It was not sufficient to solely focus on these definitions, but further scientific literature about social capital was gathered. Therefore, the following sections concentrate on more specific properties of social capital (see sub-chapters 2.2.2, 2.2.3, and 2.2.4). They describe the multifaceted concept of social capital from different angles. First, three different dimensions of social capital are described: structural, relational, and cognitive social capital. Second, the strength of relationships within social capital is illustrated: strong and weak ties. And third, three different types of relationships are delineated: bonding, bridging, and linking social capital. These sections emphasize how complex the concept of social capital is. Furthermore, they provide additional scientific information for formulating an adapted and integrated conceptualization of social capital for this research.

2.2.2. Dimensions of social capital

This section delineates the three different dimensions of social capital: structural, relational, and cognitive social capital. Putnam (1995, 2000) acknowledged three dimensions of social capital. First, the *structural* dimension describes the network of connections of a group. As Chang and Chuang (2011) put it, the structural dimension of social capital is characterized by the overall pattern of relationships. In structural social capital, people are connected via impersonal links. This research investigated the creation of structural social capital by analyzing the online communication network structure of online social media. The extent to which people are connected within these networks was investigated (Bolino, Turnley & Bloodgood, 2002). This research used network analysis methods to describe the overall structures of the online social media networks.

Second, the *relational* dimension focuses on the character of these relationships in terms of strong and weak ties. Chang and Chuang (2011) studied the nature of relationships between people in an organizational network. They found that "*trust, norms, obligations, expectations and identification*" shape the nature of relationships in a network (Chang & Chuang, 2011, p. 10).

And third, the *cognitive* dimension describes factors influencing norms and values, which might ultimately lead to a shared common perspective, understanding, and collective identity (Chang & Chuang, 2011). Social networks have a value for people related to others, probably on different levels of density, ranging from close networks of family and friends to loose networks on the internet (Helliwell & Putnam, 2004). This research aimed at sketching the latter two forms of social capital by executing a content analysis of the LinkedIn group and the Twitter content.

2.2.3. Strength of relationships

This section illustrates the strength of the relationships in social capital: strong and weak ties. This strength was already indicated in the relational dimension of social capital. *Strong ties* basically resemble firm relationships between individuals, whereas *weak ties* describe rather unstable relationships. Granovetter (1973, 1983) first mentioned the difference between strong and weak ties, with the focus on the strength of weak ties. Both strong and weak ties can have advantages and can contribute to the goals of a social network. On the one hand, the strength of the weak ties is that they help spreading new information to more people, who are loosely connected to the network (Granovetter, 2005). This effect is also contested to be overestimated, (Rost, 2011). Especially in the creation of innovation, strong ties have been shown to be crucial. Weak ties do not have any value for innovation without strong ties, whereas strong ties do have a value without weak ties (Rost, 2011). Putnam (1995, 1996, 2000) and Putnam, Leonardi and Nannetti (1993) acknowledged this conceptualization and, in addition to this distinction, proposed two forms of social capital: bonding and bridging social capital. Woolcock (1998, 2000, 2001a, 2001b, 2010) and Woolcock and Narayan (2000) added a third form of social

capital: linking social capital (Grootaert, Narayan, Jones & Woolcock, 2004). These forms are identified on the basis of relationship types. These types of social relationships are further described in the following section.

2.2.4. Types of relationships

This section describes three different forms of social capital, identified by their characteristic types of relationships. Theory about bonding, bridging, and linking social capital is based on relational strategies. *Bonding* refers to relationships between people who share similar social identities. *Bridging* describes relationships between people who have different views (Poortinga, 2012). The social capital of a group is described as behaviors and norms that encourages helping other group members. These are embedded in certain community values (Muniz & O´Guinn, 2001). Whereas bonding social capital strengthens the relationships, connections, and trust within a homogeneous group, bridging social capital creates new connections between heterogeneous groups. As members of a group connect in clusters within small world networks, bonding occurs within such clusters (Hennig, Brandes, Pfeffer, & Mergel, 2012; Kadushin, 2012; Shirky, 2008; Van Dijk, 2012). In contrast, bridging happens between clusters. As a side effect, bridging social capital encourages more creative ideas than bonding social capital, as different people might add specific talents and opinions to a group which would not be present if people were similar to each other. Bonding and bridging social capital both describe horizontal networks, thus, networks of people who are on the same level of power or influence. *Linking* social capital is an addition which describes networks that include vertical relationships between people who differ in their influence and who do not necessarily share a collective identity (Poortinga, 2012). People who take the position between two or more sub networks, and who are therefore, connecting networks which otherwise were not related to each other, are described as brokers. They fill structural holes (Burt, 2000; Ganley & Lampe, 2005). This research identified such brokers and key players in the online social networks.

Bohn, Buchta, Hornik and Mair (2014) argued that there exist contradicting approaches to building social capital. They referred to Coleman´s (1988) argument of network closure on the one hand, and Burt´s (1995) approach of structural holes on the other hand. Coleman (1988) stated that dense networks create social capital, as they are supposed to provide better information quality, facilitate creativity and are more stable against the removal of nodes. This view corresponds to the bonding approach of social capital. Burt (1995) found that bridging structural holes creates social capital. Brokers in social networks can facilitate and introduce new connections between members of the network. Furthermore, they can profit from the advantage that they have access to and are able to control information flows between different clusters within the network. Bohn et al. (2014) stated that these approaches do not exist within the same set of nodes because in a dense network, structural holes are not supposed to be there. They argued that different subsets of nodes of one network might show a high network closure

(e.g. ego networks) or structural holes (e.g. nodes which might only have one connection to the rest of the network) (Bohn et al., 2014).

To conclude this introduction to social capital theory, it is important to acknowledge the complexity of the concept in general, its three dimensions, and fundamental qualities of the relationships, regarding the strength and types of relationships. This scientific information about social capital was a first step towards proposing the conceptualization of social capital formulated in sub-chapter 2.5. The following sections add relevant information about online social media, so as to adapt existing definitions of social capital to the context of online social networks. Furthermore, the information presented in the next sections facilitates the integration of social capital theory and theory about online social media for the conceptualization of social capital for this research.

2.3. Theory about new and online social media

Online social media still belong to the "new" media of these days. Social media are new media which are described as internet-based applications, therefore, the additional adjective of "online" refers to their characteristic feature that they are only accessible via the internet. Furthermore, it establishes a first clear distinction between social networks which are built offline and social networks which are built online via these online social media. This research investigates the latter type of online social networks. The following section provides the relevant scientific background information as to new media.

If one considered a definition by Van Dijk (2012), new media are characterized as follows: new media are *"media at the turn of the 20th and 21st centuries which are both* integrated *(multimedia) and* interactive*, and use* digital code *and* hypertext *as technical means."* (Van Dijk, 2012, p. 21). The process of convergence is acknowledged as one of the most important structural characteristics of new media. It describes the *"integration of telecommunications, data communications and mass communications in a single medium"* at different levels (Van Dijk, 2012, p. 7). Interactivity is a second structural characteristic of new media. Van Dijk (2012) identified four dimensions which define the interactivity of a specific digital medium: space, time, behavioral, and mental dimensions. Furthermore, there are two essential technical characteristics of new media. First, the artificial digital code which replaces natural analog codes of old media; this uniform code consisting of bits and bytes is used for all types of data within the new digital media (Van Dijk, 2012). Second, the hypertext code of digital media replacing the linear order of data in old media; hypertext codes link different parts of digital data, so that the decision about when and how to retrieve these data is controlled by the user (Van Dijk, 2012).

Another characteristic of the new media is the integration of different patterns of information flow (Van Dijk, 2012). New media and network communication allow for a combination of the four types of information traffic patterns identified by Bordewijk and Van Kaam (1982): allocution, consultation, registration, and conversation. Therefore, new media are potentially powerful tools for information and knowledge exchange among

local units of a network as well as between local and central units of a network. The following section focuses on rather objective features of new media, which are referred to as communication capacities (Van Dijk, 2012).

2.3.1. Communication capacities of new media

The use of a new medium is difficult to generalize across different media; people can subjectively interpret and actually use new media differently from what developers of these media might have had in their minds. Therefore, one might better begin describing different types of new media with their more or less objective characteristics. Van Dijk (2012) developed an integrated approach of communication capacities of new media in comparison to old media. This sub-chapter introduces the theoretical foundation of the approach to communication capacities.

Social-psychological approaches, for instance, social presence theory (Short, Williams & Christie, 1976) or media richness theory (Daft & Lengel, 1984, 1986), focus on objective characteristics of media and concentrate on the fit between a specific task and the medium. These approaches were criticized for their objective perspective on medium characteristics, as they were inadequate for explaining some forms of medium use which were contradictory to these theories (Pieterson, 2009; Pieterson & Van Dijk, 2007; Van Dijk, 2012). Social-cultural or sociological approaches, for instance, the social information processing approach (Fulk & Steinfeld, 1990; Fulk, Steinfeld, Schmitz & Power, 1987), focus more on subjective aspects of medium use and add a relational perspective to it (Walther, 1992, 1996).

As mentioned earlier, Van Dijk (1993, 2012) developed an approach which integrates objective properties and (inter)subjective interpretation of the new media. This approach also begins with investigating objective medium characteristics – communication capacities – and remains then open for more subjective interpretation of their usage. There are ten communication capacities which can be defined for all different kinds of media: speed, geographical and social reach, storage capacity, accuracy, selectivity, interactivity, stimuli richness, complexity, and privacy protection (Van Dijk, 2012). Generally speaking, new (online) media score high on speed, referring to a fast connection between people over large distances. They have a high geographical reach, as new media can basically reach a very high number of places all over the world, although their social reach may still be variable (for instance, due to access issues mostly in developing countries). Furthermore, new media have a high storage capacity and are very accurate. People can also be very selective in using new online media, as they might communicate and interact with specifically selected others. In contrast to face-to-face communication, new media still lack the capacities for full interactivity or the ability to show natural stimuli, although technical developments already allow for many artificial stimuli. Furthermore, complex tasks or objectives seem to be difficult to reach via new media. Finally, one of the lowest communication capacities of new media lies in the insufficient protection of privacy. Whenever choosing a specific new communication

medium, one should keep these capacities in mind and evaluate the medium to be used according to its specific capacities. The next sub-chapter presents relevant definitions and illustrates classifications of online social media.

2.3.2. Definitions of online social media

Online social media can be described as a new media environment integrating individual and social communication (Van Dijk, 2012). Social media enhance the integration of offline social networks and online social media networks. It has to be noted that social media are internet-based and that their character is "online" by definition (Kaplan & Haenlein, 2010; Van Dijk, 2012). Therefore, they are referred to as "online social media" in the following. They are socially oriented and support the trend of network individualization (Van Dijk, 2012). Within this process, the individual node develops the most important position in the network society instead of certain groups, organizations, or even places.

Central to online social media is their focus on sharing content (text-based messages, and/or audio-visual contents). Van Dijk (2012) defines social media as *"Internet applications that enable the sharing of things"* (p. 180). Kaplan and Haenlein (2010) propose a similar, but more specific definition of social media: *"Social Media is a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of User Generated Content"* (p. 61).

Furthermore, Kaplan and Haenlein (2010) proposed a classification of different types of online social media based on the concepts of social presence and media richness, in contrast to the level of self-presentation and self-disclosure in these media. As mentioned earlier in this chapter, social presence theory and media richness theory are two rather objective theories. Social presence theory aims to describe different media on the basis of their capacities to mediate cues of social presence between individuals – affected by the levels of (perceived) intimacy and immediacy (Short et al., 1976). Media richness theory evaluates different media on the basis of their capacities to reduce ambiguity and uncertainty – affected by medium characteristics which allow for (and to some extent regulate) information transmission (Daft & Lengel, 1984, 1986). Text-based messages are not as rich as messages adding audio-visual contents, which again are not as rich as multimedia or even virtual worlds (Kaplan & Haenlein, 2010; Van Dijk, 2012). The level of social presence and media richness is the first classification of social media (Kaplan & Haenlein, 2010). Furthermore, different media can be described on the basis of their level of self-presentation and self-disclosure (Goffman, 1959; Schau & Gilly, 2003). Individuals present themselves using different media, often aiming at a presentation mediating an image which is in line with their own identity (Kaplan & Haenlein, 2010; Spears & Lea, 1992). The level to which media allow for certain extents of self-disclosure, and therefore, individuals´ self-presentation is the second classification of social media (Kaplan & Haenlein, 2010). Figure 1 displays the classification of online social media adapted from Kaplan and Haenlein (2010, 2011).

<table>
<tr><th colspan="2" rowspan="2"></th><th colspan="3">Social presence / Media richness</th></tr>
<tr><th>Low</th><th>Medium</th><th>High</th></tr>
<tr><td rowspan="3">Self-presentation / Self-disclosure</td><td rowspan="2">High</td><td>Blogs
(e.g. personal blogs, corporate blogs)</td><td>Social networking sites
(e.g. LinkedIn, Facebook, Google+)</td><td rowspan="2">Virtual social worlds
(e.g. Second Life)</td></tr>
<tr><td colspan="2">Microblogging sites
(e.g. Twitter, Tumblr, Jaiku, Plurk)</td></tr>
<tr><td>Low</td><td>Collaborative projects
(e.g. Wikipedia, Delicious)</td><td>Content communities
(e.g. YouTube, Flickr, Instagram, Pinterest, Slideshare)</td><td>Virtual game worlds
(e.g. World of Warcraft, EverQuest)</td></tr>
</table>

Figure 1. Classification of online social media; adapted and integrated from Kaplan and Haenlein (2010, 2011); additional examples.

As Figure 1 illustrates, blogs and collaborative projects such as Wikipedia are often mostly text-based. In contrast to social networking sites and content communities, which can also contain audio-visual data, the media richness and the mediation of social presence is rather low in blogs and collaborative projects. Microblogging sites are in between low and medium richness, as they are usually text-based, but can also contain additional audio-visual data and/or links. Virtual social worlds and game worlds score highest on their richness and social presence cues. When it comes to the level of self-presentation, usually created through self-disclosure, blogs, microblogging sites, social networking sites, and virtual social worlds are considered to allow for more options to express one´s personal identity and to create an image of one´s personality. Collaborative projects are not meant for self-presentation, as they mainly focus on information or knowledge creation and exchange. Although content communities usually offer the possibility of commenting, the contents (photos, graphics, videos, slides, presentations, etc.) are central. Virtual game worlds usually propose rather strict rules for gaming, whereas virtual social worlds are more open to own interpretation and interaction between users (Kaplan & Haenlein, 2010, 2011). Based on these classifications of online social media, especially two types appear interesting for further analyses: social networking sites and microblogging sites. These online social media score high on self-presentation and self-disclosure, which makes them suitable for content analysis methods. This in combination with a medium to high score on social presence and media richness makes them useful for online social network analyses. Whereas this sub-chapter introduced the fundamental classification of online social media, the following sections 2.3.3 and 2.3.4 delineate two of these classifications in detail: social networking sites and microblogging sites.

2.3.3. Social networking sites

Based on the social media classification by Kaplan & Haenlein (2010, 2011), social networking sites appear to be an adequate choice of example for investigating social capital and online social networks. Furthermore, microblogging sites are interesting for further research. Both, social networking and microblogging sites are rather open and nowadays very popular types of social media (Kaplan & Haenlein, 2010, 2011). They allow for a high level of self-presentation and self-disclosure, which might possibly affect human communication and the expression of social relationships (Castells, 2013).

Boyd and Ellison (2007) define social networking sites as *"web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system."* (p. 211). They identified user profiles, friends lists, and browsing through these lists as central defining aspects of social networking sites. Kaplan and Haenlein (2010) proposed a similar, but more specific definition: *"Social networking sites are applications that enable users to connect by creating personal information profiles, inviting friends and colleagues to have access to those profiles, and sending e-mails and instant messages between each other. These personal profiles can include any type of information, including photos, video, audio files, and blogs."* (p. 63). This definition acknowledged the importance of communication via these social networking sites, which was not that present in Boyd´s and Ellison´s definition (2007). Both definitions focused on rather technical characteristics of social networking sites.

In a more recent evaluation, Ellison and Boyd (2013) adapted their initial definition. They still acknowledged that technical characteristics are the most visible aspects of social networking sites, but additionally, they recognized the importance of medium use in practice. Ellison and Boyd (2013) added a new dimension of communication-oriented aspects to their definition, as human communication has become easier than ever before: *"The desire to communicate and share content is a primary driver of* [social networking site] *use."* (p. 159). Furthermore, content has become more significant on social networking sites, contrary to the focus on personal profiles. Although these profiles remain important channels for self-presentation, communication and information and content sharing have become more significant. Therefore, Ellison and Boyd (2013) proposed a more detailed definition: *"A social network site is a* networked communication platform *in which participants 1) have* uniquely identifiable profiles *that consist of user-supplied content, content provided by other users, and/or system-level data; 2) can* publicly articulate connections *that can be viewed and traversed by others; and 3) can consume, produce, and/or interact with* streams of user-generated content *provided by their connections on the site."* (p. 158).

As this definition indicates, social networking sites are all about the contents and connections between users. Communication and content or information sharing are

central within a social networking site, therefore, networks of human communication via a social networking site are investigated in this research. The following sub-chapter explains why also microblogging sites are relevant for further investigation.

2.3.4. Microblogging sites

Basically, microblogging sites are internet-based applications which allow for and *"are limited to the exchange of text-based messages of 140 characters or less"* (Kaplan & Haenlein, 2011, p. 106). This may seem severely limited referring to information and knowledge sharing. Actually, microblogging sites are sited between low and medium media richness (Kaplan & Haenlein, 2010, 2011). The reason for this position is that, although the short messages are text-based, users may post links to photos, videos, or other further contents outside the microblogging site. Therefore, the actual content of a message might be the 140 characters, but can be expanded through the use of links to additional contents.

Microblogging sites also allow for a high level of self-presentation through self-disclosure. Kaplan and Haenlein (2011) ascribed ambient awareness as key characteristic to microblogging sites. Ambient awareness can be described as interpreting people´s moods, feelings, or feeling close to them by being informed about little details in people´s lives. Microblogging sites foster ambient awareness through *"the ability to tell the world what you are doing at a particular moment – in the desire to be closely connected to your loved ones, no matter where they may be physically"* (Kaplan & Haenlein, 2011, p. 107). Furthermore, ambient awareness is fostered by the fact that messages on microblogging sites usually are *"public by default"* (Kaplan & Haenlein, 2011, p. 107). This characteristic also allows for immediate sharing of the messages and spread of information if people consider the content worth it. This way, microblogging sites facilitate public information and content sharing within seconds.

Microblogging sites include a networking characteristic as well. Basically, the messages could possibly be read by anyone. Users can also select specific other users whose messages they would like to see on their main feed of the microblogging site. Then they become their followers and get automatically updated if someone they follow posts a new message. This characteristic does not at all imply that every message on microblogging sites is read by someone, even if users follow each other (Kaplan & Haenlein, 2011). This can be explained by the law of the limits to attention (Van Dijk, 2012). People´s ability to read messages is limited; especially if in principle everyone is able to send out public messages. There are technical features of microblogging sites which make it easier to differentiate these public messages, for instance, by topic.

Ellison and Boyd (2013) proposed to describe the technical features of the social medium to be investigated for any research, as they acknowledged the mutual shaping of technical features and social aspects of medium use in practice. Therefore, the following two sections highlight and describe the medium characteristics of LinkedIn and Twitter.

2.3.5. Medium characteristics of LinkedIn

LinkedIn is a social networking site for professionals. With more than 332 million registered members in more than 200 countries in 2015, LinkedIn is the largest professional network online. LinkedIn was developed in 2002 and first launched on May 5, 2003. Within the first month, the LinkedIn network consisted of 4500 members. In 2015, LinkedIn is available in more than 20 languages. More than 6000 full-time employees work in 30 offices worldwide (LinkedIn, 2015a).

LinkedIn formulated its mission as follows: *"Our mission is simple: connect the world's professionals to make them more productive and successful. When you join LinkedIn, you get access to people, jobs, news, updates, and insights that help you be great at what you do."* (LinkedIn, 2015b). One objective is, thus, to create a powerful online social network of professionals from all over the world. LinkedIn provides the facilities to create online social relationships between people, to share and update information, and to share and develop knowledge within these networks. Therefore, LinkedIn implies some kind of social capital which can be created and extended through its use. LinkedIn is a public company which offers talent solutions, marketing solutions, and premium subscriptions to achieve financial revenues (LinkedIn, 2015b, 2015c). The following sections 2.3.5.1, 2.3.5.2, and 2.3.5.3 describe three relevant medium characteristics of LinkedIn: LinkedIn profiles, connections, and groups. Furthermore, section 2.3.5.4 illustrates how communication via LinkedIn basically works.

2.3.5.1. LinkedIn profiles

LinkedIn offers so many features to its users that it is not feasible to list and describe all of them. Therefore, only basic features which were significant in the context of this research are explained. One central part of using LinkedIn is creating a *personal profile*[1]. The profile is a LinkedIn page on which the user introduces him- or herself to others. It is a means for describing one´s personality, but evenly important, one´s professional experience (LinkedIn, 2015d). The profile contains the name (preferably the real name, no alias), a photo, and contact information, information about a user´s education, career, and interests. As LinkedIn claims a professional context, also recommendations, certifications, publications, and additional information can be added to a profile. Furthermore, users can explain their experience and career objectives, or their ambitions regarding a new job (LinkedIn, 2015e). All in all, a personal profile can be filled with professional and personal information; therefore, it is a means for self-presentation, which is central in the definition of a social networking site. Not all information must be publicly visible. There is a reduced version of the personal profile, which is called the public profile (LinkedIn,

[1] The business equivalence of a personal profile is a *company page*. Companies can create business profiles and present their objectives. Via these pages, companies can engage and interact with their followers (users who subscribe to a company´s news to see it on their LinkedIn feed on the homepage). Companies can present career opportunities and offer jobs via their pages (https://help.linkedin.com/app/answers/detail/a_id/ 28406/kw/overview+company+pages).

2015f). This public profile may show up in search engine results, but may also be customized, or even disabled. LinkedIn offers many privacy settings to their users to determine which information of the personal profile is visible to whom, and users might even hide all information to others who are no direct contacts (LinkedIn, 2015g). This way, LinkedIn offers privacy enhancing features.

2.3.5.2. LinkedIn connections

As LinkedIn is a social networking site, users can create networks by connecting to other users. LinkedIn described the basic type of *connection* as 1st-degree contact (LinkedIn, 2015h). This means that users are directly and consciously related to each other, as someone has invited someone else, and this invitation has been accepted by the other one. It is assumed that 1st-degree connections might be the online equivalence of existing offline relationships. Via LinkedIn, users have also an extended network of connections. A personal network on LinkedIn is considered as 1st- degree, 2nd-degree, 3rd-degree connections, and fellow members. Other LinkedIn users are considered as out of the network (LinkedIn, 2015i). As mentioned before, 1st-degree connections are direct contacts who mutually accept each other´s invitation. Additionally, 2nd-degree connections are contacts who are directly connected to one´s 1st-degree connections, whereas 3rd-degree connections are contacts who are connected to one´s 2nd-degree connections. Connections with a higher degree than 3 are not included in a personal LinkedIn network, at least following the definition by LinkedIn (LinkedIn, 2015i). Furthermore, LinkedIn users, who are members of the same LinkedIn group, are also considered as fellow network members. Users can opt for different settings for who may be able to see their list of connections (LinkedIn, 2015j). Only 1st-degree connections can see each other´s connections lists by default. For the rest of the LinkedIn members, this may not be the case.

2.3.5.3. LinkedIn groups

As indicated earlier, LinkedIn offers a *group* feature. LinkedIn groups can basically be created by any LinkedIn member. They are created for different purposes, for instance, for finding other members who are interested in similar topics, for sharing information and creating discussions about specific interests. Groups can be used as facilitators for finding new contacts, jobs, or for communicating about whatever users want to talk about (LinkedIn, 2015k). There are groups which are created by activists, citizens who are socially engaged, or professionals who are searching for information, knowledge, or problem solutions. Therefore, LinkedIn groups are an appropriate tool for LinkedIn users trying to create social capital for pursuing a common objective. LinkedIn uses an algorithm for suggesting groups users might be interested in. This algorithm is based on the information the user provides through his or her profile, or by actions, such as joining specific other groups. There are two different types of LinkedIn groups (LinkedIn, 2015l). On the one hand, there are members-only groups. Discussions in these groups are only

visible for group members and not publicly accessible through an online search query. On the other hand, open groups are basically open to any LinkedIn member. Discussions of these groups are visible to anyone and can also be found by web searches. Furthermore, discussions can be shared by using other social media, such as Facebook or Twitter.

2.3.5.4. Communication on LinkedIn

LinkedIn offers several features for creating and sharing content. Users can share updates, links, or posts by others or companies. People in their network can see these updates directly in their LinkedIn feeds. Another way to create content on LinkedIn is starting a *discussion* in a group (LinkedIn, 2015m). The term "discussion" implies the desire to get feedback, or reactions from others. By starting a discussion, users may share information, pose questions, or introduce specific problems to the group. Initial contributions of a discussion are *posts*. Others can react to these posts by adding *comments* or *likes* (LinkedIn, 2015n, 2015o). Comments are mostly text-based and can contain further information, personal opinions, experiences, or supporting or activating contents. Likes are created by clicking a button next to a post or comment. A like indicates that a post or comment is interesting (LinkedIn, 2015o). If someone likes a post or comment, he or she thinks that said contribution is somehow valuable and worthwhile reacting to. The same applies for a comment, albeit adding a comment is more demanding. Reading a post, thinking about it and actually reacting to it by typing a comment claims more effort than clicking on a button for a simple like.

LinkedIn is capable of sharing more than just text messages. People can form own networks and unite in a group to share information and built up a socially oriented knowledge network. People meet in this group, can exchange data, audio-visual media, or just follow the discussions in this group (Kaplan & Haenlein, 2010; Van Dijk, 2012). That way, the character of the LinkedIn group is of a more collective than individual nature (Castells, 2012; Shirky, 2008, 2010). The following sub-chapter shifts the focus to the microblogging site Twitter. It describes basic medium characteristics of Twitter and is similarly structured as this particular sub-chapter about LinkedIn.

2.3.6. Medium characteristics of Twitter

Twitter is one of the most popular microblogging sites online. Twitter was developed and launched in March 2006. The very first tweet was sent out on March 21, 2006. About one year after its first launch, Twitter became a separate company, Twitter, Inc., in April 2007 (Twitter, Inc., 2015a). Microblogs are messages which consist of 140 characters and are mostly text-based. On Twitter, these messages are called tweets. Twitter is considered as an information networking tool (Twitter, Inc., 2014a).

The real value of Twitter, as described by Twitter, Inc. (2014a), lies in reading tweets and consuming the latest news and information in real-time. Another important way to use Twitter is to tweet own messages, and to spread interesting tweets from other sources. About 500 million tweets are posted a day, by about 288 million active Twitter

members (Twitter, Inc., 2015b). About 3600 employees work for Twitter in 12 U.S. offices and 19 international offices. Twitter is available in 33 languages (Twitter, Inc., 2015b).

Twitter described its mission as follows: *"Our mission: To give everyone the power to create and share ideas and information instantly, without barriers."* (Twitter, Inc., 2015b). Although this is a rather short mission statement, it captures the essence of Twitter. Twitter is a microblogging site which is meant to be an information network tool. It is a fast and rather open social medium. Although microblogs are mostly text-based short messages, Twitter offers several features which add additional value to it. These features are presented in the following sections. In the following sections 2.3.6.1, 2.3.6.2, and 2.3.6.3, three relevant medium characteristics of Twitter: Twitter profiles, hashtags, and following on Twitter. Section 2.3.6.4 explains how communication on Twitter works.

2.3.6.1. Twitter profile

As with other social media, Twitter users can create their *personal profiles*[2]. These profiles contain a profile and a header photo, the username, and additional biographical information within a limit of 160 characters or less (Twitter, Inc., 2014b). The *username* is preceded by an @ sign (e.g. @username) which functions as a hyperlink to the user profile (Twitter, Inc., 2014c). Furthermore, the @ sign can be used to address tweets to a specific other user. Twitter users can also add a location and a personal website link to their profiles (Twitter, Inc., 2014b). Via their profiles, Twitter users can post own *tweets*, which are then immediately sent out to the world. Tweets are publicly visible by default unless the Twitter user explicitly decides to protect his or her tweets. In this case, tweets are only visible to approved users (Twitter, Inc., 2014d). Otherwise, tweets may appear on Twitter timelines, or even on public websites, blogs, or search engine results. Tweets may contain additional information, photos, videos, or links (Twitter, Inc., 2014c).

2.3.6.2. Twitter hashtag

A *hashtag* on Twitter is characterized by a # sign preceding a word or phrase (Twitter, Inc., 2014c). A hashtag functions as a hyperlink which links every tweet containing that specific hashtag. Hashtags can be keywords or phrases referring to a specific topic. Therefore, hashtags are widely used to mark tweets belonging to the same topic or interest (Twitter, Inc., 2014e). If picked out carefully, a hashtag helps identifying different tweets and categorizing them. There are ways to create useful hashtags, e.g. by using a topic-specific keyword or phrase which clearly identifies a topic. Hashtags with ambiguous meanings are not useful if one aims at traceable topic-related tweets. It may help introducing an entirely new hashtag, e.g. distinct abbreviations, if simpler hashtags produce too much irrelevant contents on a Twitter search. A hashtag can be used to

[2] Twitter does not explicitly differentiate between personal and business profiles. Basically, any individual, group, initiative, association, or corporation can create a Twitter account and communicate with their stakeholders. There are some techniques Twitter suggests for business use (https://business.twitter.com/).

bundle several tweets under one topic, so that others can easily find these tweets in a Twitter *search* (Twitter, Inc., 2014f), or by clicking on the hyperlink of the hashtag.

Twitter has become one microblogging site which is also used for social good (Twitter, Inc., 2015c). Organizations, nonprofit institutions, and social initiatives use Twitter to build and expand their audiences. Twitter makes it easy to spread the news immediately and to publicly communicate and engage with their followers. Hashtags can help finding the relevant tweets of a conversation. For instance, in live-tweeting sessions, or with questions, smartly picked hashtags are used to channel all relevant tweets under one topic (Twitter, Inc., 2015d).

2.3.6.3. Twitter following

If users find the tweets of other users interesting or valuable, they can subscribe to their tweets. This subscription is called *following* (Twitter, Inc., 2014g). Following someone on Twitter means that tweets and updates by this account show up on the Twitter user´s *timeline* (Twitter, Inc., 2014h). Furthermore, *direct messages* can be exchanged if users follow each other (Twitter, Inc., 2014c). Twitter users can see others who follow them, and the users they follow. One thing to mention is that following someone is not per se mutual (Twitter, Inc., 2014g). Users can decide to follow someone, but that person does not have to follow them back. This way, the relationship to a follower is not the same as, for instance, a direct connection on LinkedIn. Hennig et al. (2012) described an example by Huberman, Romero, and Wu (2009) who stated that a relationship called friendship is different on Twitter than on other social media sites. This kind of relationship would rather be created by direct communication than by just following someone. There are different ways users can directly communicate with each other, which are described in the following section.

2.3.6.4. Communication on Twitter

If Twitter users like what they see on their timelines, they can decide to share a tweet with their followers. They can easily re-post such a tweet which is then called a *retweet* (Twitter, Inc., 2014c, 2014i). Retweets are often used to spread interesting contents to followers. These contents can be news, updates, events, or just subjectively valuable expressions. Twitter is very open and encourages retweets, unless tweets are protected from being publicly available (Twitter, Inc., 2014i). Furthermore, users can add their own contents to a retweet if the limit of 140 characters is not exceeded. They can personalize initial tweets and send out the new version without losing the original content.

A more direct way to communicate with other Twitter users is a *mention* (Twitter, Inc., 2014c, 2014j). Mentions are tweets including one or more usernames preceded by the @ sign. These mentions are directed to the specific user who gets a special notification if someone mentioned him or her in a tweet. By mentioning someone in a tweet, Twitter users may start a conversation. Another way to direct a tweet to a specific Twitter user is to *reply* to one of his or her tweets (Twitter, Inc., 2014j). This reply feature

allows users to contribute to a conversation by reacting to tweets directly referring to them. It offers a feedback or comment function.

These features enable online communication on Twitter, and although tweets are basically limited, additional information and content can be added, linked, and spread easily. Twitter offers several features which foster rapid information sharing and immediate updates. Users are free to follow whomever they want to and to actively contribute to conversations about different topics. Therefore, the barriers for online communication via Twitter are rather low. In comparison to LinkedIn, for instance, it is easier to search and find interesting contents, news, and up-to-date information on Twitter. Actually, one does not even have to have a Twitter account, as most tweets are public by default.

2.3.7. Medium choice

To be able to investigate how people use different media, especially online social media, it is important to gain at least basic knowledge about why people choose specific media for their purposes. Therefore, this sub-chapter introduces fundamental theory about medium choice. As stated earlier in this chapter, rather objective approaches to medium use cannot adequately explain how people subjectively interpret and actually use different media, these approaches are also not sufficient for explaining medium choice (Pieterson, 2009; Pieterson & Van Dijk, 2007). Medium choice is dependent on more than just rational decisions based on medium characteristics. Research showed that the fit between the task to be accomplished and the channel characteristics may not be the initial starting point for choosing a specific medium (Pieterson, 2009). Instead, there may be situational or emotional constraints which could influence medium choice. Furthermore, personal characteristics could affect decision making when it comes to using a specific medium.

Research indicated that the decision making process of choosing a medium often relies on habits (Aarts & Dijksterhuis, 2000; Aarts, Verplanken & Knipppenberg, 1998). Pieterson (2009) elaborated a model in which habit is shown to be the first step if people choose a specific medium to contact governmental institutions. This mostly happens without conscious rational elaboration but more out of usual behavior. Habit is, thus, one important factor influencing medium choice. If tasks become more complex or ambiguous, people take a second step and follow more rational decisions in choosing a specific medium (Pieterson & Van Dijk, 2007). This section summarized basic scientific information about the decision making process in medium choice. As this thesis aimed to investigate online social media networks by means of a case study, is has to be noted that the decision for choosing and using a specific medium has already been made by the citizens´ initiative. Therefore, this particular section closes the theoretical foundation of sub-chapter 2.3. The next sub-chapter 2.4 bridges the gap between the scientific information provided about social capital and online social media. The following sections translate the literature presented above into the context of online social media networks.

2.4. Social capital in the era of online social media

This sub-chapter establishes the connection between the sub-chapters about the network theory and social capital theory (see sub-chapters 2.1 and 2.2) and especially integrates these theories into the context of online social media (see sub-chapter 2.3). Therefore, this sub-chapter links all relevant theoretical background of this research. In this way, it is another important step towards an accurate conceptualization of social capital in this research.

As the review of social capital literature indicated, social capital is a crucial factor facilitating people to work collectively in their networks (Poortinga, 2012; Woolcock & Narayan, 2000). Networks of individuals create social capital to act collectively for a shared social goal. Most of the social capital theory was developed on the basis of offline social networks. The creation of social capital relies on real world relationships and networks do take form as people meet and talk to each other. The challenge is to translate the creation of social capital also into online social networks. The internet and online social media are supposed to have effect on people´s sociability (Van Dijk, 2012). Internet use enhances this sociability by increasing social capital and strengthening offline relationships (Boase, Horrigan, Wellman, & Rainie, 2006; Katz & Rice, 2002; Quan-Haase, Wellman, Witte, & Hampton, 2002). Online social media help to maintain existing social relationships (Lenhart, 2009; Van Deursen & Van Dijk, 2010).

If one considers social capital in an online social network context, social relationships between individuals are digital, but can also create networks in the sense that people interact with each other through online communication. Online relationships do not explicitly mean that people have to know each other in real life (Brunsting & Postmes, 2002; Sassenberg & Postmes, 2002). People can increase their numbers of social contacts via the internet and they create new social relationships online (Van Deursen & Van Dijk, 2010). Thus, internet use may enhance the creation of weak ties (Parks, 2010). An important aspect to mention is that internet use is more likely to create more social contacts for individuals who already do have many contacts than for individuals with fewer contacts (Cummings, Butler & Kraut, 2002; Robinson, DiMaggio & Hargittai, 2003; Van Dijk, 2005). One can explain this by referencing the power law of the web (Van Dijk, 2012). Numbers of social contacts then follow a power law distribution, meaning that those with many contacts get even more, while others do not. As this section shows, there are aspects which the researcher had to consider in this design study. The context of online social media, for instance, indicates a difference in the nature of relationships. These are digital and have to be clearly defined before the implementation of measurement techniques. Relationships in online social networks are created through communication online. The following sections focus on this particular topic and they furthermore illustrate in how far communication facilitates knowledge sharing in online social media networks. Information, expertise, and knowledge are important resources which can be accessed through online social networks.

2.4.1. Communicating via online social media

This section delineates the importance of communication for the creation of social capital. This becomes even more relevant in the context of online social networks, as communication basically creates the relationships between individuals online. As Bohn et al. (2014) put it: *"Social capital consists in the exchange of knowledge, trends, ideas, news, and opinions. As opposed to economic capital (money and goods) that is exchanged by means of physical transportation or bank transfers, social capital is exchanged through communication."* (p. 30). Therefore, communication is a crucial factor for building social capital – whether it is offline communication or online communication. People can choose different media channels for communicating with each other to pursue a shared social goal. Different medium characteristics can facilitate communication over long distances, independent of specific time frames (Van Dijk, 2012).

Computer-mediated communication can change how people communicate with each other. It can also influence social networks (Fulk & Collins-Jarvis, 2001). Communication via these online social media does not necessarily have to be formal, most of the information is shared informally (Shumate & Lipp, 2008). There is a shift from vertical communication flows to more horizontal and bottom-up communication flows in online social networking sites (Shirky, 2008, 2010; Van Dijk, 2012). Social movements can take place more easily and are not managed by organizations, but organized by groups of people. The threshold to build and extend networks of people and to form groups which share a common goal has become very low. The barriers which prevented people from forming groups are gone (Castells, 2012; Shirky, 2008). Furthermore, the costs of building and maintaining networks via online social media are almost not worth mentioning at all. Basically, everyone can contribute to the conversation in online social networking sites, without high efforts. The next section illustrates in how far information and knowledge sharing are facilitated through the use of online social media.

2.4.2. Knowledge sharing via online social media

Engagements in online social networks are considered as internet supported actions (Van Laer & Van Aelst, 2010); activities are facilitated through the use of online social media tools. Van Dijk (2012) described social media as a means to network individualization, meaning that individuals are becoming the most important nodes within the network society. Online social media are socially oriented and offer the possibility to share contents. These contents can be text messages, photos, videos, music, and so on. Furthermore, people can send information or create knowledge networks via online social media.

Chang and Chuang (2011) found that individual motivation encourages people to share their knowledge in communities. In the structural dimension of social capital, social interaction motivates people to share their knowledge in communities, as well as trust, identification, and reciprocity does in the relational dimension and a shared language

does in the cognitive dimension. It is likely that people participate in knowledge sharing if the perceived benefit is exceeding the shared information, experiences, and theory (Chang & Chuang, 2011).

There are cases in which people start using these online social media differently from what developers might have anticipated. Technical developments and adaptations enhance human communication via these tools (Van Dijk, 2012). By choosing a specific online social networking tool, for instance, LinkedIn or Twitter, communication is bound within the medium characteristics of these tools. These were described earlier in sub-chapters 2.3.5 and 2.3.6. The following sub-chapter 2.5 proposes a conceptualization for social capital in this research developed from adapting and integrating the theoretical background presented up to this particular section.

2.5. Conceptualization of social capital in this research

This sub-chapter is the conclusion of this first step towards measuring social capital in online social media networks. It answers the first sub-question of this research: *What is an accurate conceptualization of "social capital" in online social media networks?* The integration of the introductory social capital theory and the online social media theory presented in previous chapters was the basis of the operationalization of social capital in this research. This section summarizes the characterizing aspects of social capital which most definitions have in common, and puts them in the context of online social media. One crucial aspect of social capital relies on social relationships. In the offline context, these relationships may be with family members, friends, colleagues, acquaintances, etc., basically all different kinds of social contact could create a relationship between two individuals. The stronger this relationship and the closer the connection between these individuals are, the higher the potential competitive advantage is estimated (Burt, 2000; Granovetter, 2005). Relationships which are not that strong or close can create social capital as well (Granovetter, 1983; Grootaert et al., 2004; Woolcock, 2010; Woolcock & Narayan, 2000).

This remains valid in the context of online social media. The essential difference lies in the definition of relationships. Whereas most direct offline relationships are created face-to-face, online relationships do not have to be built in person (Brunsting & Postmes, 2002; Sassenberg & Postmes, 2002). This also influences the way "friendship" relationships are defined online. Online connections between individuals are digital. For instance, creating a mutual connection on LinkedIn can be identified as such a digital connection. Following someone on Twitter is slightly different from connecting to someone on LinkedIn, as this follower relationship does not have to be mutual. It becomes similar if the other user follows back. Both types of relationships do not per se have to exist offline. Online social media are rather open and widely available communication and networking tools, which make connecting to others very easy.

What appears to be even more important than these friendship or follower type connections between individuals, are the relationships created through online

communication (Huberman et al., 2009). Bohn et al. (2014) identified communication as crucial factor for building social capital. Knowledge, ideas, news, or opinions are exchanged through communication. This might be even more important in an online social media network, as communication expressed through mostly text-based messages is the most apparent human interaction in this context. The advantage of online relationships is that these are clearly expressed through communication. For the first time, the intangible concept of social capital becomes actually visible. Online social relationships, however, merely rely on what is actually expressed online. The difference between these online relationships and offline relationships is that people can interact and create social relationships through more than just explicit communication offline. In this way, offline social relationships may have a greater value as to implicit emotional or situational direct communication. In both contexts, communication can open new ways to access potential or actual resources which might ultimately facilitate coordinated actions for pursuing a commonly shared goal. In online social media contexts, explicit communication is the only way to create online social relationships, and is therefore, the only actually measurable variable of social capital.

In an online environment, resources would have to be limited to resources which are actually available online. In an online social network, information and knowledge are very important resources (Chang & Chuang, 2011; Van Laer & Van Aelst, 2010). Access to this kind of resources is gained through online communication. Furthermore, there are objectives which can actually be achieved online. One objective could be to spread news and information about societal projects which do actually take place offline. This way, communication in online social media networks would fulfill an agenda-setting function (McCombs & Shaw, 1972). Online social media can, therefore, be used as tools for creating public awareness and for drawing attention to important societal topics. They can be used to communicate the importance of collaboration and collective action (Brunsting & Postmes, 2002; Castells, 2012; Shirky, 2008, 2010). With all this in mind, the researcher proposed the following conceptualization of social capital in online social media networks:

Social capital in online social media networks is considered as the power of online social relationships built through online communication and the additional value online social networks offer to individuals within these networks, for whole or sub-networks, and between networks.

Within this conceptualization, the following presuppositions applied: online social media are platforms for the creation of social capital. They facilitate online social networking and the creation of online social structures. These structures consist of digital connections between individuals. Social relationships within these online social networks are built through online communication. The value of online social networks is the potential competitive advantage they offer to individuals within these networks, for whole or

sub-networks, and between networks. Medium characteristics of online social media facilitate online communication between individuals and provide, thus, access to resources as information and knowledge. Online communication can be used for agenda-setting purposes, knowledge sharing, and activating individuals to collaborate and work collectively for a shared social goal.

In this way, social capital in online social media networks could be considered as mediating variable which can be created through the use of online social media and which facilitates the access to information and knowledge resources. Ultimately, social capital could foster collaboration for a shared social purpose. This last section of Chapter 2 sums up the first step towards measuring social capital in online social media networks. It provided a conceptualization of social capital which is operationalized throughout this design study. The following Chapter 3 introduces current measurement methods for social capital.

3. Current measurement methods for social capital

Chapter 3 describes current research methods for measuring social capital in social networks and bridges the gap between offline and online data analysis methods. It is a fundamental introduction to provide an overview of scientific methods for measuring social capital in general. The actual implementation of the methods, the evaluation of the findings, and the reflection on the methods used in the case study are presented in subsequent Chapters 4, 5, and 6. This particular chapter is divided into three parts. The first part introduces the online social network analysis. The second part describes an analysis method of network triad configurations. The third and last part of Chapter 3 closes with an introduction to content analysis.

3.1. Measuring social capital in online social media networks

The last section of Chapter 2 proposed an adapted and integrated conceptualization of social capital in online social media networks for this and potential future researches. This section focuses on the methodological challenges for measuring the social capital. There are different measurement methods to explore social capital and active or passive methods of data collection (Hennig et al., 2012). These methods make use of different sources, such as surveys, questionnaires, or interviews (Fowler, 2009; Marsden, 2005). Those methods are mostly based on recall studies, which makes them sensitive to biased recall, accuracy, and subjectivity (Borgatti & Molina, 2003; Hennig et al., 2012). Archives can also be sources of research data (Hennig et al., 2012; Huberman et al., 2009; Mintz & Schwartz, 1985). Furthermore, observation can be useful in gathering research data for the investigation of social capital. Whereas field observation and direct observation are often time-consuming and executed with an extensive effort, an observation of electronic communication tools can contribute to the analysis of digital traces (Bernard, 2011; Hennig et al., 2012; McCurdy, Spradley & Shandy, 2005). The advantage of observing electronic communication tools is that there are mostly many data immediately available. Furthermore, these data can be collected with less effort and are above all less sensitive to recall bias and subjectivity. All in all, data from electronic communication sources can be more accurate than active data collection through surveys or interviews. Research data were derived from the online social media sites LinkedIn and Twitter. Therefore, data collection was conducted passively through observation of electronic communication tools.

For the analysis of the online social network data, a triangulation of different analysis methods appeared reasonable and feasible, including both quantitative and a more qualitative analysis methods (Rothbauer, 2008). The following sub-chapters 3.1.1, 3.1.2, and 3.1.3 provide general fundamental information about three current measurement techniques for social capital: online social network analysis method, analysis method of network triad configurations, and content analysis method.

3.1.1. Online social network analysis method

The first quantitative analysis method to be evaluated was a thorough online social network analysis. This method provides insight into the structure and the development of the networks. Relationships between individuals are analyzed and significant individuals within the online social networks are identified (Hennig et al., 2012). There are software tools to support data analyses. Several statistics, filters, and layouts help to understand the online social network structures. There are general network metrics which indicate the overall network structures, or focus on sub-networks in comparison to the entire network. Edge metrics focus on the path lengths of the edges between individual nodes and indicate the distance of relationships. And finally, there are node metrics which investigate the characteristics and indicate the importance of individual nodes within the network. Filters help to focus on sub-networks, and layout settings help to visualize the social networks. The following sections illustrate conventional measurement techniques of online social network analysis, including common statistics, filters, and layouts.

3.1.1.1. Statistics

Statistical online social network measures can indicate the structure of a network. Specific metrics can be used as indicators for measuring social capital in social networks. These statistical measures have mainly been applied to offline social networks. Within this research, these statistics were used to describe online social networks. From this perspective, they were computed and evaluated as indicators for measuring social capital. The following sections introduce existing indicators and describe potential practical interpretations of these indicators based on former research. First, general network metrics are delineated, then, more specific edge and node metrics are described. These are commonly used statistical indicators for analyzing social networks.

General network metrics

The *graph density* describes the actual network compared to the complete network, which would have all possible edges. A complete network has a density equal to 1 (Gephi, 2011a; Heymann, n.d.). Hennig et al. (2012) define graph density *"as the ratio of the number of edges to the number of dyads, i.e., the ratio of the number of actual to possible edges.*" (p. 118). The denser a graph is, the faster (potential) information spread in the network, as more communication relationships among nodes exist.

The *modularity* detects communities within a network (Blondel, Guillaume, Lambiotte & Lefebvre, 2008; Gephi, 2011b; Heymann, n.d.). A high modularity score is an indicator for an advanced internal community structure of the network. It describes the division of the network into sub-networks which might also be present in the offline world (Blondel et al., 2008; Newman, 2006). In how far this is the case, would have to be investigated in further research. It is not part of this particular research to test this proposition. The modularity basically shows the fraction of edges of the sub-networks

minus the expected fraction of a random edge distribution (Newman, 2006)[3]. A high score on modularity means there are dense connections between nodes of a sub-network which only share sparse connections with nodes of other sub-networks. A high modularity score does not per se imply a high number of sub-networks (Blondel et al., 2008; Lambiotte, Delvenne & Barahona, 2009).

The measure of *connected components* identifies sub-graphs in which all nodes are connected through a path and which are not connected to other sub-graphs (Heymann, n.d.). The algorithm developed by Tarjan (1972) is able to identify strongly and weakly connected components in directed networks (Gephi, 2011c).

Finally, within the general network metrics, the *diameter* of the graph shows the maximal "*distance between all pairs of nodes*" (Heymann, n.d., p. 15; Brandes, 2001; Gephi, 2011d). Hennig et al. (2012) define a graph´s diameter as "*the longest shortest path of any dyad*" (p.143). The smaller the network diameter is, the faster information (potentially) reaches the farthest node over the longest distance via the shortest paths.

Edge metrics

The edge metric of the *(average) path lengths* describes the (average) distance between all pairs of nodes, with connected nodes having a distance equal to 1 (Brandes, 2001; Gephi, 2011e; Heymann, n.d.). The measure of path lengths is the basis for the diameter metric as well as node centrality measures of betweenness centrality and closeness centrality.

Node metrics

Freeman (1979) provided a conceptual framework for *centrality* measures. In general, centrality metrics are supposed to indicate the structural importance of individuals within the network (Hennig et al., 2012). They are to "*express a structural advantage, importance, or dominance*" (Hennig et al., 2012, p. 124). One could refer to absolute values to describe how important one node is within a network of a specific size. One disadvantage of absolute values is that they depend on a network´s size and make it difficult to compare two networks of different sizes. If such a comparison is a research objective, centrality measures can be normalized [0,1]. Then, each centrality value is divided by the sum of all centrality values of that network. This approach provides relative scores which can be compared across different networks (Hennig et al., 2012).

A node´s *degree* is described by the number of adjacent edges (Gephi, 2011f; Heymann, n.d.; Kadushin, 2012). In-degree represents incoming edges, whereas out-degree shows outgoing edges of a node. The degrees are supposed to be an indicator of an individual´s activity or involvement. Therefore, degree is evaluated as a measure for centrality, as activity and involvement might express a structural advantage (Hennig et al., 2012). Important individuals in a social network can be identified based on their degrees.

[3] For the detailed mathematical definition of modularity, see also Hennig et al. (2012, p. 133f.).

The *betweenness centrality* shows the number of times "*a node appears on shortest paths between nodes in the network*" (Heymann, n.d., p. 16; Brandes, 2001; Brandes, 2008; Gephi, 2011g; Kadushin, 2012). Freeman (1977) introduced betweenness centrality as an indicator for the control of an individual over the communication flow within the network (Newman, 2005).

Closeness centrality measures "*the average distance from a given node to all other nodes in the network*" (Heymann, n.d., p. 16; Brandes 2001; Brandes 2008; Gephi, 2011h; Kadushin, 2012; Sabidussi, 1966). Closeness centrality is supposed to indicate how long it will take to disseminate information from a given node to all other nodes (Newman, 2005).

The *eccentricity* measure is a by-product of the centrality measures based on path distance. Node eccentricity shows the maximal distance from a given node to the farthest node from it in the network.

The *eigenvector centrality* metric assigns a score indicating importance to nodes, based on their connections to other nodes of importance (Gephi, 2011i). Eigenvector centrality increases as the node is connected to other central nodes (Heymann, n.d.).

The *clustering coefficient* of a node indicates how complete its neighborhood is (Gephi, 2011j; Heymann, n.d.). The algorithm was developed by Latapy (2008) and was based on theory by Watts and Strogatz (1998) who used this measure to identify small-world networks. The clustering coefficient indicates the integration of a node into the structure surrounding it, and thus, indicates the level of cohesion on the node level (Hennig et al., 2012). The average clustering coefficient applies to the entire network and is defined by the mean value of individual coefficients (Latapy, 2008).

3.1.1.2. Layouts

In online social network analysis, it is useful to visualize these networks for further investigation. A visualization of online social networks can illustrate underlying structural patterns within the network. In graph visualization tools, there are many different layout settings to create a readable graph (Bastian et al., 2009). For instance, the *Force-Atlas 2* layout is a force-directed algorithm which calculates nodes´ repulsion on the basis of a Barnes-Hut calculation (Barnes & Hut, 1986; Heymann, n.d.). This layout allows for preventing overlap of nodes and adjusting node sizes and colors based on different node metrics, such as degree, modularity class, or centrality measures. Edges can be adjusted by size and color as well. Furthermore, nodes and edges can be labeled, and label overlap can be ruled out.

3.1.1.3. Filters

For more detailed investigations of, for instance, underlying structural patterns of online social networks, it is also practical to create sub-networks for focusing on specific characteristics of these sub-networks. Different filters are available to produce sub-graphs of the network, which allows for a more in-depth analysis of those sub-graphs

(Bastian et al., 2009; Heymann, n.d.). For instance, ego-networks can be created to analyze sub-networks referring to important individuals within the complete online social networks. There are filters to help understand the development of an online social network in time. Furthermore, more filters and various possibilities to highlight specific sub-networks can be used based on many different network characteristics (Bastian et al., 2009; Heymann, n.d.). As these sections showed, online social network analysis is an appropriate research method for investigating the overall and more specific structures of online social networks. Within this research method, there are many options for researchers to focus on different levels of these networks, from the macro level of analyses of whole networks, via meso levels of analyses as to sub-networks, to the micro level of analyses regarding individuals. When it comes to identify more specific underlying relationship patterns of online social networks, another method is commonly used: the triad census. The triad census method is a social network analysis method which adds supplemental findings to the analyses illustrated in this sub-chapter. The next sub-chapter introduces this method in further detail.

3.1.2. Analysis method of network triad configurations

A complementary quantitative network analysis method to be evaluated is the analysis of triads within the networks (Davis & Leinhardt, 1972; Hennig et al., 2012; Holland & Leinhardt, 1970; Holland & Leinhardt, 1976; Kadushin, 2012; Wasserman & Faust, 1994). This research method relies on social network analysis and supplements those analyses with a more specific view on the smallest possible networks, the triads. The triad census investigates the underlying relationship patterns of the smallest possible sub-networks, consisting of three nodes. As relationships in online social networks are built through communication, the triad census method basically investigates communication patterns. By analyzing all different constellations of three nodes within the entire social network, it is investigated how information is distributed within the network via different routes of directed relationships.

Possible LinkedIn relationships are likes and comments on a post. As with commenting on someone´s post on LinkedIn, questions are answered, or extra information is added to the discussions. For Twitter, the relationships are defined as, for instance, mentioning someone in a tweet, replying to tweets, or spreading tweets of others by retweeting them. This way, information is distributed via different directed relationship routes as well.

The triad census analysis might, thus, indicate underlying communication patterns of the networks. Therefore, the different triad configurations can function as additional indicators for measuring social capital in online social networks. It is a social network analysis method which complements the analyses described in sub-chapter 3.1.1. The following sections describe how the triad census emerged from the dyad census – the basic analysis of a relationship between two nodes – and how it developed to the basic analysis of the smallest possible networks consisting of three nodes.

3.1.2.1. Dyad census

A constellation of two nodes in a directed network is called a dyad (Davis & Leinhardt, 1972; Holland & Leinhardt, 1970). Basically, there are four possible connections between two nodes (Kadushin, 2012). First, the two nodes do not share any relationship, thus, they are not connected at all (null dyad). Second, node A has one direct relationship with node B, and third, vice versa (both are asymmetric dyads). Fourth, both nodes A and B are mutually connected to each other (mutual dyad) (Hennig et al., 2012; Kadushin, 2012). Table 1 describes the possible relationships mentioned above:

Table 1

Dyad configurations in directed networks

Dyad configuration	Graphical expression
Null dyad	o o A B
Asymmetric dyad	o → o A B
Asymmetric dyad	o ← o A B
Mutual dyad	o ⇄ o A B

It is important to understand these relationships as basic elements of network analysis. The dyad census, developed by Davis and Leinhardt (1972) and Holland and Leinhardt (1970) basically counts the different dyad configurations of a directed graph. It assigns three values for the frequencies of mutual, asymmetric, and null dyads. The following section illustrates the next level of analysis, the triad census.

3.1.2.2. Triad census

Within the triad census, constellations of three nodes are investigated. The smallest possible network actually contains at least three nodes (Hennig et al., 2012; Kadushin, 2012; Van Dijk, 2012). Such a small network can be considered as a possible starting point of a society. A constellation of three nodes within a network is called a triad (Davis & Leinhardt, 1972; Holland & Leinhardt, 1970; Holland & Leinhardt, 1976; Wasserman & Faust, 1994). In the triad census, the different triad configurations of a directed graph are counted. The frequencies of the different triads might indicate global structures in the network (Kadushin, 2012). When it comes to the possible relationships between three nodes in a directed graph, it becomes more differentiated. In fact, there are 16 possible configurations of triads. These triad configurations are presented in Figure 2.

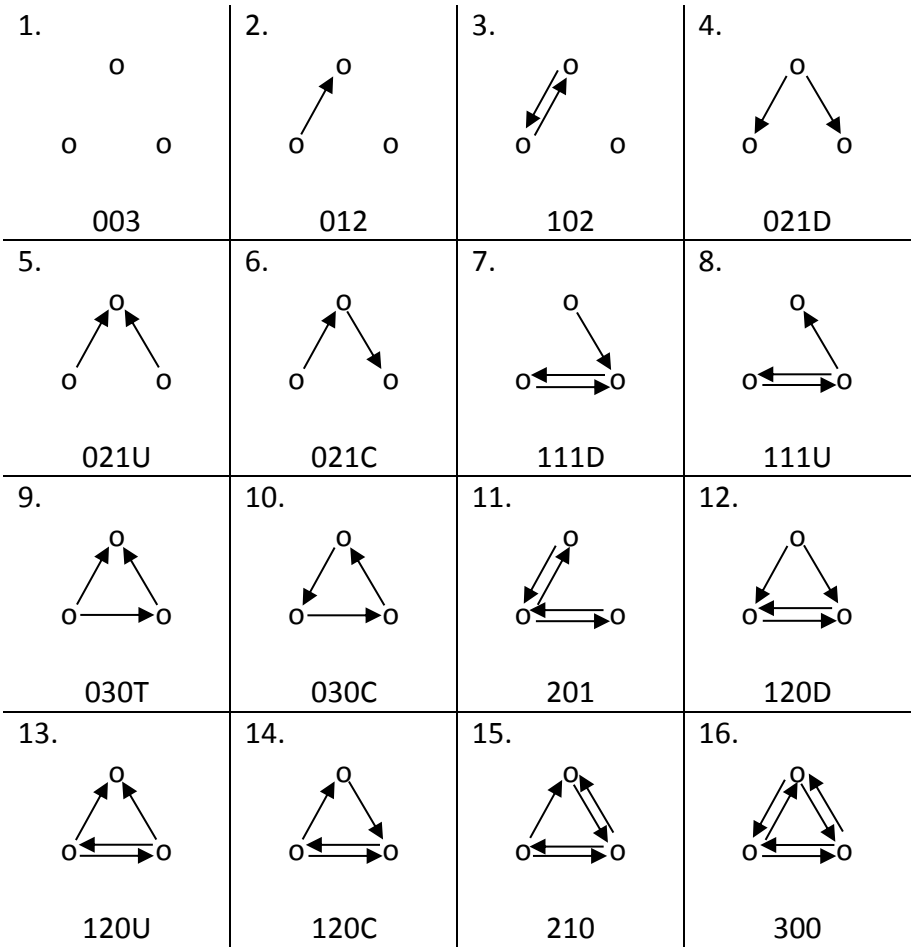

Figure 2. Triad configurations in directed networks; adapted from Davis and Leinhardt (1972), and Holland and Leinhardt (1976).

The configurations are named based on their numbers of "Mutual", "Asymmetric", and "Null" dyads (MAN). The first triad configuration 003, thus, contains three null dyads, and no mutual and asymmetric dyads. This can also be called an empty triad (Davis & Leinhardt, 1972). In a network which is not complete (which does not have all possible edges) and which does not show a high density, empty triads are likely to represent a high percentage of all triads counted. The letters in the configuration names indicate differences between triads which have identical numbers of MAN dyads (Hennig et al., 2012; Kadushin, 2012). Take, for example, triads 7 and 8. Both triads each have one mutual, one asymmetric, and one null dyad. Their difference lies in the direction of the asymmetric dyads. One is directed downwards (see triad 7) and the other one is directed upwards (see triad 8). Take triad 10 as an example of a cyclic triad in which the relations between the nodes describe a directed line, and triad 9 as an example of a transitive triad. The additional letters, thus, have the following meanings: U = upwards, D = downwards, T = transitive, and C = cyclic.

In network analysis, triads are recognized as smaller local sub-sets of a bigger network. In the triad census, the distribution of triad configurations might be an indicator for the global processes of the complete network (Kadushin, 2012). As one considers the

triads 4 and 5, they show rather different characterizations in a network, although their formal MAN dyad counts are the same (Davis & Leinhardt, 1972; Holland & Leinhardt, 1976). Triad 4 could be defined as one node with two outgoing directed edges. In this research, this triad configuration could be interpreted as one person relating to others by, for example, reacting to their posts or by mentioning them. Triad 5, in contrast, shows the opposite direction of relationships. In this configuration, one node receives two directed edges by others. Within this investigation, this triad would represent persons who, for instance, receive reactions to their posts or who are mentioned by others. If one then would interpret triad 6, with a cyclic configuration from one node via a mediating node to another node, this would indicate that the two nodes at the bottom are only indirectly connected to each other via the node on the top. Basically, information is spread via the intermediary node. While the online social network analysis and the triad census describe rather quantitative research methods for social capital, it is reasonable to include a more qualitative method in the triangulation, such as content analysis. The next sub-chapter illustrates this analysis method more specifically.

3.1.3. Content analysis method

The third research analysis method to be evaluated within this research is content analysis. Berg and Lune (2014) define content analysis as *"a careful, detailed, systematic examination and interpretation of a particular body of material in an effort to identify patterns, themes, biases, and meanings"* (p. 335). The material to be analyzed is mostly text-based or can be transcribed into textual data (Julien, 2008). Basically, content analysis includes coding and interpretation processes and is applicable in various disciplines of analyzing human communication (Berg & Lune, 2014). Content analysis can be used as quantitative or qualitative research method. Nowadays, content analysis is a research method which is primarily used as qualitative analysis (Berg & Lune, 2014; Hsieh & Shannon, 2005). It is possible to integrate qualitative and quantitative methods in content analysis. Textual data can be coded into different qualitative categories and then analyzed and described by using statistical methods (Morgan, 1993).

Generally, content analysis is a flexible method for exploring research data (Hsieh & Shannon, 2005). There are different ways of developing a coding scheme for a content analysis, each of them differing in the gathering or creation of initial codes: conventional, directed, and summative approach to content analysis (Berg & Lune, 2014; Hsieh & Shannon, 2005). To begin with the latter approach, *summative content analysis* basically counts keywords derived from the raw textual data and counts these. Keywords can be chosen based on the researcher´s interests or identified during literature review. Thus, keywords can be defined before and during data analysis. This approach to content analysis may have issues concerning the contextual meaning of these keywords (Hsieh & Shannon, 2005). The other two approaches differ in their inductive or deductive natures of deriving initial codes (Berg & Lune, 2014). Whereas *conventional content analysis* develops initial codes from the textual research data itself, *directed content analysis*

derives its initial codes based on theory and literature review. Research showed that it can be advantageous to combine inductive and deductive approaches (Berg & Lune, 2014; Glaser & Strauss, 1967). Whichever approach is applied, a detailed and thorough coding scheme is crucial to any kind of content analysis (Hsieh & Shannon, 2005).
The development of such a coding scheme is a process of identifying and assigning units or whole items of textual data into smaller content categories (Hsieh & Shannon, 2005; Weber, 1990).

Although developing and refining a coding scheme is a rather individual process which might strongly depend on the case data, the categories of the final coding scheme may be considered as additional indicators for measuring social capital in online social networks. Even a more qualitative analysis method such as a content analysis can provide practical indicators if it is in alignment with the case and explicated on the basis of existing literature and research findings. The size of this case allows for such a detailed and in-depth content analysis. The objective of this content analysis was to create a coding scheme which fits the requirements of the specific case, but which can be easily adapted to other case data if necessary. This is a challenging process which would have to be evaluated and possibly adjusted to special characteristics of a different case.

This Chapter 3 provided a thorough overview about current research methods for investigating social capital. The sub-chapters 3.1.1, 3.1.2, and 3.1.3 introduced three commonly used analysis methods: online social network analysis method, analysis method of network triad configurations, and content analysis method. The first two research methods are implemented to investigate the online social relationships which build the fundament for the creation of social capital. The latter research method is implemented to investigate in to which extent the social capital of these online social networks facilitates the creation of advantageous values for individuals, whole or sub-networks, or between networks. Access to information and knowledge resources as well as activating ambitions to collaboration are studied. In the following, the case study within this design study is presented. Chapter 4 first illustrates the case chosen for this research project, and then describes the implementation of the three research methods delineated above.

4. The case study: Implementation of the methods

This chapter introduces the case from which data were gathered for the implementation and evaluation of the research methods of this case study. Within this chapter, the second sub-question of this research is answered: *Which indicators for measuring social capital are applicable to online social media?* This implementation of the research methods described in the following combined with the evaluation, but more important, with the reflection on these methods in Chapters 5 and 6 answer this second research question in detail. In conjunction with the conceptualization of social capital proposed in sub-chapter 2.5 and the evaluation of the findings of the case study presented in Chapter 5, this implementation is another important step towards measuring social capital in online social media networks. A triangulation of online social network analysis, network triad analysis, and content analysis methods is outlined. The researcher chose for two rather quantitative and one more qualitative research methods. These analysis methods are designed to investigate case data of online social media networks. The following parts of this chapter illustrate the development of the three research methods and provide a detailed description of the implementation of these methods regarding the case.

4.1. Case description

The data for this research were collected from a citizens´ initiative working in and around Amsterdam dedicated to finding, categorizing, and revitalizing wastelands. The size of the case, and therefore, the amount of data was rather small. A generalization of these data would be difficult to realize. The advantage of this case was that the researcher could apply an in-depth investigation and evaluate the different analysis methods to develop a practical method for measuring social capital in online social media networks.
The subsequent sections introduce the citizens´ initiative Onder-Tussen, describe their ways of organization and working, and illustrate how this initiative uses online social media for its purposes (see sub-chapters 4.1.1, 4.1.2, and 4.1.3).

4.1.1. The Onder-Tussen initiative

Amsterdam, the capital of the Netherlands, is a flourishing city. Although Amsterdam is striving for innovation in all different kinds of sectors, for instance business, cultural events, sports, or leisure activities, there are terrains in the Amsterdam region which are not yet or no longer used for any particular purpose. These terrains are so-called wastelands. Due to the economic circumstances, these terrains are in a temporary empty state (www.amsterdam.nl, 2014). Because these wastelands are diminishing the spatial quality and quality of life of city neighborhoods (but are most certainly not unusable), a citizens' initiative emerged which started as the LinkedIn discussion group called "Onder-Tussen"[4]. This initiative is a group of people (citizens, professionals, and government professionals) living, working, or spending their time otherwise in Amsterdam, who worry

[4] "Onder-Tussen" can be literally translated into "meanwhile".

about the wastelands in and around the city, and who have ideas and ambitions regarding the organization and facilitation of the temporary usage of these wastelands by citizens. The Onder-Tussen initiative follows its goals to inspire, realize, and manage projects to develop new opportunities of using wastelands in the Amsterdam region. In 2010, the group began building up an open network of people who might be interested in the topic of temporary usage of wastelands, and who are expected to be able to contribute to ideas and projects.

By organizing and managing all different kinds of projects, the Onder-Tussen initiative acquired new skills and developed own services which they could offer to potentially interested parties. Those services were mainly based on the prior experiences and as such, they were project-oriented and of practical nature. The Onder-Tussen initiative took the challenge to inspire people, to connect them with other stakeholders, to give advice in difficult questions, and to realize and manage running projects without too much bureaucracy and rules, but with a certain level of purposeful planning. There were more than 90 initiatives and projects realized already in 2013, ranging from natural playgrounds via gardens or recreational areas to temporary gastronomy. Whereas this section introduced the citizens´ initiative, the next section focuses on its use of a Google map to picture recent information about wastelands in the Amsterdam region.

4.1.2. The Google map of wastelands

The basic idea of the Onder-Tussen initiative was to create a digital map with Google Maps indicating all wastelands in the region. The initiative also tried to gather official information from the city of Amsterdam about those spaces which were temporarily without any particular usage. Its goal was to complete this map with even more specific information from all the land owners. Unfortunately, the overall involvement of the city of Amsterdam was rather low. The steady efforts of the Onder-Tussen initiative, via its LinkedIn group, a small Twitter campaign, and the organization of offline activities informally called attention to the initiative and its goals. These activities finally resulted in an interactive online map showing wastelands in Amsterdam, Diemen and Zaanstad.
On July 1st 2011, the city of Amsterdam launched the first official digital map (http://maps.amsterdam.nl/ braakliggende_terreinen). This map contains information about wastelands which is regularly updated by adding new information from land-use planners, construction companies, and the city of Amsterdam. Furthermore, the current status of the wasteland and its availability for temporary use is indicated. The map also provides contact information of persons who might be interested in new ideas, innovative and feasible plans as to the possible usage of those wastelands.

Communication among members of the Onder-Tussen initiative, land owners, the city of Amsterdam, and other people involved in the projects surrounding the wastelands in the region, takes place via different media channels. The following section illustrates the online social media usage of the Onder-Tussen initiative. It describes which online social media the initiative uses and how and for which purposes it uses them.

4.1.3. Online social media usage of the Onder-Tussen initiative

The Onder-Tussen initiative uses different communication channels to organize and present itself and to communicate with the outside world, directed at people who are interested in the topic of temporary usage of wastelands. This section identifies the two relevant online social media tools LinkedIn and Twitter, and shortly describes the Google map of wastelands.

The main communication tool the Onder-Tussen initiative uses is the social networking site LinkedIn. LinkedIn is a service for building primarily professional business networks by connecting colleagues, employees, employers, and organizations with each other. The Onder-Tussen initiative has an open LinkedIn group in which everyone can become a member of the initiative. This group is an online tool for group communication and organization. Members can participate in conversations, post ideas, plans, or events by themselves, or simply follow the conversations passively. People participating in this group are professionals, citizens of Amsterdam, or just interested persons. A more thorough analysis of the group structure was executed during this research.

Furthermore, the other communication tool the Onder-Tussen initiative uses is the microblogging service Twitter. The Onder-Tussen initiative uses a hashtag (#blt020) to link specific tweets about the subject, group, activities, projects, or events to each other.

Finally, one of the most important online media usages of the Onder-Tussen initiative is the website with the digital map (http://maps.amsterdam.nl/braakliggende_terreinen). This website is primarily used to provide information about specific projects, wastelands, and their recent actual statuses. It is not used for communicating more complex information than that. If people are willing to participate in the initiative, or to propose an idea for a certain project, they are supposed to use the contact information they find within the digital map to get in contact with the persons in charge.
Because this website is primarily not used for online communication and because there are no communication data available via this website, it was not used for further analyses. Therefore, the main focus of this case study was the analysis of the two online social media tools LinkedIn and Twitter. The following sub-chapter 4.2 illustrates how data were gathered for the case study.

4.2. Data collection on LinkedIn and Twitter

As identified above, a LinkedIn group and a Twitter hashtag campaign were two of the most important communication channels of the Onder-Tussen initiative. Therefore, data were collected from these two online social media sites. This research investigated methods to measure social capital in online social media networks. Data sources were, thus, online social media tools. In this case, data were collected from LinkedIn and Twitter. Therefore, the researcher decided to observe, analyze, and interpret online social media data to implement and evaluate the methodology. Furthermore, the researcher

chose a descriptive approach to identify and evaluate indicators which were used to measure social capital in these online social media networks (Hennig et al., 2012).

To be able to answer the research questions properly, the online social media sites of the Onder-Tussen initiative were investigated. The Onder-Tussen initiative uses a LinkedIn group (http://www.linkedin.com/groups/ONDERTUSSEN-3818086) and a specific hashtag on Twitter (#blt020). For the purpose of this research project, especially these two social media tools were used to gather relevant communication data.
These communication data were the expression of the otherwise intangible concept of social capital. It became actually visible, and therefore, observable in the first place.
The subsequent sections 4.2.1 and 4.2.2 delineate how the data sets for the implementation of the research methods were created and which data were included in these sets.

4.2.1. The LinkedIn data set

The LinkedIn data set was created on the basis of the LinkedIn group of the Onder-Tussen initiative. The LinkedIn group was founded on March 8, 2011 and had 282 members in October 2013, and 287 members in July 2014. The first post in this group was uploaded on March 13, 2011. The founder defines the type of the group as networking group and describes the group´s objectives as follows: "*ONDER-TUSSEN: Shares knowledge and practical experience about temporary use of wastelands."* (http://www.linkedin.com/ groups/ ONDERTUSSEN-3818086). He encouraged (future) members of the group to contribute to the network and to invite others to do so as well. Anyone can become a member of the group if he or she has an account on LinkedIn. Posts and comments – so-called discussions – are publicly visible. People, therefore, are also able to follow the discussions passively, even if they are not logged into LinkedIn. Data were gathered manually from the LinkedIn group in October 2013. The researcher gathered information about time and date of the discussions, the type of text (post or comment), likes, and the individuals involved in the discussions. Individuals were identified either as government professionals, or other professionals, and citizens. Furthermore, the locations they work or live were categorized either as local (in and around the Amsterdam region), or non-local. These characteristics were added to the data set.

Additionally, several types of relationships (edges) between sources and targets were defined. In this investigation, a relationship is defined as an individual reacting to another individual. This reaction is supposed to imply a certain value expressed, such as "I think what you say is important, thus, I react to it.". Furthermore, all unique individuals (nodes) were identified. For LinkedIn, this meant the identification of authors of posts and reactions they got from others who commented on their posts, or who liked their posts. Therefore, in the LinkedIn data set, two types of relationships were defined: *reactions* to a post and *likes* of a post. This section illustrated the structure of and the data included in the LinkedIn data set. The next section 4.2.2 describes how the Twitter data set was structured and which data were included in that set.

4.2.2. The Twitter data set

This section describes how the Twitter data set was created based on the Twitter hashtag campaign of the citizens´ initiative. The Onder-Tussen initiative uses the hashtag "#blt020" on Twitter when referring to interesting information about the temporary use of wastelands. The "blt" in the hashtag stands for "BraakLiggende Terreinen" and is the Dutch term for wastelands. This hashtag was first used on September 20, 2011. The researcher executed a Twitter search for the hashtag #blt020 and extracted the relevant data manually. The following data were gathered: time and date of the tweets, the type of tweet (tweet, retweet, reply, etc.) and the individuals who posted and/or were mentioned within tweets under the hashtag #blt020. By manually adding replies which did not necessarily contain the hashtag, the Twitter data set was extended in addition to the data of the Twitter search. Furthermore, the researcher extracted and followed all links that were posted in the tweets gathered.

For the Twitter data set, the classification of relationship types was different due to the medium characteristics of Twitter. Twitter users can use mentions in their tweets, they can easily retweet something, and they can directly reply to a tweet. All those actions indicate a relationship between Twitter users. Therefore, the following types of relationships were defined: *direct mentions* in a tweet, *retweets*, and *replies*. As all collected tweets were classified manually by the researcher, an additional relationship was identified. Twitter users might also mention other users in their tweets by retweeting someone else´s tweet. Thus, it might be the case that the mention in the tweet was originally made by someone else. Although this was only observed rarely (9 times), this *original mention* type of relationship was added to the classification.

Different types of relationships are different in their quality as well. Liking someone´s post is less demanding or involving than actively creating a reaction to a post. Additionally, a direct mention, as it is sent via an own tweet or via a retweet, is more directed than just retweeting something. A direct reply also is expected to claim higher involvement than a simple retweet. Thus, the focus of these relationships lies on the individuals and their interactions with each other rather than on the content of the tweets and discussions. In the online social network analyses, the individual view was surmounting the message or content view. As the structures of and the data included in the LinkedIn and Twitter data sets were described above, it is now important to illustrate the actual implementation of the three research methods introduced in Chapter 3. The next sub-chapter 4.3 explicates the choice of using the network visualization and analysis tool Gephi for further analyses, which are also referred to in the following sections.

4.3. Online social network analysis using Gephi

There are several software tools to import, analyze, and visualize social network data. One such software tool is Gephi. Gephi is a network visualization and analysis tool which is often used for exploratory data analysis (Bastian, Heymann, & Jacomy, 2009;

Heymann, n.d.). Gephi offers state of the art visualization and basic network analysis facilities. Therefore, Gephi was chosen as graph visualization software for this case study.

The collected data were formatted and imported into Gephi. The data were analyzed by running statistics which are described in the following section. Network measures were computed which provided insight into the development and the structure of the networks. Furthermore, the analyses indicated the importance of individuals within the networks (Hennig et al., 2012). To be able to compare both networks of LinkedIn and Twitter, the same statistics were run and also the layout settings were the same for both networks. Therefore, the following description of the implementation of the online social network analysis applies for the LinkedIn network, as well as for the Twitter network.

4.3.1. Running statistics in Gephi

First, the general network metrics were computed. These statistics included the following indicators: graph density, connected components, and the network diameter. Furthermore, the modularity was calculated. In this research, the modularity algorithm was randomized in Gephi to produce a better decomposition. Second, the edge metric of the (average) path lengths was computed. Finally, the node metrics were computed, such as centrality measures – including degrees, closeness centrality, betweenness centrality, eccentricity, and eigenvector centrality – and the (average) clustering coefficients. To be able to compare the betweenness centrality between both the LinkedIn and the Twitter networks, this metric was normalized [0,1]. For a better comparability in both networks, also the closeness centrality metric was normalized [0,1]. The next two sections 4.3.2 and 4.3.3 shortly depict which layout settings were used for both graphical visualizations and which filters were useful for focusing on specific sub-networks.

4.3.2. Applying layout settings in Gephi

There are multiple layout algorithms available in Gephi. The challenge in visualizing online social networks is to produce a readable graph which can be interpreted by the researcher. After having experimented with several layouts, the best readable graphs of the LinkedIn and Twitter networks were produced by the Force-Atlas 2 layout. This layout allowed for preventing overlap of nodes, which was also applied in this research. Nodes´ sizes were adjusted according to their degrees and their colors were changed on the basis of the different modularity classes. Labels were adjusted and potential label overlap was prevented by applying the specific layout configurations.

4.3.3. Using filters in Gephi

In this research, ego-networks were created for the three most active individuals within the networks. Those individuals were selected on the basis of their degree values, as degree is supposed to be the simplest measure for a node´s importance (Hennig et al., 2012). Furthermore, the researcher filtered sub-graphs for every month, which was to indicate the development of the networks in time. In these sub-graphs, statistics and

layout adjustments were applied as well. The following sub-chapter 4.4 shortly illustrates the implementation of the network triad census method.

4.4. Analysis of network triad configurations

The analysis of the triad census investigated the underlying communication structures of the LinkedIn and Twitter networks. The online social network data were used to count all possible triad configurations. Relationships between nodes were analyzed and bundles of three nodes were counted. Furthermore, it was analyzed which triad configurations appeared relatively often in comparison to other triad configurations. Finally, the researcher obviated an overestimation of empty triads. The next sub-chapter 4.5 thoroughly illustrates the implementation process of the content analysis methods for the LinkedIn and the Twitter communication. Overall, the implementation of the content analysis appeared to require constant reflection and evaluation. This is further explained in the following sub-chapter.

4.5. Content analysis

The third research method of this case study was the content analysis method. As sub-chapter 3.1.3 indicated, the content analysis method is a rather qualitative research method. There are different ways to produce initial codes for developing coding schemes. The researcher chose for a combination of inductive and deductive content analysis, thus, for integrating conventional and directed approaches to derive initial codes. For the content analysis of LinkedIn, the researcher developed a coding scheme following a bottom-up approach. To investigate the content posted and commented on in LinkedIn, the first objective was to understand what individuals actually said on LinkedIn. Therefore, the first step was to read every discussion and try to assign a characteristic to it – if it was informative, descriptive, supportive, humoristic, engaging, mobilizing, etc. These characteristics were later integrated into different codes. Finally, these codes resulted in four different content categories. LinkedIn posts and comments were then assigned to one of the four categories presented in Table 2.

Table 2

Short description of LinkedIn content categories

Category	**Short description**
Information	Sharing information, ideas, opinions, knowledge, and/or expertise
Identity	Showing support, approval, and/or affirmation, expressing hope and/or humor
Action	Appealing for action, participation, mobilization, announcing events and/or projects
Other	All posts which cannot be put into one of the other categories

For the full coding scheme including examples, see Appendix I. An interrater reliability analysis was conducted by letting a second coder independently apply the coding scheme to the LinkedIn data. The interrater reliability was analyzed using IBM SPSS Statistics 22, which showed sufficient reliability for all categories. Table 3 summarizes the Cohen´s Kappa values for each of the LinkedIn content categories (Cohen, 1960; Viera & Garrett, 2005).

Table 3

Cohen´s Kappa values for LinkedIn content categories

Category	**Cohen´s Kappa**
Information	0,67
Identity	0,74
Action	0,607
Other	0,761

To increase the validity of the results, only identically coded posts and comments were used in further quantitative analyses. For the content analysis of the Twitter data, the researcher chose to adapt an existing coding scheme developed by Chew (2010) and Chew and Eysenbach (2010). The content categories were originally developed to determine the Twitter content during the H1N1 outbreak in 2009. Therefore, not all content categories were applicable in this particular research and had to be adapted. After adaptation, this coding scheme suited the Twitter data. It was not applicable to the LinkedIn data, as discussions on LinkedIn were much broader, more detailed and just too extensive to be put into one of those differentiated categories of the Twitter coding scheme. Therefore, the researcher chose to keep using two different coding schemes, each suitable for the different kinds of data gathered on LinkedIn and Twitter.

The Twitter coding scheme contained three main parts, describing the contents, the sentiments, and the links of the tweets. Each of these main categories was further fragmented into several sub-categories. The first main category focused on the actual *content* of the tweets. It described what individuals said in their tweets and what they referred to. The second main category was *sentiment*[5], which aimed at giving insight into the tone of the tweet. This category focused on the intentions and the temper of the Twitter users with regard to the subject they were describing in their tweets. The third main category showed which kinds of *links* the Twitter users shared and promoted through their tweets. Table 4 presents a short description for each of the content categories.

[5] Within the Twitter coding scheme, especially three of the sentiment sub-categories were to some level comparable to the LinkedIn coding scheme: *Informative* tweets created to share information and knowledge; *supportive* tweets created to build and strengthen the group identity; and *appealing* tweets created to activate and mobilize others.

Table 4

Short description of Twitter content categories

Category	Short description
	Content
Resource	Tweet referring to the topic, containing news, updates, or information about #blt020 and associated projects, probably containing an article/website title, or a photo/video caption
Event	Tweet referring to an upcoming/recent event, probably containing a concrete name and/or date of the event
Personal expression	Tweet describing an individual´s direct or indirect personal experience/opinion/interest
Other	All contents which cannot be put into one of the other categories
	Sentiment
Informative	Tweet is informative, the Twitter user explicitly or implicitly intends to inform others about something
Supportive	Tweet showing some kind of support, affirmation, probably describing something with positive attributes
Appealing	Tweet is encouraging, appealing, motivating, the Twitter user might formulate an objective and probably propose a way how to achieve it
Questioning	Tweet containing a question, the Twitter user might ask for specific information
Neutral	Tweet not showing any sentiment at all, the tone of the tweet is neutral
Other	All sentiments which cannot be put into one of the other categories
	Link
News website	Tweet referencing a news website or blog
Project website	Tweet linking to a website or blog referring to a project, a group or initiative
SNS (“Social Networking Site”)	Tweet referencing a SNS, or a post/picture/video posted on SNS
Map	Tweet containing the link to the #blt020 Google Map
Government	Tweet referring to an official governmental website of a municipality/province/ministry or other governmental departments
No reference	Tweet not containing any link
Not accessible	Link mentioned in the tweet is not accessible (anymore)
Other	All links which cannot be put into one of the other categories

Note: content categories based on and adapted from Chew (2010) and Chew and Eysenbach (2010).

Each tweet, thus, had three content categories assigned to it, one from each main category. To test the reliability of the coding scheme, an independent second coder applied it to the Twitter data set. The interrater reliability analysis executed with IBM SPSS Statistics 22 showed sufficient Cohen´s Kappa values for each category (Cohen, 1960; Viera & Garrett, 2005). Table 5 presents the results of this analysis.

Table 5

Cohen´s Kappa values for LinkedIn content categories

Category	**Cohen´s Kappa**
Content	0,764
Sentiment	0,794
Link	0,67

Again, only identically coded tweets were included in further quantitative analyses to prevent an adverse effect on the validity.

4.6. Practical considerations and recommendations

To conclude this Chapter 4, the implementation of the three research methods in triangulation was feasible. All three methods produced differentiated results. This sub-chapter summarizes relevant considerations of the practicability of each research method applied to the case study.

Based on the produced data sets of the LinkedIn group and the Twitter hashtag campaign, the online social network analysis could be adequately implemented using the graph visualization and analysis tool Gephi. The online social network analysis method appeared to be a practicable research method for investigating social capital in online social networks. This method thoroughly illustrates the relationships between individuals, highlights structural characteristics of these networks, and it offers the possibility to shift the focus from the macro level of the whole network, via meso level sub-networks, to even micro level analyses of individual nodes. It has to be noted that the data sets have to be accurately created with regard to the defined relationships between the nodes. This is a crucial step to be taken before the online social network analysis can be implemented. Therefore, the researcher recommends a thorough definition of the relationship types and encourages a distinct labeling of these types in the data sets.

Furthermore, also the triad census method could be adequately applied to the online social network data. Based on the accurate data sets, this method investigated the smallest possible sub-networks, the triad configurations. With this research method, underlying communication patterns within the online social networks could be identified.

Even the more qualitative content analysis method could be implemented with further specifications regarding the case. It has to be noted, though, that developing a reliable coding scheme for a content analysis method is strongly interwoven with the case

itself. As sub-chapter 4.5 illustrated, the content analysis method required continuous reflection and revision of the coding schemes and content categories. Finally, the content analysis methods used for LinkedIn and Twitter both revealed reliable content categories, although the process of validating and improving them required constant efforts by the researcher. It is, therefore, recommended to weigh the cost-benefit ratio for implementing the content analysis method in a case study. For this research, the content analysis method could be practically applied because of the rather small amount of content data. Therefore, this analysis method was useful in this case study. The following Chapter 5 thoroughly illustrates the evaluation of the findings resulting from the case study.

5. The case study: Evaluation of the findings

This chapter aims to provide insight into the results of the content analyses and the network analyses of LinkedIn and Twitter. Within this chapter, the third sub-question of this research is answered: *What is the social capital of the online social media networks of the citizens´ initiative?* The evaluation of the findings shows that every research method used in this case study revealed specific output. Especially the online social network analysis and the triad census methods could be used to quantify the network statistics and network triad configurations. Formatting the research data was a crucial step to produce practically useful data sets which could be imported into the research software. Although a constant reflection and revision of the coding schemes for the content analysis method were necessary, this method also produced relevant findings. These findings are presented in this Chapter 5.

It has to be noted that all examples of posts, comments, and tweets were translated from Dutch into English. First, the results regarding the LinkedIn group are presented in sub-chapter 5.1. In subsequent sub-chapters 5.1.1 and 5.1.2, the content shared in the LinkedIn network is summarized, and then the entire network is presented. Furthermore, this chapter shows most important persons in the LinkedIn network in sub-chapter 5.1.3 and describes their contents as well as their ego-networks. Second, the Twitter results are summarized in sub-chapter 5.2. The structure of this section is similar to the LinkedIn results section. And finally, the development of both the LinkedIn and Twitter networks in time is compared and relevant differences and similarities are highlighted in sub-chapter 5.3. Both networks are compared in their visual characteristics, and then described with regard to their triad census results.

5.1. LinkedIn

This sub-chapter illustrates the evaluation of the results regarding the LinkedIn group of the Onder-Tussen initiative. The LinkedIn group was founded in March 2011. Since then, 365 posts and comments were posted by 127 individuals who shared 248 unique edges. The content of these discussions is summarized, the entire network is described and central persons are identified and further described referring to the contents they posted and with regard to their ego-networks.

5.1.1. Content of the LinkedIn discussions

The content analysis following the generated coding scheme for LinkedIn investigated the use of the LinkedIn group for the purposes of information and knowledge sharing, building a group identity and supporting each other, and activating and encouraging people to engage. The results described the proportion of each content category represented in the LinkedIn group. Figure 3 displays the percentages.

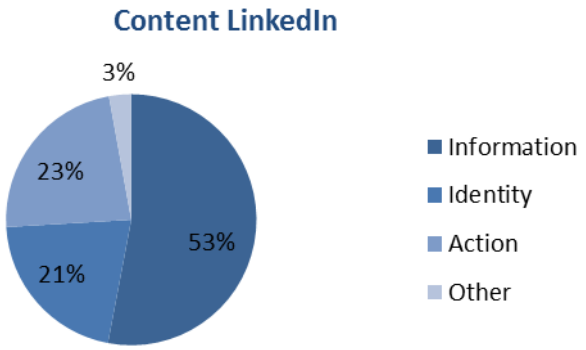

Figure 3. Percentages of the LinkedIn content categories.

As Figure 3 shows, the content category information was overrepresented in comparison to the other categories. More than half of the posts and comments (53%) in the LinkedIn group were informative, whereas the content categories of identity (21%) and action (23%) accounted for about one-fifth of the posts and comments each. Only a small number of posts (3%) could not be assigned to one of the three content categories.

Typical informative posts and comments shared examples, knowledge, expertise, or ideas and opinions. They were meant to inform others about something or to ask for certain information. The following post was an example for a typical informative post: "*The Map wastelands metropolitan area Amsterdam was updated! There are wastelands omitted, because there will be constructions (e.g. Confuciusplein) or because they do or shortly will fulfill temporary functions (Moes32, land sailing park, BMX track etc.) and there is one particular wasteland added (at August Allebeplein in Nieuw West). Look at www.gisdro.nl/braakliggende_terreinen."*.

Identity posts and comments help to create and form a common or group identity. In typical identity posts or comments, people supported each other and acknowledged, liked, or affirmed someone else´s post. Typical identity posts were the following: *"Interesting concept, I hope to manage it in Utrecht, too..."*, or: *"Nice idea, good luck!"*. Another example was this post: *"Amazing to have contributed to this and how beautiful it has become!"*. One of the most suitable LinkedIn comments of the identity category was this comment: *"Yes! Nice, man! I'm your Friend! (well, you knew this before...)"*.

The third content category of LinkedIn was the action category. A typical action post appealed for certain action, was meant to mobilize people, or announced events and asked for participation. One example for such an action post was the following: *"REMINDER: Wednesday, May 11, from 17.15 opening of the exhibition* "New space for the city" *in Arcam. EVERYONE WELCOME. More info: http://lnkd.in/ZGRBgS"*. This was another example: *"Here´s a tip: The evening debate* "Do it yourself" *in The Hague on July 7, which is probably interesting for members of Onder-Tussen: http://www.stroom.nl/ activiteiten/lezing_ symposium.php?l_id=2799408"*. The next section presents the visualization of the LinkedIn network.

5.1.2. The LinkedIn network

As described earlier, the online social network analysis was executed in Gephi. Alongside the statistics that were run, the layout used created a graph of the LinkedIn network, which is presented in Figure 4.

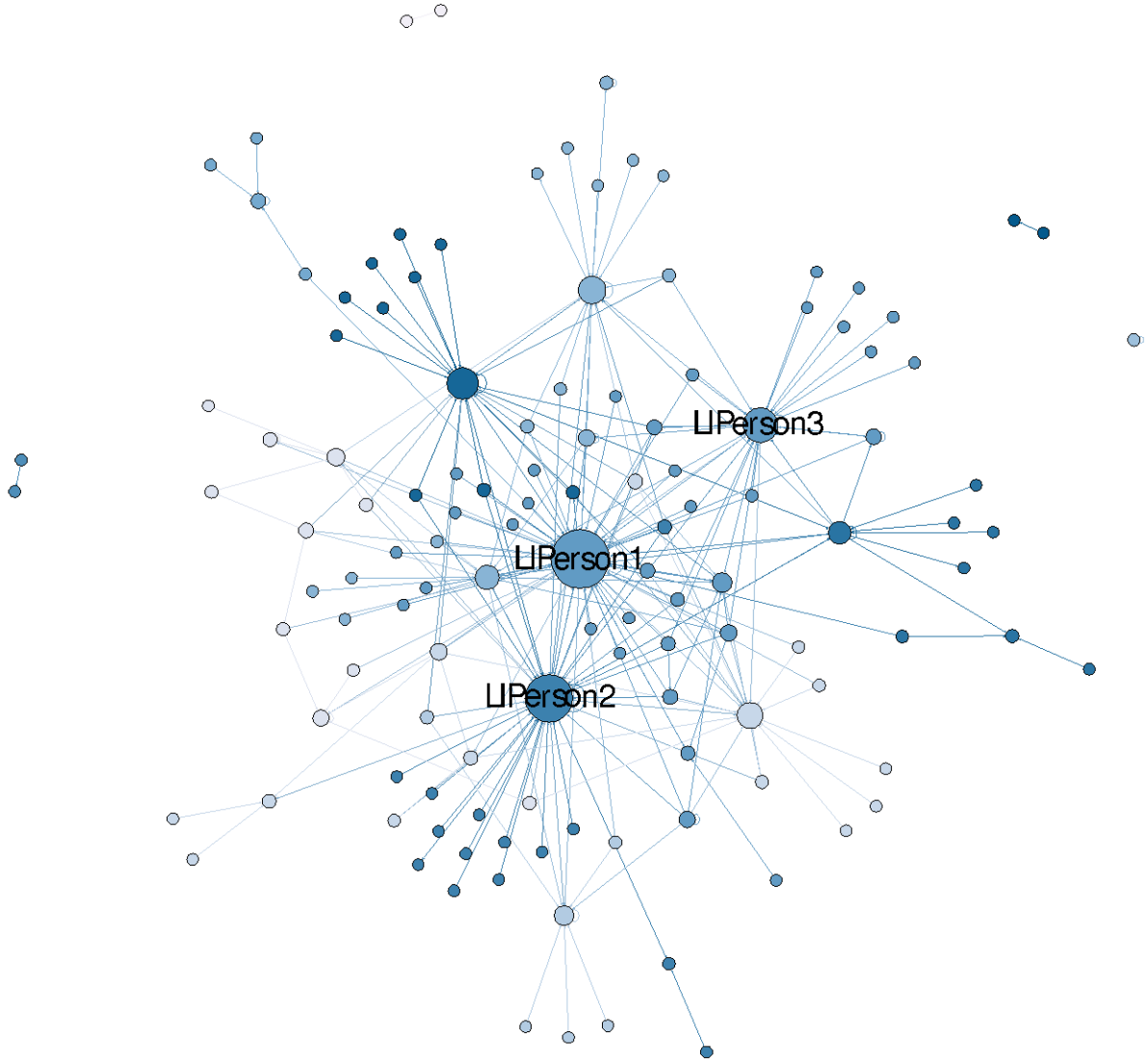

Figure 4. LinkedIn graph with nodes´ sizes based on degree and nodes´ colors representing the modularity classes.

5.1.2.1. Graphical representation of the LinkedIn network

As the graph in Figure 4 shows, the structure of the network looked rather sparse. Nodes did not seem highly interconnected to each other. Although the overall impression was a rather sparse network, the LinkedIn network seemed to have formed around one central person (later identified as LIPerson1). Actually, there were several nodes in the center of the network which were rather active and which shared common edges (two of them were later identified as LIPerson2 – the founder of the LinkedIn group – and LIPerson3).

Furthermore, it became visible that nodes which were interconnected in the center of the network sometimes did have some kind of supporting bases. They were connected to nodes in the periphery which had only one single edge connecting them to the network. And, there even was one stand-alone node which had only one loop directed at itself. The structure of the LinkedIn network was reminiscent of a random network which developed in time (Barabási & Albert, 1999; Hennig et al., 2012; Newman, 2003; Newman, 2010; Newman, Watts & Barabási, 2006). This network seemed rather fault tolerant (Callaway, Newman, Strogatz & Watts, 2000). Although there were some nodes which were positioned in the periphery, most of the nodes were connected to the center of the network. Thus, if one would have left those peripheral nodes behind, the overall connectedness seemed comparatively well-structured. There were comparatively few nodes which were connected to the network by only one edge. If one random node would have been taken out of this network, the rest would still be rather connected. Even if one of the most central and active persons would have been extracted, most of the other nodes would still be connected. For this research, this interconnectedness was interpreted as information was shared via different routes along the nodes. People of the Onder-Tussen initiative could receive information via several ways; they were not completely dependent on what the most important persons shared. This became also visible in the triad census analysis. For the creation of a common group identity and for the purpose of spreading information throughout the entire network, this structure seemed eligible. This was an important observation, as the LinkedIn group could be used to spread the word about temporary usage of wastelands, to discuss opinions, and to present and promote new ideas, projects, or events. The detailed network metrics are presented in the following section.

5.1.2.2. Network metrics of the LinkedIn network

The LinkedIn group network consisted of 127 nodes and 248 edges and was a directed graph. Out of the individuals included in this graph, 65,35% lived or worked in an around the Amsterdam region. The network also included 30,71% of the individuals who lived or worked outside this area. For 3,94% of the individuals, this information was not accessible. Furthermore, the greatest percentage, 74,02%, of the individuals worked in a non-governmental profession. 22,83% of the individuals worked as a government professional. For 3,15%, this information was not accessible.

The impression of a relatively sparse network was affirmed by the statistics, as the entire network of the LinkedIn group had only a density of 0,015. A complete graph with all possible edges between the nodes would have a density equal to 1 (Heymann, n.d.). The diameter of the LinkedIn network equaled 5, and the average path length in the network was 2,563 paths long (Brandes, 2001). The average degree of the LinkedIn network was 1,953. Furthermore, there were 13 communities detected in the LinkedIn network, based on the modularity classes (Blondel et al., 2008; Newman, 2006). The overall modularity of the graph was 0,403 (Heymann, n.d.), and the average clustering

coefficient was 0,143. Additionally, there were 113 strongly connected components found, leaving 4 weakly connected components within this network (Heymann, n.d.; Tarjan 1972). Within this LinkedIn network, three important persons were identified. The next sub-chapter provides a detailed overview of these persons.

5.1.3. Important persons in the LinkedIn network

This sub-chapter presents the findings regarding the three most important persons who could be identified by the online social network analysis. When it comes to identifying important persons within a network, several measures could be used. In this research, the most active persons within the network were chosen for further detailed analyses. The identification of those persons was based on their node degree metrics. Activity is supposed to be the simplest measure indicating some structural advantage (Hennig et al., 2012). A second factor, which was supposed to identify structurally important individuals within the network, was the betweenness centrality measure of each node (Brandes, 2001; Brandes, 2008; Freeman, 1977; Heymann, n.d.). In both rankings, the three most important persons were the same, which implied the in-depth analyses for those three persons. For the reason of anonymity, these persons were not mentioned by name, but referred to as LIPerson1, LIPerson2, and LIPerson3 (LI = LinkedIn). LIPerson1 scored highest on degree with degree equal to 60, LIPerson2 had a degree of 46, and LIPerson3 a degree of 30.

5.1.3.1. Network metrics of the three central persons on LinkedIn

LIPerson1

LIPerson1 was a local government professional who received 86 reactions from 47 different individuals. Furthermore, LIPerson1 also sent 25 reactions out to 13 different individuals. LIPerson1 scored highest for betweenness centrality (0,073) in the graph, although this score was rather low, as it was normalized [0,1]. The closeness centrality measure for LIPerson1 was 0,595, also normalized [0,1]. The probably most noticeable centrality measure of LIPerson1 was its eigenvector centrality of 1,0. The eccentricity of LIPerson1 was 3,0. Furthermore, LIPerson1 was randomly assigned to modularity class 5 and its clustering coefficient was 0,031. During further analyses, LIPerson1 appeared to be an important person in the Twitter network, too.

LIPerson2

LIPerson2 also lived and worked in the Amsterdam region, but was not a government professional. LIPerson2 was the founder of the LinkedIn group. This person sent 19 reactions to 10 others in the network and received 61 reactions from 36 others.
The betweenness centrality of LIPerson2 was 0,063. Its closeness centrality was 0,568. Both the betweenness and closeness centrality were normalized [0,1]. Also the eigenvector centrality of LIPerson2 was at a high level of 0,933. Its eccentricity was also 3,0. LIPerson2 was assigned to a different modularity class 3 with a clustering coefficient

of 0,04. Although LIPerson2 also appeared in the Twitter network, it did not have an important position within that network. To investigate the reason for this, future research would have to be conducted.

LIPerson3

LIPerson3 was not a government professional, but also lived and worked in the Amsterdam area. LIPerson3 sent out 12 reactions to 9 other persons and received 36 reactions from 21 different individuals in the network. The betweenness centrality score was 0,025. Its closeness centrality was 0,543. And, the eigenvector centrality of LIPerson3 was 0,655. Its eccentricity was 3,0, too. LIPerson3 was also assigned to the same modularity class 5 as LIPerson1. The clustering coefficient of LIPerson3 was highest among these three persons at 0,072. LIPerson3 appeared in the Twitter network as well. However, also this person did not show structural importance in that network. Again, the reasons for that would have to be investigated in future research. Table 6 summarizes these LinkedIn network metrics for the three central persons.

Table 6

Summary of LinkedIn network measures of central persons

	LIPerson1	**LIPerson2**	**LIPerson3**
Profession	governmental	non-governmental	non-governmental
Locality	local	local	local
Reactions sent	25 (C: 14) (L: 11)	19 (C: 9) (L: 10)	12 (C: 9) (L: 3)
Reactions received	86 (C: 35) (L: 51)	61 (C: 40) (L: 21)	36 (C: 19) (L: 17)
Degree	60 (In: 47) (Out: 13)	46 (In: 36) (Out:10)	30 (In: 21) (Out: 9)
Betweenness centrality	0,073	0,063	0,025
Closeness centrality	0,595	0,568	0,543
Eigenvector centrality	1,0	0,933	0,655
Eccentricity	3,0	3,0	3,0
Modularity class	5	3	5
Clustering coefficient	0,031	0,040	0,072
Strongly-connected ID	13	13	13

Note. Centralities normalized [0,1]; “C”: comments; “L”: likes; “In”: in-degree; “Out”: out-degree.

As preceding analyses showed, three most active persons were identified: LIPerson1, LIPerson2, and LIPerson3. Their network metrics are presented above. Furthermore, it was important to analyze what these individuals were saying in their discussions. A selection of the posts by these people was an indicator for the way they were communication on LinkedIn. Only identically coded posts and comments were selected. As absolute numbers of posts and comments differed with all three persons, percentages were calculated to provide a better comparability.

5.1.3.2. Content analysis of the three central persons on LinkedIn

LIPerson1

LIPerson1 scored high on the informational content category, two-thirds accounted for information and knowledge sharing on LinkedIn. In comparison to the average percentage of informative posts and comments (53%), LIPerson1 scored higher (66%). LIPerson1 discussed the term of "temporariness": *"Does temporariness need a strategy?"*. LIPerson1 referred to an article and discussed its content. LIPerson1 described its own opinion *"Rightly, he* [the author of the article] *is critical about the buzz function of the term temporariness. In my opinion, it may not become something trivial as city marketing. On the other hand, it does require a strategy."*, and asked others to join the conversation and contribute their own ideas: *"Because why strategy? Which goal of whom has to be achieved when?* […] *How do you think about this?"*. Furthermore, LIPerson1 informed others about newly listed and available wastelands: *"Zeeburgereiland 020 3,6 hectare wasteland 10 years for 1€"*, or presented a new project idea, and referred to scientific information about its feasibility: *"From food bank to market garden: It´s possible! The concept of an organic market garden in Utrecht is feasible. This emerges from a feasibility study by the Science Shop of the Wageningen UR (University & Research center) at the request of the Stichting Moestuin…"*. LIPerson1 posted about projects not only in the Netherlands, but also broadens readers´ minds with examples from other countries: *"Berlin's urban agriculture is growing and innovative. Urban agriculture and innovation and temporary. Nice article by guest blogger* [name] *about the growth and positive experiences in Berlin."*.

In contrast to the informational content category, building a group identity by supporting each other was at about one-tenth rather low (11% in comparison to the average 21%). One of LIPerson1´s first posts tried to express hope for upcoming projects: *"Thanks for the invitation. I hope that this network will quickly be expanded and that it will lead to many temporary initiatives."*. Sometimes, although infrequently, LIPerson1 also complimented others for their work: *"Hello* [name]. *Kudos to this extraordinary good approach."*. Furthermore, LIPerson1 used nearly one-fifth of its posts and comments for motivating and activating others (19% in comparison to the average 23%). One example was this post: *"Congress New Media and Urbanism + call for projects. Conference: 17 February 2012 Preconference workshop: 14-16 February 2012 Our everyday lives are increasingly shaped by digital media technologies, from smart cards and intelligent GPS systems to social media and smartphones..."*. Only a small percentage (4%, the average is 3%) of its content could not be assigned to one of these categories. Figure 5 displays the proportions of the content categories.

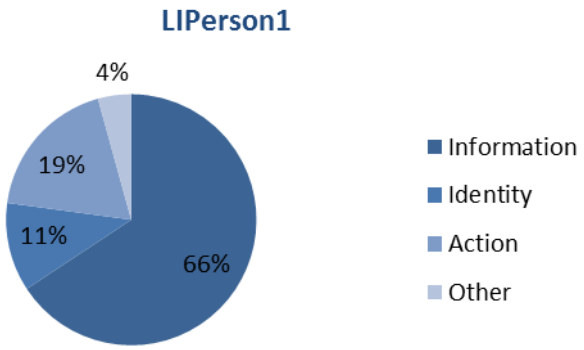

Figure 5. Percentages of the LinkedIn content categories of LIPerson1.

If one now considered the ego-network of LIPerson1, it showed that with 54 nodes and 156 edges, it almost contained half of the nodes, and even more than half of the edges of the entire LinkedIn network. The network diameter was 4 with an average path length of 2,079, and its density was equal to 0,055. The modularity was 0,205, and the average clustering coefficient was 0,332. This ego-network consisted of 70,37% persons, living and working in and around Amsterdam. This percentage was higher relative to the entire network. Furthermore, 25,93% of the individuals of this ego-network were government professionals. This percentage was higher relative to the entire network as well. The three most active persons were the same as in the entire network. Figure 6 shows the ego-network of LIPerson1.

Within this ego-network, there were few nodes which did only have one single edge connecting them to the network. This sub-network of LinkedIn was slightly better interconnected, and thus, relatively more tolerant towards faults. If one would have extracted one random node out of this ego-network, most of the other nodes would still be connected (Callaway et al., 2000). Information was spread via different routes within the network (Barabási & Albert, 1999; Hennig et al., 2012; Newman, 2010).

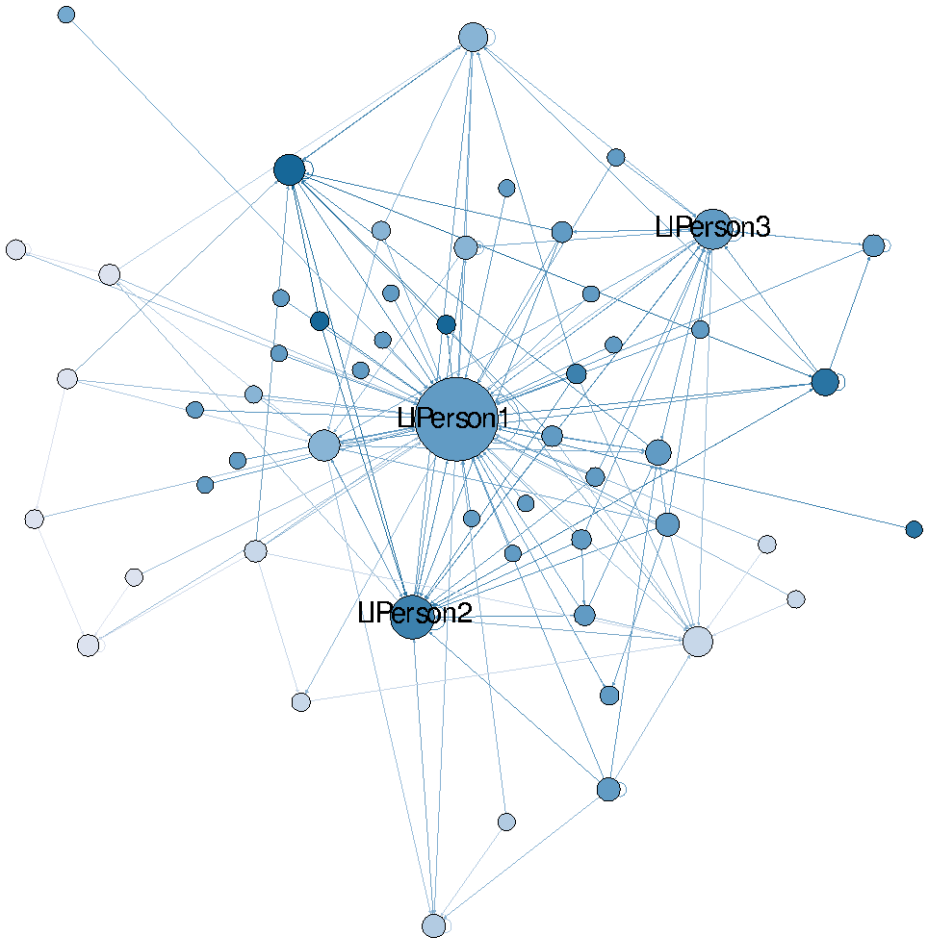

Figure 6. Ego-network of LIPerson1.

LIPerson2

LIPerson2 also used most of its posts and comments to inform others about something. In comparison to the average (53%), more posts and comments were informative (60%). LIPerson2 contributed to a definition of temporariness: *"Temporariness is a different term for everyone. Overall, temporariness – referring to wastelands – is limited to a maximum of 5 years. What are your experiences?"*. Furthermore, LIPerson2 shared information about new projects: *"Now online http://www.zaanij.nl, a fascinating project area from the IJ-banks in Northern Amsterdam to the Zaan-banks. Brimful of temporary possibilities!"*, and about new scientific projects including the use of wastelands: *"Creative City Lab investigates in 2012 sustainable food strategy and takes wastelands into account. Focus Amsterdam region."*.

LIPerson2 posted less than the average user on LinkedIn to affirm others in its network (15% compared to the average of 21%). LIPerson2 essentially expressed interest and excitement about the possibilities the Onder-Tussen initiative might offer: *"In my opinion, the analogy of Onder-Tussen and Meanwhile is an extra affirmation of following the right way, within an international development. I´m very curious about what great, temporary projects this group will put into effect this year!"*. About one-fourth (25%) of

the posts and comments accounted for mobilizing others to engage. This was similar to the average percentage of 23%. This way, the communication patterns of LIPerson2 were similar to that of LIPerson1. LIPerson2 encouraged members of the group to invite others and to add their ideas to the group: *"The network of Onder-Tussen is for all of us. Contribute something and invite others (experts, interested persons, thinkers, doers, etc.). By sharing as much knowledge and experience as possible, we will come forth together."*. Furthermore, LIPerson2 announced group events and provided information about time, location and purpose of the events. Figure 7 shows these percentages.

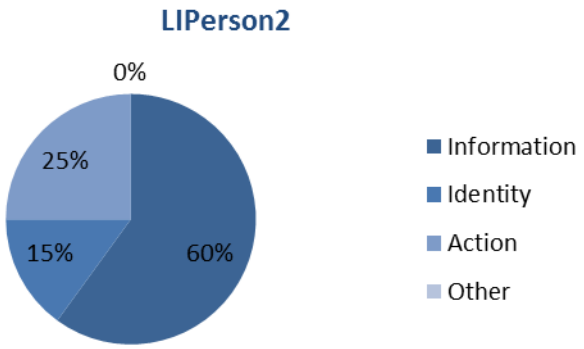

Figure 7. Percentages of the LinkedIn content categories of LIPerson2.

The ego-network of LIPerson2 contained 41 nodes, about one-third of the entire network, and 116 edges, almost half of the entire network. The diameter of the network was 4, with an average path length of 2,037. The density of the ego-network was 0,071. The ego-networks modularity was 0,232, with an average clustering coefficient of 0,303. 78,05% of the individuals in this ego-network lived and worked in the Amsterdam area, 17,07% as government professional. The three most active persons in this ego-network again were the same as in the entire network. Figure 8 displays the ego-network of LIPerson2.

This ego-network was similar in its structure to that of LIPerson1. Nodes seemed relatively more connected to each other than in the entire network of LinkedIn. Although the upper part of the ego-network shared several different edges, and thus, created the impression of being fault tolerant (Callaway et al., 2000), LIPerson2 did connect several nodes to the network which would be excluded if one would have extracted LIPerson2 (Barabási & Albert, 1999; Hennig et al., 2012; Newman, 2010). Therefore, these nodes were dependent on LIPerson2 to get information.

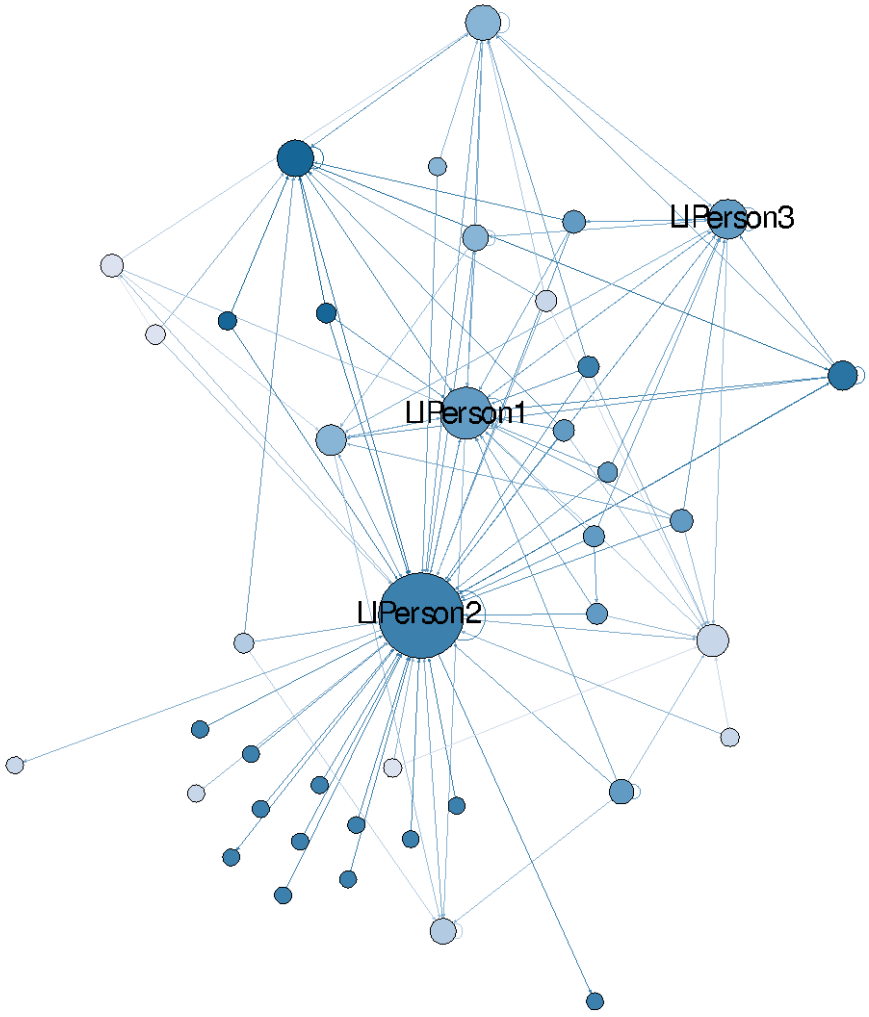

Figure 8. Ego-network of LIPerson2.

LIPerson3

LIPerson3 showed a slightly different communication pattern. Although also the information content category accounted for most of the posts and comments (40%), it was almost equal to the identity content category (35%). In comparison to the average scores for informational content (53%), LIPerson3 was the only one of the three central persons who posted less information. Most of the information LIPerson3 posted referred to specific projects or recently available wastelands: *"Tree nursery for parcel Zuidas."*, or *"Children occupying wasteland. Initiative by* [name] *of the Amsterdam Environmental Center. It can be this easy."*.

LIPerson3 posted more to create a common identity (the average for the identity category was 21%). Although most identity building posts were rather short (a few words at the top), these might have contributed to create and maintain some kind of group identity: *"Meanwhile project is inspiring"*, *"Thanks to everyone for this nice and inspiring evening"*, *"Nice idea, good luck!"* were three typical identity supporting posts by

LIPerson3. About one-fourth (25%) of its posts and comments were assigned to the action category. Figure 9 describes the proportions.

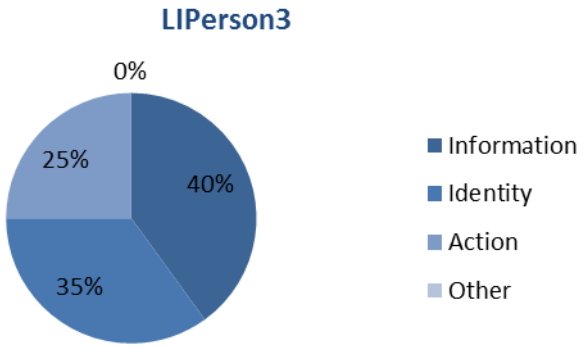

Figure 9. Percentages of the LinkedIn content categories of LIPerson3.

With 25 nodes and 75 edges, this third ego-network was the smallest out of the three most important persons on LinkedIn. With an average degree of 3,0 and a network diameter of 3,0, this ego-network seemed a bit better connected than the other two ego-networks presented so far. Also, its density was higher at 0,125, with an average path length of 1,874. The modularity within this ego-network was 0,177, with an average clustering coefficient of 0,454. 84% of the individuals of this ego-network lived and worked in the Amsterdam area, 24% of them worked as government professional. Figure 10 presents the ego-network of LIPerson3.

This ego-network of LIPerson3 showed a comparatively higher interconnectedness between the nodes. There were few nodes which shared only one single edge with the network. If, therefore, one would have taken a random node out of the network, the overall connections would still be apparent – even if this randomly extracted node would have been one of the most important nodes (Callaway et al., 2000). People in this ego-network did not solely depend on their connections to the most active persons, but could get information via other routes as well (Barabási & Albert, 1999; Hennig et al., 2012; Newman, 2010). The following section provides the results of the Twitter analyses in a similar sequential order as this section did for the LinkedIn analyses.

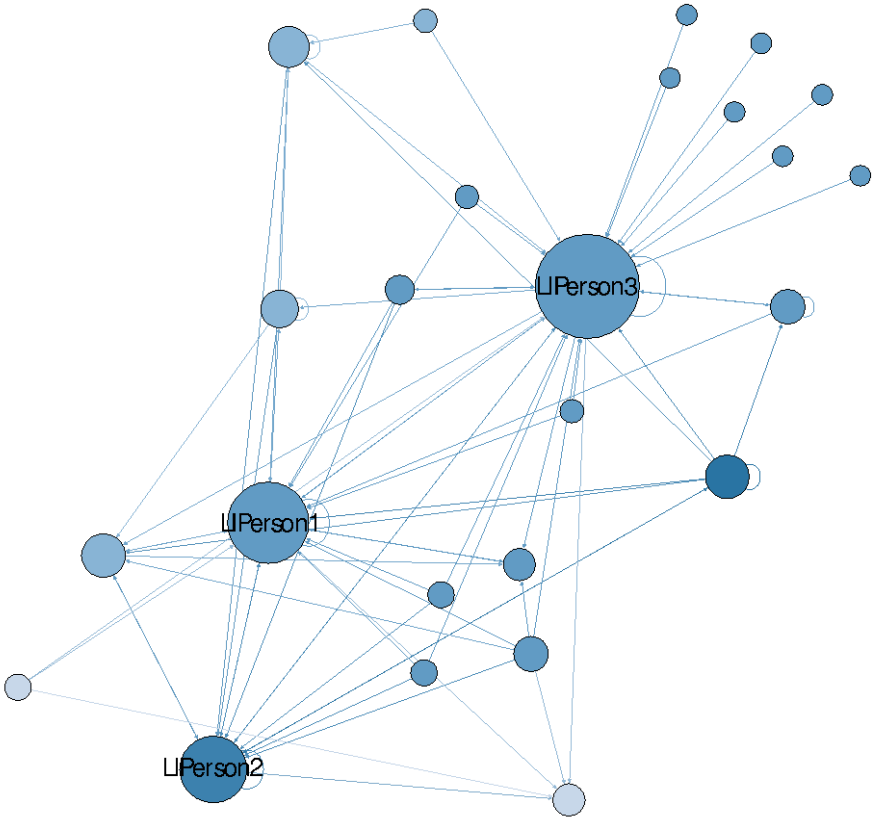

Figure 10. Ego-network of LIPerson3.

5.2. Twitter

The first tweet containing the hashtag #blt020 was sent out on September 2011. Since then, and until the data extraction, 250 individuals have twittered about this topic. These persons shared 368 unique edges. The following paragraphs shed light on the content delivered by these tweets. Furthermore, the Twitter network is described and central persons are identified. Additionally, their contents and ego-networks are described.

5.2.1. Content of the Twitter tweets

The adapted coding scheme was applied to the content analysis of Twitter. The content categories helped analyzing the Twitter usage for delivering different contents, sentiments, and spreading links. The results described each content category in percentages. Only identically coded tweets were included in the analyses.
Figure 11 displays the categorization of the Twitter content. Figure 12 shows the percentages of the different sentiments of the tweets. And, Figure 13 describes the various kinds of links included in the tweets.

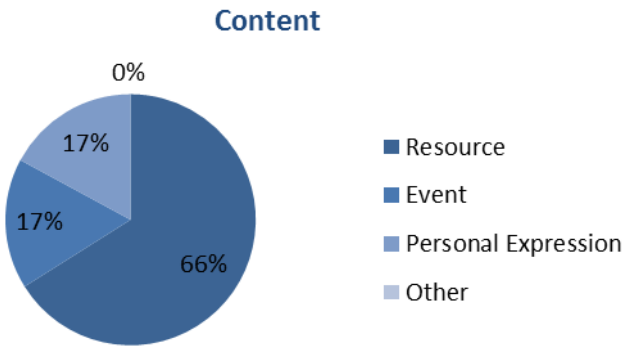

Figure 11. Percentages of the Twitter content categories.

The distribution of the content categories showed a high representation of information. Two-thirds of all tweets provided information, or were supposed to share knowledge or experience. Events were promoted in only 17% of the tweets, as were personal expressions shared. Thus, most of the content posted in tweets with the hashtag #blt020 was clearly informational.

Typical tweets referring to the resource content category provided information about projects, news, or updates relating to the topic of wastelands in Amsterdam. For instance, tweeting about the updated #blt020 Google Map: *"Map wastelands updated #blt020 http://url4u.nl/11802"*, or: *"New wasteland on the map: August Allebéplein block 6. http://goo.gl/xUHJC #blt020"*. Information about new possibilities regarding projects was shared: *"Wasteland offerors: Zuidas, Sloterdijk, Zaanoevers, Hembrugterrein, Havens, Amstel3, etc. #blt020"*. Furthermore, there were photos, articles, or videos shared referring to projects: *"Municipality invested 8.000 Euros in leveling the ground, is delivering hedges and soil #blt020 pic.twitter.com/YsAcUPMG"*, *"Project* "Op de Schop"*: wastelands > latest news – The healthy City http://iturl.nl/snJw8 #blt020"*, or: *"more than 4.000 IJcitizens and St Nicholas on.... a wasteland #blt020 http://www.at5.nl/artikelen/71856/stadsoase-aflevering-8 … #huh"*.

In addition to content referring to resources, Twitter users also shared information about events: *"Talk of the Town: No time to waste land. 13-12-2012 Pakhuis de Zwijger. http://bit.ly/TcICUL Initiative searching for (temporary) land #blt020"*, or their personal experiences: *"Just had an unexpected interview about #blt020 and http://www.socialcitiesoftomorrow.nl/* […]*."*. Twitter users also expressed their opinions about something being *"Inspiring"*, or their interest in something: *"So much! Curious about implementation & especially if one gets activated, does it become reality #blt020 keep me posted"*. Within the content category, all tweets could be assigned to one category. The following section describes the sentiment categories.

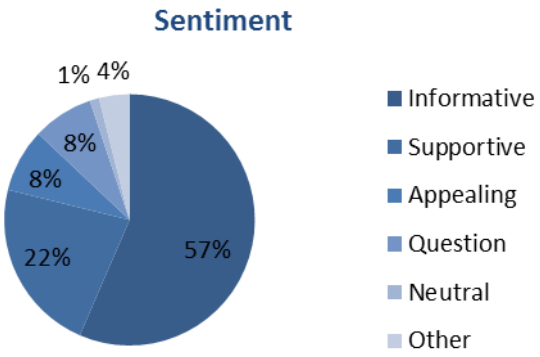

Figure 12. Percentages of the Twitter sentiment categories.

What was already indicated in the content category, was resembled in the sentiment category, most of the tweets (57%) were informative. One-fifth of the tweets were supposed to show support and affirm each other. This might indicate some kind of group forming. Only some of the tweets were appealing or formulated to motivate others to engage. Also, not many questions were posed in the tweets. Fewest of the tweets did not convey any sentiment, some of them only posting a link without any further information.

Tweets which were intended to be informational simply explained something, or just gave an update on a project, an article, additional information, etc. A typical tweet of this sentiment category was the following: *"See* "Sociale media: New ways to social innovation" *(with ONDER-TUSSEN and #blt020 as example) http://tinyurl.com/qy4jy67"*. Other examples were: *"Financial and business models for temp use projects–1st project, the readingroom http://ow.ly/ogM5h #tacticalurbanism #blt020 #temporary"*, or *"Initiatives on wastelands, see: http://www.at5.nl/nltv/bouw-je-buurt … #blt020"*.

Supportive tweets were intended to show appreciation for something someone did or wrote. These tweets affirmed someone´s opinion, project, or idea. Typical supportive tweets were, for instance: *"Also a nice concept for temporary use of wastelands #blt020: urban campsite amsterdam pic.twitter.com/dirFKNie9H"*, or *"Sounds good, everyone, what is happening on Twitter about* "No time to waste land" *#blt020 Nice to follow"*. Although 22% of the tweets were supportive, fewer tweets than one might expect were actually motivating or trying to activate others. One example was this tweet: *"#Stadsloods Register today and come to @De_Zwijger for TALK OF THE TOWN on Thursday http://bit.ly/11oUaZN NO TIME TO WASTE LAND #BLT020"*. Invitations to events were the most common appealing tweets, but there were also tweets which tried to motivate people to take action online: *"#blt020 this is Rotterdam bringing out its best! Roll up your sleeves, get to work, spread it on Twitter!"*. Some Twitter users asked for extra information: *"It´s a pity we missed #blt020 in Pakhuis de Zwijger. Is there going to be a report?"*. The following results describe which links were posted on Twitter.

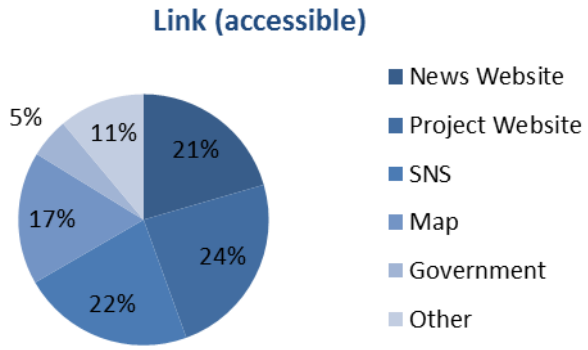

Figure 13. Percentages of the Twitter link categories.

About two-fifths of the tweets did not contain any link (42%), and of the remaining 58% tweets including a link, 16% were not valid (anymore). Therefore, only 42% of the tweets contained a link that could be assigned to the link categories. The proportions of these links are presented in Figure 13. About one-fifth of the links led to a news website, most of them were citing an article title, for instance, this tweet: *"Initiatives on wastelands, see: http://www.at5.nl/nltv/bouw-je-buurt … #blt020"*. Almost one-fourth of the links led to project-specific websites, promoting several projects: *"Social Cities of Tomorrow » International conference 17 February 2012, Amsterdam, New Media and Urbanism #blt020 http://www.socialcitiesoftomorrow.nl/"*. Furthermore, about one-fifth of the tweets linked to social networking sites, such as other tweets, Facebook or LinkedIn posts, photos, videos, etc.: *"Save the date pakhuis de Zwijger about wastelands http://lnkd.in/3myG93 #blt020"*. The portion of the links leading directly to the Google Map was almost one-fifth as well. As this interactive Google Map was supposed to contain much useful information, one might expect that people would link to this map more often. Only a small proportion of 5% of the links led to governmental websites, such as the website of the municipality of Amsterdam.

5.2.2. The Twitter network

The network analysis using Gephi applied the same statistics and layout settings to be able to create a comparable graph of the Twitter network. This graph is presented in Figure 14.

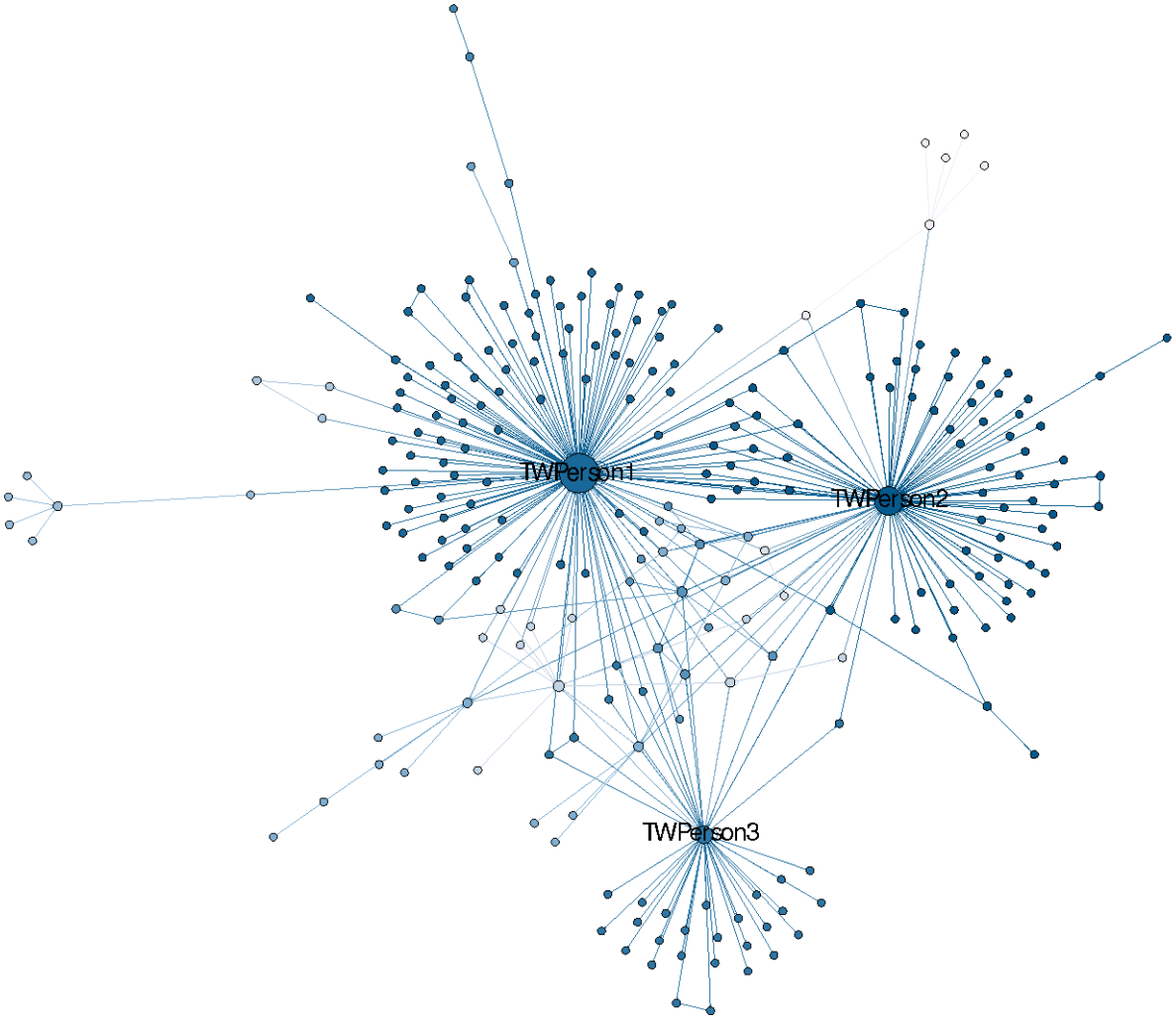

Figure 14. Twitter graph with nodes´ sizes based on degree and nodes´ colors representing the modularity classes.

5.2.2.1. Graphical representation of the Twitter network

The Twitter network showed that there were three dominant persons who each had their own bunch of people behind them. It could be described as some kind of fan base or supportive base. These three persons connected new nodes to the network and created a triangle structure. This network did not seem as dense as the LinkedIn network. Nodes were not that interconnected and most of them shared only one single edge with the network – mostly to one of the three nodes with the highest degree. The network structure of Twitter, thus, reminded of a scale-free network (Barabási, 2009; Barabási & Albert, 1999; Barabási & Bonabeau, 2003; Newman, 2003). There were few nodes with a high degree, and the tendency of new nodes was to connect to one of those bigger nodes. Such bigger nodes are called hubs (Barabási & Albert, 1999). The degree distribution of such scale-free networks follows a power law distribution, in which very few nodes have a high degree followed by most other nodes with a low degree (Barabási & Albert, 1999; Shirky, 2008; Shirky, 2010; Van Dijk, 2012). Those hubs function as

brokers between otherwise external nodes in a network. They are also the nodes which might create a small-world effect, in which all nodes of a network are connected by few steps (Albert & Barabási, 2002; Barabási, 2014; Newman, 2003; Strogatz, 2001; Van Dijk, 2012; Watts & Strogatz, 1998). The Twitter network seemed quite robust to faults (Callaway et al., 2000). If one random node would have been extracted from the network, the overall network structure would probably not be affected. But, if one of the hubs would have been taken out, the network would lose its connectedness. The general structure would fall apart and many isolated nodes would be the consequence (Callaway et al., 2000). Thus, the hubs in the Twitter network on the one hand, expanded and strengthened the network, but on the other hand, they were also recognized as weakness, and could be the Achilles heel of the entire network. The detailed network metrics are presented in the following section.

5.2.2.2. Network metrics of the Twitter network

The Twitter network contained 250 nodes and 368 unique edges, thus, this network was considerably bigger than the LinkedIn network. The original Twitter search resulted in 282 tweets which actually contained the hashtag #blt020. In addition to this search, further replies to these tweets were gathered and added to the data set manually. Therefore, the total count of edges within this network was 645 (spreading over the 368 unique edges mentioned above). As the graph in Figure 14 indicates, the density was very low, and it was actually only 0,006. Nodes were not very interconnected, and many of them only had one edge connecting them to the network. The average degree of the Twitter graph was 1,472. The network diameter was 6, which was one path longer than in the LinkedIn graph. The average path length of 2,582 was almost equal in both networks (Brandes, 2001). Furthermore, there were 12 communities detected in the Twitter network, with a modularity of 0,524, and an average clustering coefficient of 0,165 (Blondel et al., 2008; Heymann, n.d.; Newman, 2006). There were 211 strongly connected components identified, leaving only one weakly connected component (Heymann, n.d.; Tarjan 1972).

5.2.3. Important persons in the Twitter network

If one looked at the graph in Figure 14, the internal structure was probably most eye-catching. The apparent triangle structure of the graph already gave a clear hint on the most important persons of the Twitter network. Although the overall density was rather low, these three central persons connected many people to the network, and thus, introduced them to the topic of the timely usage of wastelands. There were individuals connected to more than one of the important persons, maybe even to all of them.

When it comes to the node statistics, degree was supposed to indicate the activity, and therefore, a structural advantage (Hennig et al., 2012). Furthermore, the betweenness centrality was also used to identify structurally important persons (Brandes, 2001; Freeman, 1977; Heymann, n.d.). It was not surprising, that the three most important persons identified by these metrics, were the same who get these prominent

positions within the network visualization. For Twitter, the identification was much easier than it had been for LinkedIn. The three most important persons detected in the Twitter network were named TWPerson1, TWPerson2, and TWPerson3 (TW = Twitter). TWPerson1 had a degree of 155, TWPerson2 had a degree of 102, and TWPerson3 a degree of 50.

5.2.3.1. Network metrics of the three central persons on Twitter

TWPerson1

First, it must be said that TWPerson1 was identified as the same person as LIPerson1. This was a very important finding that had to be acknowledged before more details are revealed. TWPerson1 was a local government professional. TWPerson1 sent out 180 tweets and reactions to 62 others and got 170 reactions from 93 others. Its betweenness centrality was 0,206 and its closeness centrality was 0,686 (both normalized [0,1]). Both measures were higher than in the LinkedIn network, which indicated that TWPerson1 had strengthened its central position in the Twitter network even more. In Figure 14 one can see that TWPerson1 connected many nodes to the network which would not be connected otherwise. Its eigenvector centrality was 1,0 and the eccentricity was 3,0. TWPerson1 was randomly assigned to modularity class 1, and the clustering coefficient was 0,004.

TWPerson2

TWPerson2 was also a local government professional. TWPerson2 also appeared in the LinkedIn network, but had not such a central position within that network. TWPerson2 sent out 75 reactions to 39 different persons on Twitter and received 179 reactions from 63 persons. The betweenness centrality score was 0,140 and the closeness centrality was 0,6 (both normalized [0,1]). The eigenvector centrality was rather high at 0,847. The eccentricity was 3,0 as well. TWPerson2 was assigned to modularity class 0, and had a clustering coefficient of 0,007.

TWPerson3

TWPerson3 was a government professional living and working in Amsterdam, just as TWPerson1 and TWPerson2. Although TWPerson3 was the third most important person on Twitter, this person did not even appear in the LinkedIn network. This was an important finding in this research. The reason why TWPerson3 engages so well on Twitter, but not on LinkedIn, remains to be investigated in future research. TWPerson3 sent 48 reactions to 28 individuals, and received 47 reactions from 22 individuals. Its betweenness centrality was 0,063 and the closeness centrality equaled 0,555 (both normalized [0,1]). TWPerson3 had an eigenvector centrality of 0,535 and an eccentricity of 3,0, just as TWPerson1 and TWPerson3. It was assigned to the modularity class 2, with a clustering coefficient of 0,022. Table 7 presents the node metrics for TWPerson1, TWPerson2, and TWPerson3.

Table 7

Summary of Twitter network measures of central persons

	TWPerson1	**TWPerson2**	**TWPerson3**
Profession	governmental	governmental	governmental
Locality	local	local	local
Reactions sent	180	75	48
	(1: 76)	(1: 34)	(1: 26)
	(2: 3)	(2: 1)	(2: 0)
	(3: 86)	(3: 33)	(3: 15)
	(4: 15)	(4: 7)	(4: 7)
Reactions received	170	179	47
	(1: 29)	(1: 23)	(1: 5)
	(2: 1)	(2: 1)	(2: 1)
	(3: 111)	(3: 149)	(3: 38)
	(4: 29)	(4: 6)	(4: 3)
Degree	155 (In: 93) (Out: 62)	102 (In: 63) (Out:39)	50 (In: 22) (Out: 28)
Betweenness centrality	0,206	0,140	0,063
Closeness centrality	0,686	0,6	0,555
Eigenvector centrality	1,0	0,847	0,535
Eccentricity	3,0	3,0	3,0
Modularity class	1	0	2
Clustering coefficient	0,004	0,007	0,022
Strongly-connected ID	68	68	68

Note. Centralities normalized [0,1]; "1": direct mention; "2": original direct mention; "3": retweet; "4": reply; "In": in-degree; "Out": out-degree.

Three most important persons were identified in preceding analyses, whose network measures were presented above. Furthermore, it was important to sketch the contents, sentiments, and links they were spreading through their tweets. Thus, identically coded tweets by these persons were selected and the percentages of the categories were presented to compare the results. Furthermore, their ego-networks were supposed to provide more in-depth results.

5.2.3.2. Content analysis of the three central persons on Twitter

TWPerson1

TWPerson1 tweeted mostly informative contents referring to resources. For these purposes, TWPerson1 linked to specific project websites, news websites, and the Google Map (with 30% of the tweets containing valid links). Furthermore, TWPerson1 used almost one-fourth of the tweets to show personal expressions, but only 12% to promote events. One-fifth of the tweets was supportive and was purposed to affirm someone.

Almost none of TWPerson1´s tweets were appealing or motivating others to engage. Figures 15, 16, and 17 show the percentages of each category for TWPerson1.

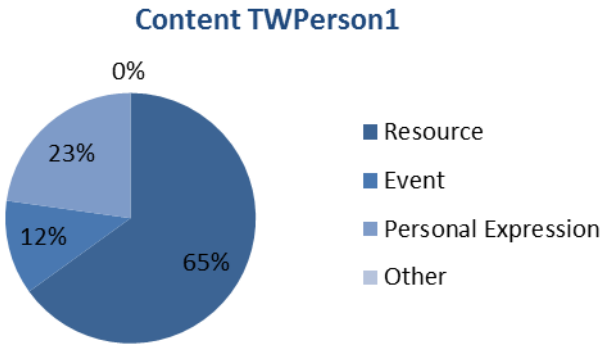

Figure 15. Percentages of the Twitter content categories of TWPerson1.

The overall content that TWPerson1 shared in its tweets resembled the broader content categories of the entire Twitter network. Most tweets were referring to a resource, such as this tweet: *"Wastelands search for temporary users. Nice article on #wikistedia #blt020 http://lnkd.in/6f_9yg"*. TWPerson1 did not tweet about events as much as the average Twitter user in this network, but did it in 12% of its tweets: *"30 Jan @De_Zwijger 020 #temporary and fiscal obstacles #temporarilydifferent #blt020 http://yfrog.com/kj9z1pxj"*. TWPerson1 shared slightly more own impressions or experiences: *"Arrived in Deventer* […]*"*, or *"Was jury member yesterday Creative City Challenge #g3c about temporary #blt020 + and exhibition at gorgeous http://www.openlabebbinge.nl"*. Furthermore, TWPerson1 expressed its opinion: *"Nice that Zwolle will also stimulate wastelands. Shared experience #blt020 with @smwds http://www.innofood.org/nl/nieuws/7761/ actie-voor-stadslandbouw-en-buurtmoestuinen-in-zwolle.html …"*.

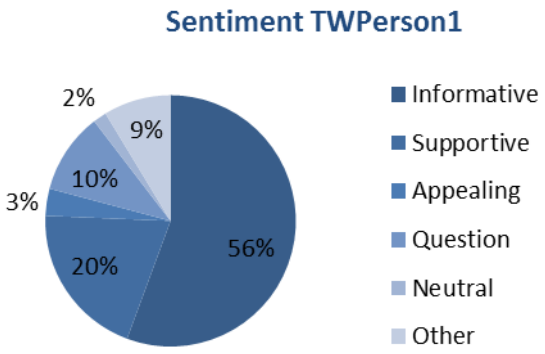

Figure 16. Percentages of the Twitter sentiment categories of TWPerson1.

TWPerson1 almost seemed to perfectly resemble the average sentiment category distribution of the entire Twitter network. Typical informative and supportive tweets were: *"Tree nursery on and in front of the Zuidas on wasteland #temporary #blt020*

http://zuidasgroeit.nl/ informatie/", and *"#blt020 Super nice! Online platform research Wastelands. Different methods cases whole world http://bit.ly/qlCNBl"*. Although TWPerson1 accounted for a high portion of all tweets, Figure 16 shows that TWPerson1 was even less appealing than other Twitter users of this network were. In the rather rare cases TWPerson1 did try to motivate or activate others, TWPerson1 was mostly trying to gather new ideas for projects: *"Museumn8 #ARCAM 5-11 at 20.00 workshop through temp.architecture wastelands. Be welcome to present new ideas #blt020 http://arcam.nl/ evenementen/programma_nl.html …"*, or *"*[…] *Come and present (sustainable) initiatives"*.

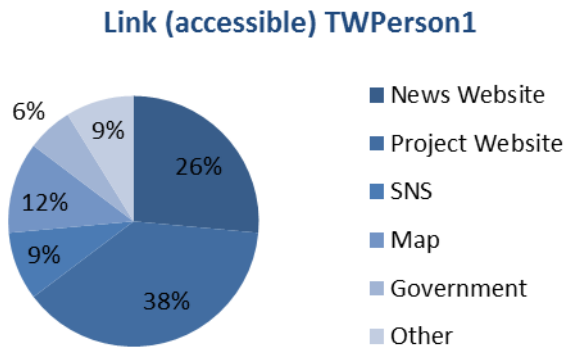

Figure 17. Percentages of the Twitter link categories of TWPerson1.

In comparison to the average Twitter user in the hashtag network, TWPerson1 tweeted more links to project websites, but less to social networking sites. One example for spreading project websites´ links was the following tweet: *"http://www.uitjeeigenstad.nl works without license, but with support of the deputy mayors ;-) #blt020"*. TWPerson1 also promoted other initiatives and shared links to their websites as well. For instance, the initiatives *"De Gezonde Stad"* ("the healthy city"), *"Open Lab Lebbinge"*, *"Urban Signature"*, and several more, were mentioned frequently.

In summary, TWPerson1, thus, used Twitter to provide mainly informative updates about several projects, linking directly to project websites. The content of the tweets mostly referred to resources. TWPerson1 also tried to support people and gave insight into personal expressions as well. Sometimes, TWPerson1 promoted certain events. TWPerson1 did not often link to the map website, and even less to social networking sites or governmental websites.

The ego-network of TWPerson1 contained 135 nodes and 240 edges, in comparison to the entire network, this ego-network alone would account for more than half of the nodes and edges. This again indicated the importance of TWPerson1. The graph density was with 0,013 twice as high as in the entire network, although this value in general was rather low. The ego-network was connected with 100 strongly connected components. The internal community structure seemed advanced with a modularity of 0,312 and 6 communities detected. The average clustering coefficient was 0,299. The average degree was 1,778, which was slightly more relative to the entire network.

The ego-network diameter was 4 with an average path length of 2,087. Figure 18 displays the ego-network of TWPerson1.

As Figure 18 shows, TWPerson1 connected many nodes to the graph which otherwise did not share an additional edge to the network. It became visible that TWPerson1 had a big base of supporters, which one might call some kind of fan base. This was already visible in Figure 14, which shows the entire Twitter network. What was striking in this ego-network was that the supportive bases of TWPerson2 and TWPerson3 seemed to disappear right away. Furthermore, the structure of the three most important persons in the Twitter network remained the same and was clearly visible in the ego-network. TWPerson1 shared some nodes with TWPerson2 and TWPerson3, but was also connected to them itself.

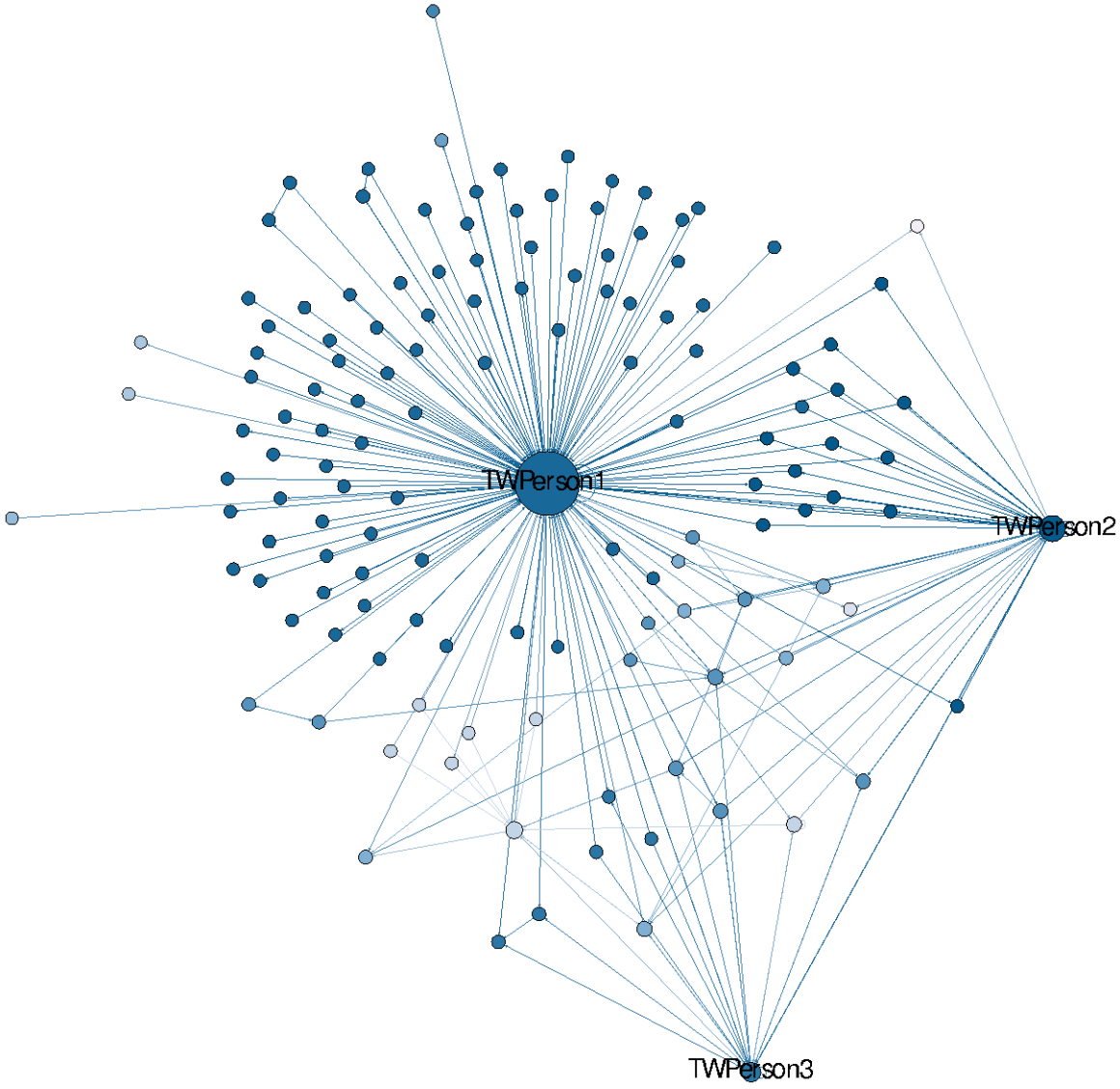

Figure 18. Ego-network of TWPerson1.

TWPerson2

TWPerson2 used more than three-fourths to tweet about resources. This, in combination with most of the tweets informing others about something, was an important finding. 15% of the tweets promoted events, but only 7% showed personal expressions. About one-fifth of the tweets were supposed to express support and affirmation. Furthermore, TWPerson2 was a bit more motivating than TWPerson1, although this portion was rather small in comparison to the other sentiment categories as well. Links of TWPerson2 were almost equally spread about news websites, social networking sites, the Google Map, and project websites (59% of the tweets containing valid links). Fewest of the tweets linked to government websites and other websites. Figures 19, 20, and 21 present the percentages of each category for TWPerson2.

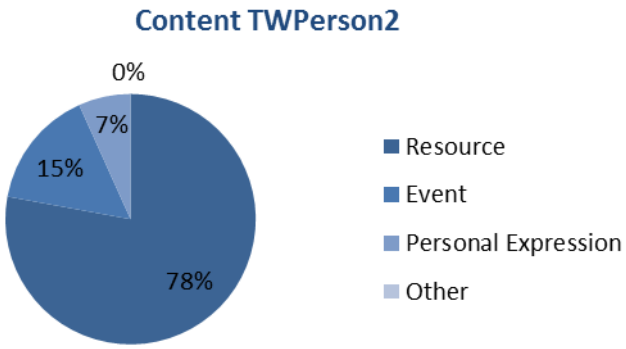

Figure 19. Percentages of the Twitter content categories of TWPerson2.

The distribution of the content categories of TWPerson2 was different from the overall distribution of the network. TWPerson2 tweeted even more about resources, projects, or news regarding the topic of wastelands and #blt020. With 78%, the resource content category exceeded the average by more than 10%. Typical tweets were: *"And this is the website of Zuidas grows #blt020 http://zuidasgroeit.nl/bomentuin/"*, or *"Here again the film the meeting No time to wasteland is going to be opened http://www.at5.nl/artikelen/92188/bouw-je-buurt-1 … #blt020"*, and *"More information about bonus question creative plan for wasteland zeeburgereiland see www.http://Zeeburgereiland.nl/sluisbuurt #blt020"*. When it comes to promoting events, TWPerson2 fitted the average proportion: *"Talk of the Town* "No time to wasteland" *13 December at 20:00 in Pakhuis de Zwijger, come! #blt020"*. In contrast to others in the Twitter network, TWPerson2 tweeted less to express its own impressions: *"Interesting article!* "Take-away" *landscape for today´s citizens: http://bit.ly/rLSkbb via @AddThis #blt020"*.

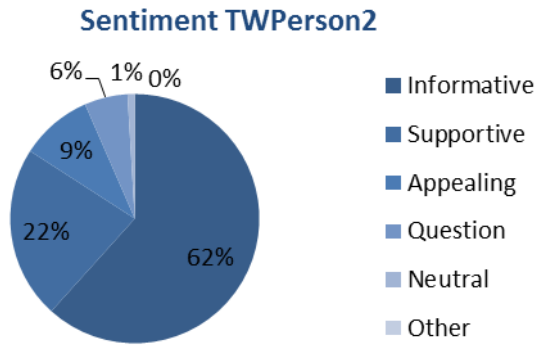

Figure 20. Percentages of the Twitter sentiment categories of TWPerson2.

Comparing TWPerson2´s sentiment categories, they visibly resembled the average sentiment distributions. Most of the tweets provided information about projects, articles, or updates: *"Land Sailing Park wins bonus question Zeeburgereiland. See jury report at http://www.zeeburgereiland.nl/sluisbuurt/ #blt020"*, or *"Press release: Space for great creative plan zeeburgereiland. http://bit.ly/yaPPUv #blt020"*, and *"Map wastelands was updated referring to the Amsterdam region: http://bit.ly/j3Vih9 #blt020"*.
Typical supportive tweets were these: *"Well done* [username] *Making wastelands #green. pic.twitter.com/LOkHhAtdDk #blt020"*, and *"Tree garden opened on wasteland, nice initiative! #blt020 http://www.iba.amsterdam.nl/nieuws/nieuwsberichten/newsitem/ 2013-jan-jun/bomentuin-zuidas/ …"*. In the less frequent appealing tweets, TWPerson2 asked people to come to specific events, or to watch videos online: *"Come to Pakhuis de Zwijger on Thursday 26 Jan and think about a temporary usage for Noorderhof Zuid http://www.iturl.nl/snpST/ #blt020"*.

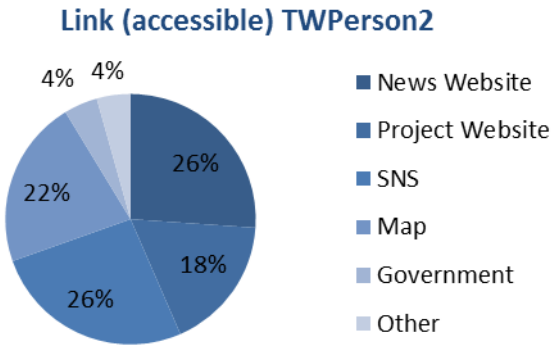

Figure 21. Percentages of the Twitter link categories of TWPerson2.

The links TWPerson2 shared were spread about the different categories similar to the overall links posted in the Twitter network. Most of the tweets led to news websites: *"Stadsoase about creative plans for wasteland IJburg http://at5.nl/s/ipH #AT5 #blt020"*, and to social networking sites: *"Save the date pakhuis de Zwijger about wastelands http://lnkd.in/3myG93 #blt020"*. Furthermore, TWPerson2 posted slightly more links to

the #blt020 Google Map than the average Twitter user in this network. In comparison to TWPerson1, for instance, TWPerson2, thus, linked relatively more often to social networking sites and to the Google Map.

To conclude these results, TWPerson2 tweeted about resources most, but also provided information about upcoming events. Furthermore, TWPerson2 rarely shared personal expressions with its followers. The tweets were informative and sometimes supportive as well. At times, TWPerson2 also used appealing elements in the tweets. TWPerson2 tried to appeal its followers more often than TWPerson1, although the percentage of those tweets was comparatively low as to the rest of the tweets.

The ego-network of TWPerson2 was smaller than that of TWPerson1. This ego-network still contained 92 nodes and 164 edges. Additionally, the ego-network was more dense with 0,02 graph density. The diameter was 4 and the average path length was 2,106. The average degree in this ego-network was 1,783, which was slightly higher than in the entire graph. The modularity was 0,292 with 7 communities identified within this ego-network. The average clustering coefficient was 0,31. Furthermore, there were 73 strongly connected components detected. Figure 22 shows the ego-network of TWPerson2.

If one compared the overall structure of the ego-networks of TWPerson2 and TWPerson1, they would show visible similarities. The basic structure of the three most important persons remained the same. TWPerson2 also connected single nodes to the network which would otherwise not have been part of the Twitter hashtag network. This resembled the structure of the supporting base of TWPerson1 and TWPerson3. What is striking in this ego-network as well, the supporters of TWPerson1 and TWPerson3 seemed to completely disappear in this ego-network. Finally, TWPerson2 also shared some nodes with TWPerson1 and TWPerson3, although it was directly connected to them as well.

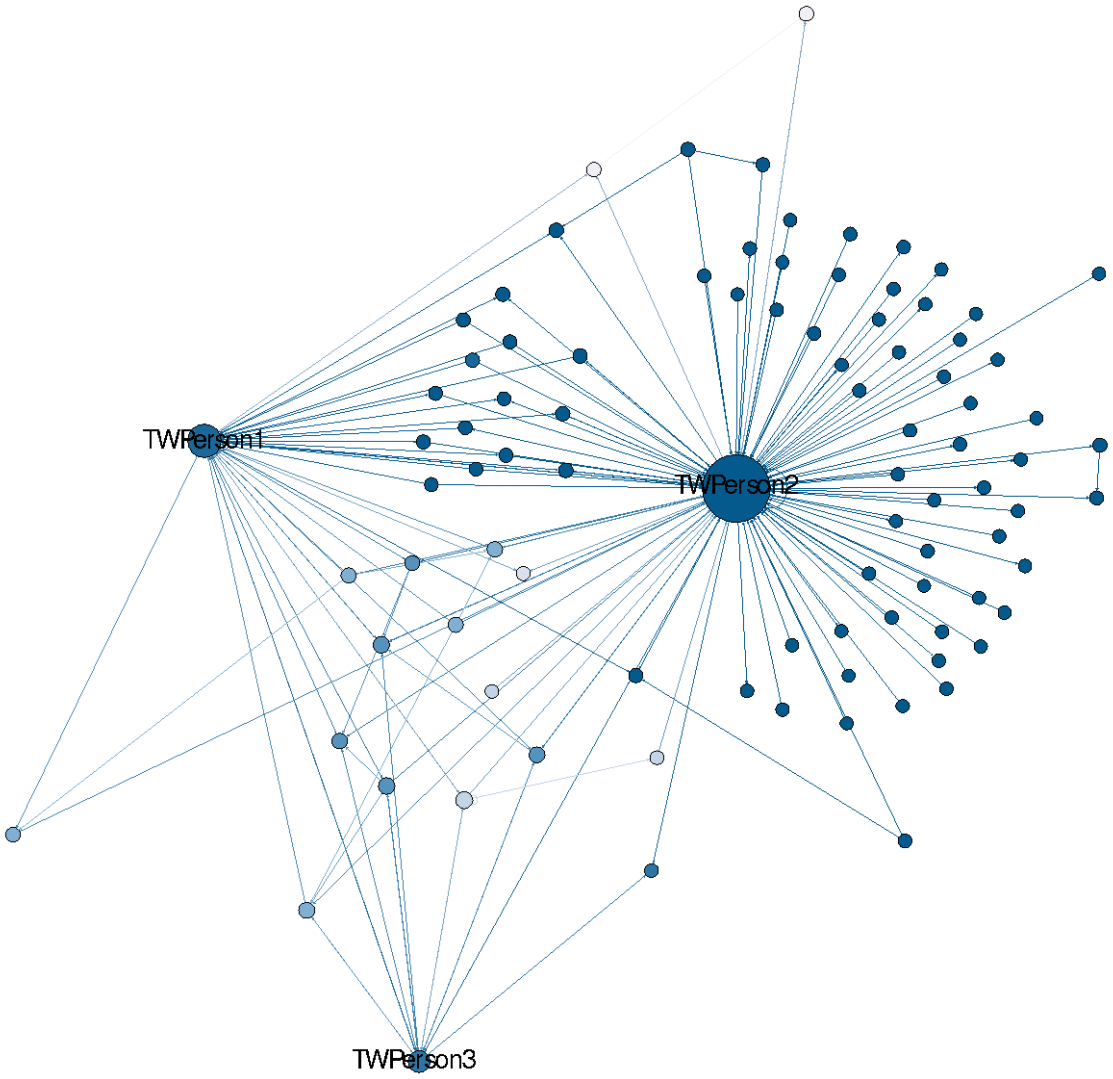

Figure 22. Ego-network of TWPerson2.

TWPerson3

TWPerson3 used 70% of the tweets to refer to resources, about the same amount of the tweets were informative. Again, fewer tweets contained event promotions, and even fewer showed personal expressions. Only 13% of the tweets were supportive, and 10% were appealing, again underrepresented in comparison to the informative sentiment category. Most of the links were social networking sites and project websites (72% of the tweets contain valid links). Fewer links led to the Google Map and to other websites. What was striking about the links posted by TWPerson3 was that only 5% linked to news websites, which was much less than by TWPerson1 and TWPerson2. Figures 23, 24, and 25 display the percentages of each category for TWPerson3.

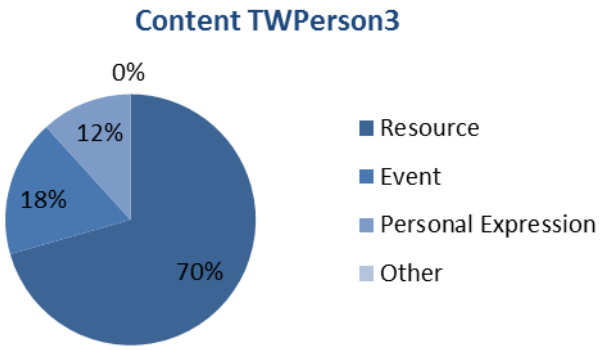

Figure 23. Percentages of the Twitter content categories of TWPerson3.

The content of TWPerson3 was similar to the overall content shared in the Twitter network. Slight differences were that TWPerson3 posted relatively more posts referring to resources and tweeted less about personal expressions. Typical resource tweets were the following: *"There is some gardening going on at the wasteland in the Bellamy neighborhood* […] *#blt020"*, and *"There were 1.000 bulbs planted at the opening temporary usage #020ZO at the market garden Evergreen! #blt020 pic.twitter.com/ cKgKTnAV"*. The following tweet was an example for an event promotion: *"November 3 is national citizens day in #020ZO about active neighborhoods: #bottumup #citizenpower #blt020 #LBD12 http://www.landelijke bewonersdag.nl/"*.

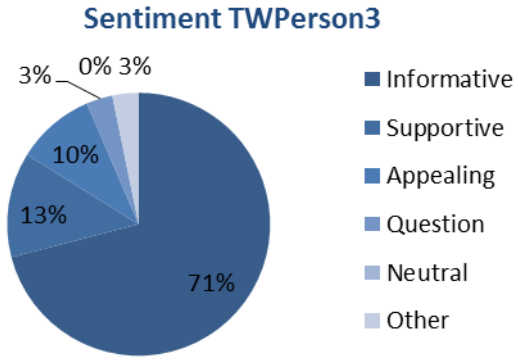

Figure 24. Percentages of the Twitter sentiment categories of TWPerson3.

TWPerson3 mostly shared informative tweets, even slightly more in comparison to the overall sentiment categories of the Twitter network. Typical tweets were: *"Article @BBnieuws* "Happy with the building pit" *about citizens who are thankful for using #wastelands #blt020 http://www.binnenlandsbestuur.nl/ruimte-en-milieu/achtergrond/ achtergrond/blij-met-de-bouwput.8507418.lynkx …"*, or *"Wasteland in The Hague changed by and for citizens into* "Green impact" *http://www.staedion.nl/over_staedion/ nieuws.aspx?id=11105 … #blt070 #blt020"*.

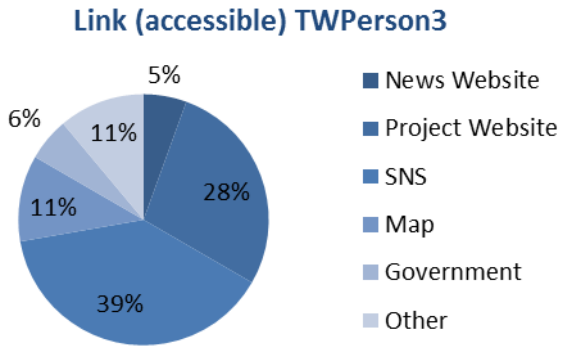

Figure 25. Percentages of the Twitter link categories of TWPerson3.

Whereas TWPerson3 was similar to the content and sentiment categories of TWPerson1 and TWPerson2, and even resembled the overall network, the link categories of TWPerson3 were different. TWPerson3 was the one linking least to news websites, in comparison to the other two important persons on Twitter. What was the most striking difference in the links category TWPerson3 posted was the proportion of links to social networking sites: *"Temporary nature at wasteland in the Amsterdam harbor http://youtu.be/eosdPZBLPt4 #blt020"*, and *"Spring has officially arrived: First vegetable gardeners spotted in market garden Evergreen #blt020 #temporary #020ZO pic.twitter.com/gmsWOHTDGZ"* were typical tweets.

To sum it up, the highest percentage of TWPerson3´s tweets were informative tweets referring to resources, but it also shared personal expressions and promoted some events through Twitter. Some of the tweets were supportive or appealing. TWPerson3 linked to social networking sites and project websites at most, whereas the map, news websites or governmental websites were infrequently linked to.

The ego-network of the TWPerson3 was the smallest out of the three ego-networks with 42 nodes and 89 edges. The average degree within this ego-network was 2,119. The network diameter was 4, with an average path length of 1,975. The density of the ego-network was 0,052, and thus, higher than the density of the entire network, and even higher than the densities of TWPerson1´s and TWPerson2´s ego-networks. The modularity was 0,145 and the average clustering coefficient was 0,288. There were 32 strongly connected components identified in this ego-network. Figure 26 presents the ego-network of TWPerson3.

Although this ego-network was smaller than the other two ego-networks, similarities between all three of them were visible. TWPerson3 shared some nodes with TWPerson1 and TWPerson2, but was also directly connected to them as well. Furthermore, TWPerson3 connected nodes to the entire network which would not have appeared otherwise. These nodes also indicated the follower base of TWPerson3. Again, the supporters of TWPerson1 and TWPerson2 did seem to disappear.

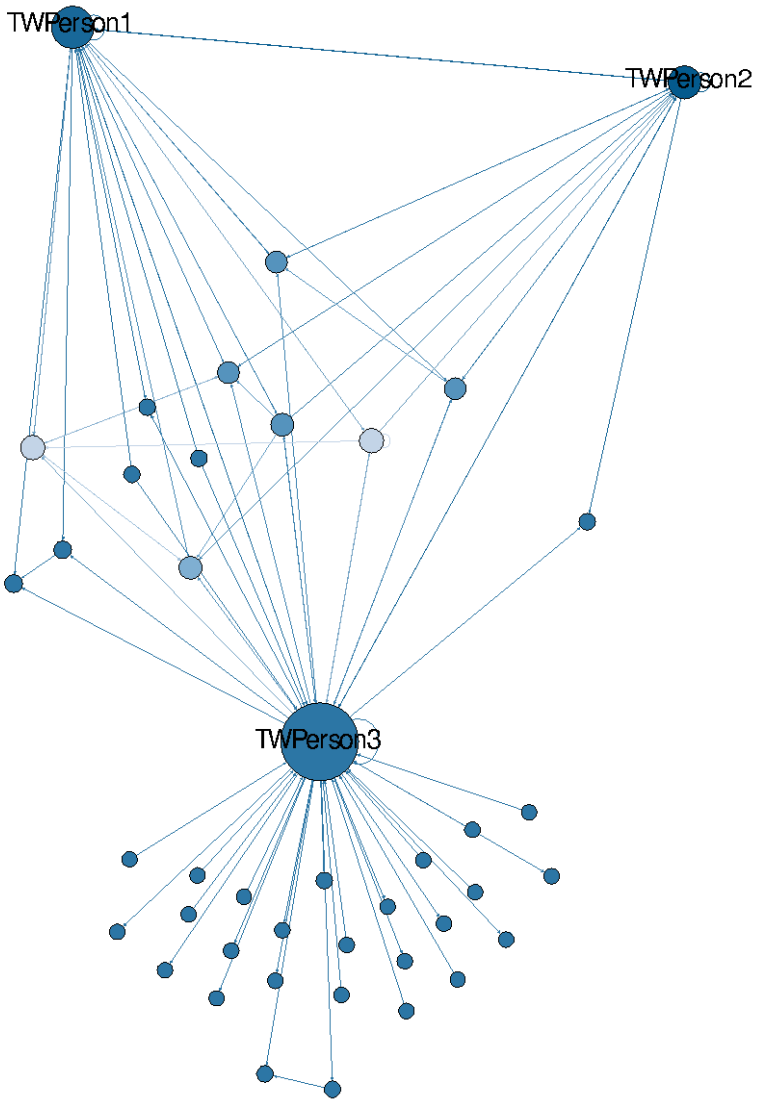

Figure 26. Ego-network of TWPerson3.

5.3. LinkedIn and Twitter

The preceding results showed that both networks of LinkedIn and Twitter differed in their network metrics, their structures, and their members. However, also some similarities were found. This chapter aims at highlighting these differences and similarities.

5.3.1. Direct comparison of the LinkedIn and Twitter networks

In Figure 27, the comparison of the LinkedIn and Twitter networks in time is presented. This figure shows the sum of the networks´ edges[6] which were observed in the months from March 2011 to October 2013. As edges represent the relationships created between the nodes in a network, the edges sum is recognized as indicator for interactive communication in the LinkedIn and Twitter networks. Thus, the edges sum presented in Figure 27 describes the level of activity. Most edges in the LinkedIn group were created in

[6] The edges sum does not represent the number of posts, comments, tweets, and likes. This measure only delineates the number of edges, thus, the sum of the relationships created among the nodes.

the very first month when the Onder-Tussen initiative began to use LinkedIn. After this point, the edges sum line of LinkedIn decreased rapidly, and did not increase to a high level anymore. Many persons in the LinkedIn group have been active for only a few times. Some were promoting their projects or events, but have not actively participated in many discussions after that. Although there were some persons who tried to keep communication on LinkedIn going, the edges sum showed that reactions and likes decreased in time.

When the hashtag #blt020 was first used on Twitter in September 2011, the edges sum of Twitter showed a rather strong increase until January 2012, but this increase did not resist for a long time. In April 2012, also the Twitter edges sum remained rather low. Although it constantly surpassed the edges sum on LinkedIn, the overall activity on Twitter was on a low level. There was one peak visible in December 2012. This was when the Onder-Tussen initiative participated on a talk session for the temporary use of wastelands ("*No time to waste land*" in "*Talk of the town*" in Amsterdam). During this talk session, new developments in Amsterdam were presented and discussed together with initiatives like Onder-Tussen, politicians, developers, creative citizens, etc. on the behalf of urban development and structural designs. For this reason, people of the Onder-Tussen initiative promoted, shared and spread this event throughout their Twitter network. After this point, the edges sum, and thus, the activity level strongly decreased again and did not increase anymore. In the Twitter network, the researcher observed that there were three persons who accounted for most of the activity on Twitter. The rest of the persons did not take a representative role in this network.

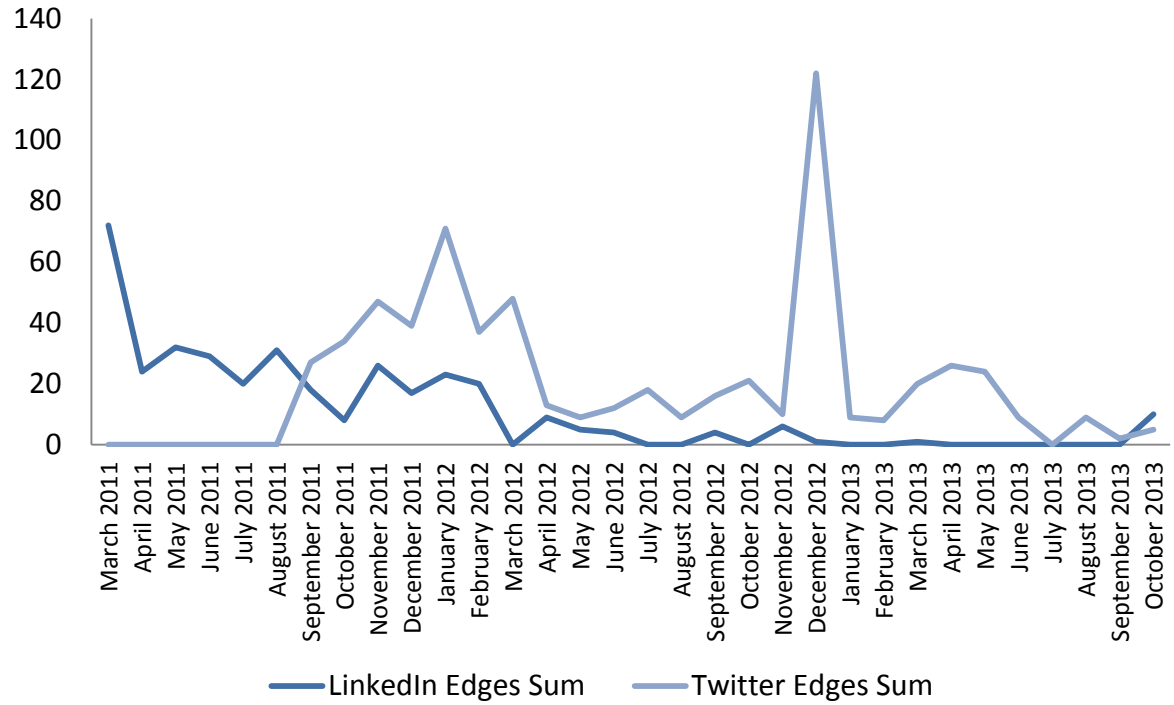

Figure 27. The edges sums of LinkedIn and Twitter in time.

If one now considered graphical representations of the LinkedIn and Twitter networks in direct comparison to each other, more differences would become visible. The probably most striking difference between the two networks was their internal structure, which is shown in direct comparison in Figure 28.

The LinkedIn network on the left was reminiscent of a random network (Barabási & Albert, 1999; Hennig et al., 2012; Newman, 2003; Newman, 2010; Newman, Watts & Barabási, 2006). The biggest fraction of the LinkedIn network seemed to have developed in the very first month LinkedIn was used. Most relationships were built at that point in time. Although there was one central important person (LIPerson1) in the LinkedIn network, the other active persons spread around the center of the network (LIPerson2 and LIPerson3). LIPerson2 created the LinkedIn group and tried to build a community dealing with the topic of wastelands in Amsterdam. LIPerson2 was the initial founder of the LinkedIn group. LIPerson2 was not a government professional, but tried to bring citizens, professionals, and government professionals together in the LinkedIn group. LIPerson1 was such a government professional and did take a prominent role in the LinkedIn network (and later also in the Twitter network). LIPerson3 was not a full-time government official, but a professional networker and part-time consultant for the City of Amsterdam. LIPerson3, thus, functioned as a broker between professionals and government officials.

The Twitter network on the right, in contrast, had a clear triangle structure, with three significant persons each connecting nodes to the network which seemed to form supportive bases for the bigger nodes. These are called hubs and function as brokers within the network (Barabási & Albert, 1999). The Twitter network structure furthermore reminded of some kind of scale-free network (Barabási, 2009; Barabási & Albert, 1999; Barabási & Bonabeau, 2003; Newman, 2003). There were few nodes with a high degree, followed by many others with a low degree. The degree distribution was reminiscent of a power law distribution (Barabási & Albert, 1999; Shirky, 2008; Shirky, 2010; Van Dijk, 2012). Although there were nodes in the LinkedIn network which seemed to have a similar function, this effect was not as distinctive as in the Twitter network. It was found that all three most important persons in the Twitter network were government professionals in Amsterdam. TWPerson1 even turned out to be the same person as LIPerson1. This showed that this network was created by government professionals promoting the temporary use of wastelands. The three most active persons on Twitter accounted for most tweets and relationships in the entire network. They were active for a longer time period than most other nodes in the network.

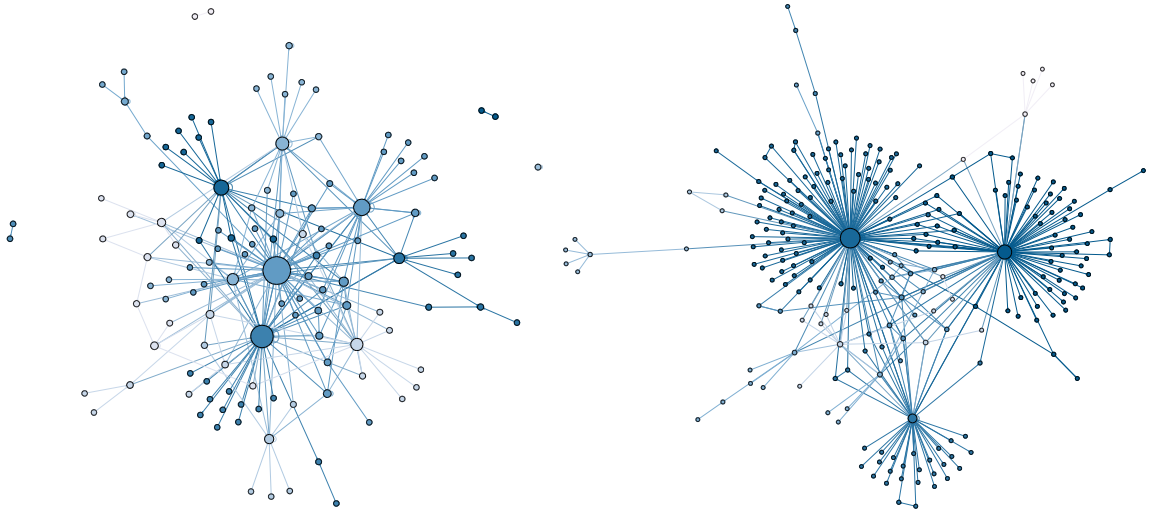

Figure 28. The LinkedIn group network (left) in comparison to the Twitter hashtag network (right).

Besides the visual differences between the networks, the overall integration of both networks seemed rather low. Although in both networks the most important person was identified as the same person, the other important persons did not take similarly important positions in the other networks. LIPerson2 and LIPerson3 did appear in the Twitter network; however, they were not quite active or central within this network. Although TWPerson2 was part of the LinkedIn network as well, its position was not as prominent. And, finally, TWPerson3, who had a clearly important position in the Twitter network, did not appear in the LinkedIn network at all. These differences did not mean that this per se had negative consequences. They just highlighted the different basic structures of the two networks. On LinkedIn, professionals tried to attract both citizens and government professionals to the network. The purpose of this LinkedIn group seemed to focus on sharing information about successful implementations and projects to be able to build a community, some kind of common identity. On Twitter, it was the government professionals who tried to attract citizens and professionals to the network. They focused on information and knowledge sharing, also focusing on successful projects. Furthermore, they set specific events and projects on the public agenda and try to create awareness among as many people as possible. Therefore, the use of Twitter had an agenda-setting function (McCombs & Shaw, 1972).

5.3.2. Triad census of the LinkedIn and Twitter networks

In addition to the overall graphical representations of the LinkedIn and Twitter networks, these networks were also analyzed on the basis of the smallest possible sub-networks, the triads (Davis & Leinhardt, 1972; Hennig et al., 2012; Holland & Leinhardt, 1970; Holland & Leinhardt, 1976; Kadushin, 2012; Van Dijk, 2012; Wasserman & Faust, 1994).

All different types of triads were counted in both networks. The intention was to highlight the most frequent communication patterns in these sub-networks. Table 8 presents the results of the triad census of the LinkedIn and Twitter networks.

Table 8

Triad configurations of the LinkedIn and Twitter networks

MAN	LinkedIn	LinkedIn %	Twitter	Twitter %
003	324587	92,87%	2505745	97,39%
012	20778	5,94%	47961	1,86%
102	873	0,25%	5304	0,21%
021D	123	0,04%	1477	0,06%
021U	1893	0,54%	4202	0,16%
021C	678	0,19%	4898	0,19%
111D	361	0,10%	1960	0,08%
111U	66	0,02%	1154	0,04%
030T	65	0,02%	20	0,00%
030C	4	0,00%	0	0,00%
201	7	0,00%	200	0,01%
120D	40	0,01%	19	0,00%
120U	7	0,00%	22	0,00%
120C	10	0,00%	12	0,00%
210	10	0,00%	21	0,00%
300	2	0,00%	5	0,00%
Total	349504	100%	2573000	100%

Note. "M": mutual dyad; "A": asymmetric dyad; "N": null dyad.

In Table 8, the total number of triads counted highlights the different network sizes. The Twitter network was bigger than the LinkedIn network, thus, resulting in more triads counted. Therefore, the percentages were calculated as well to be able to compare both networks. The most outstanding result showed that most triads were empty (MAN: 003). This basically meant that if one randomly chose three nodes from the networks, they would likely not be connected to each other. These empty sub-networks accounted for almost 93% in the LinkedIn network, and more than 97% of the Twitter network.
This supported the visual impression of two sparsely connected networks. Furthermore, in both networks, the second highest fraction of triad configurations was represented by the triads with only one directed edge (MAN: 012). In the LinkedIn network, this triad configuration accounted for almost 6%, in the Twitter network, this was still almost 2%. Even fewer triads were counted in which there was a mutual directed edge between two of the three nodes (MAN: 102). These first three triad configurations impressively showed that in both networks, the nodes were not highly interconnected.

Additionally, in both networks were only very few triad configurations counted in which one node had two downwards oriented directed edges to the other two nodes (MAN: 021D). For LinkedIn this was 0,04%, and for Twitter 0,06%. This was earlier considered to be a node mentioning others, or reacting to others through comments, replies or likes. In contrast, if one considered the next triad configuration (MAN: 021U), it became visible that in the LinkedIn network there were relatively many nodes which were directly connected to other nodes through upwards oriented edges (0,54%). This was earlier described as someone who receives reactions, comments, likes, or replies from others. For the Twitter network, this configuration did not account for many triads (0,16%). In both networks, there were 0,19% of the triad configurations which described a cyclic relationship between the three nodes (MAN: 021C). All the other triad configurations were represented by considerably lower proportions.

For the interpretation, the triad census could be summarized as follows. There was an overall low level of interactivity in both networks. This was even worse in the Twitter network than in the LinkedIn network. There were few mutual relationships created in both networks. There were some relatively popular nodes in the LinkedIn network who received their reactions from multiple other nodes. For the information and knowledge sharing purposes, these observations indicated that in both networks, information was not evenly spread and discussed within the networks. This effect was even worse on Twitter than on LinkedIn. As was already mentioned in the results described earlier, three persons in the Twitter network accounted for most of the edges. Although there seemed to be a bit more interaction on LinkedIn, the results of the triad census showed that this was rather low as well.

5.4. Concluding evaluations

As this Chapter 5 showed, the evaluation of the findings revealed detailed information about the online social networks and the contents. The evaluation of the three research methods produced differentiated results. This chapter answered the third sub-question of this research: *What is the social capital of the online social media networks of the citizens´ initiative?* The findings showed that most of the actively communicating group members of LinkedIn are merely involved for a short moment. Some of them just post one post or comment, or like someone else´s post. On Twitter, there are especially three individuals who are actively communicating over a longer period of time. Two of these individuals are involved in the LinkedIn network as well.

The comparison of both graphical representations of the online social network shows that the Twitter network basically consists of three central nodes, each with their own supportive base. The LinkedIn network seems more interwoven. However, both networks show a low overall density, which means that there is a rather low level of interactivity in the networks. These findings are supported by the evaluation of the triad census. Another indication for a low interactivity is revealed by the edges sums of the LinkedIn and Twitter networks, which both show the highest values during the beginning

phase of the online social media usage. The peak in the Twitter edges sum in December 2012 can be explained by the talk session about wastelands in Amsterdam. The contents of the discussions on LinkedIn and the Twitter tweets mostly consist of information to create and share knowledge.

The findings presented in this Chapter 5 indicate that the LinkedIn group networks as well as the Twitter network created social capital to the extent that they created some level of group identity. Online communication was used to build social relationships which also facilitated the access to information and knowledge creation within the networks. The online social networks did not automatically create social capital, but the individuals within these networks did by communicating actively. This shows that there is a relationship between online social networks and the creation of social capital, but that this is not an automatic process. If individuals actually engage in online communication, the social capital is strengthened. This can lead to forming a group identity and facilitate the access to resources such as information and knowledge. A practical example is the peak of interactivity in December 2012. If people actively communicate about commonly shared topics, such as the talk session about wastelands in Amsterdam, more online social relationships are created and the fundament for social capital is built.
More interactive communication leads to the exchange of relevant information and the creation of knowledge. If interactive communication is rather low, less relationships and thus, less social capital is created. Therefore, the access to advantageous values and resources is impaired.

Whereas this Chapter 5 presented the results of the evaluation of the research methods, the following Chapter 6 depicts the thorough reflection on the method design itself. Therefore, there are twofold results within this research: the extent to which social capital is created in the case study and in how far the method design is practically useful for these investigating purposes. The following reflection functions as the second results chapter of this design study.

6. Reflection on the method design

This research aimed at developing a practical method for measuring social capital and it applied different research methods to the context of online social media networks. Three analysis techniques were implemented to investigate case data of a citizens´ initiative: online social network analysis method, the triad census, and the content analysis method. Therefore, the researcher reflected on each part of the investigation regarding its feasibility, reliability, and validity. The following sections summarize this reflection.

6.1. The case

The researcher chose for a case study to implement and evaluate the analysis methods. To be able to test different measurement techniques, a case had to be picked which offered essential data for the analyses. As this particular research project was integrated in the broader context of a research executed by Alterra Wageningen UR, the case of the Onder-Tussen initiative was suggested. This case suited the requirements of the research purposes because it relied on a social network structure, and the initiative tried to create social capital for pursuing their commonly shared goals. This case was rather small and did not deliver large amounts of data. Therefore, generalizability of this research would be difficult. The researcher could not deduct general inferences for other cases from the case data of this research. The focus of this investigation was not merely on the case itself, but on the adaptation, implementation, and evaluation of the practical indicators which were derived from the social network analysis, the triad census method, and the content analysis. For this fundamental kind of investigation, a rather manageable data set was more practicable and this is what basically made the thorough and detailed data analyses feasible in the first place.

6.2. Sources of research data and ethical considerations

The Onder-Tussen initiative used a social networking site (LinkedIn) and a microblogging site (Twitter) for extending and strengthening their networks, and for communicating about their projects. Therefore, LinkedIn and Twitter were the sources for the research data. Discussions in the LinkedIn group were publicly available, which made the access to data easy. The same accounted for the Twitter data. Furthermore, this form of availability, the so-called “public by default” setting, reduced ethical considerations to a minimum. Users had to agree to the terms and conditions of LinkedIn and Twitter before starting to use these tools in the first place. If users did not agree with public availability of their online communication, they would have had to choose different publication settings – which are free to be applied by everyone. Data were, furthermore, not actively gathered, but relied on passive collection of existing data. In the course of the broader context of the research project by Wageningen UR, important central individuals of the networks were contacted and asked for their permissions for analyzing their communication online in more detail. They have been informed about the research

objectives, appeared to be interested, and they provided their consents. For privacy issues, their identities have been protected by assigning aliases to these individuals. Furthermore, contents have been translated from Dutch into English, so that tracking identities from cited contents was made improbable. Names have been removed as well.

6.3. Data collection and formatting

As mentioned above, data were gathered by observation of electronic communication tools. This form of data collection was a passive method. Data were voluntarily published by LinkedIn and Twitter users and recorded by LinkedIn and Twitter. Accessing the data was without any effort, as they were publicly available.

Discussions in the LinkedIn group were easily followed, observed, and data were extracted manually. Due to the size of the case, this method was feasible and appropriate. In a next step, the discussions were analyzed referring to the communication network relationships. This evaluation and assignment to the different types of relationships was executed manually as well. Sources and targets of the network relationships were identified and assigned by the researcher.

A Twitter search for the hashtag “#blt020” was executed through the Twitter search tool. All tweets including the hashtag were easily displayed by this search. Furthermore, the researcher added replies and preceding tweets to the data set manually. This method was practicable and assured a data set extension with relevant tweets. Formatting of the Twitter data was also applied manually. Twitter network relationships were identified and defined by the researcher. Due to the medium characteristics of Twitter, these relationships differed from the LinkedIn relationship types. Both network relationship definitions relied on communication networks, and were therefore, appropriate for the following analyses. They were the basis for the online social network analysis. Furthermore, the relationships identified in the LinkedIn and Twitter networks also formed the fundament for the triad census.

For the content analysis, all posts, comments, and tweets were also gathered manually. As one research objective was an in-depth investigation of the content in online social networks, this method of data collection provided the initial impression of communication contents to the researcher. Although it was time-consuming to collect all these data, the researcher invested an appropriate amount of effort in gathering and formatting research data.

In a more extensive research project with a large amount of data, this method would have to be adapted. It might not be appropriate to manually gather data from online social media sites. It would probably excess the capacities regarding time and effort. The researcher would suggest to either collect only a sample of data, or to develop a method to automate data collection, for instance, by analyzing the APIs of the particular social media site, and by extracting relevant data by leveraging a (self-written) software application. When it comes to formatting a large quantity of data, the method used in this research might also not be feasible.

6.4. Development and implementation of practical indicators

The development process of the practical indicators differed per analysis method. There were already existing indicators for social network measures. Although these statistical indicators were originally developed for the analysis of offline social networks, the researcher could adapt these measures to the context of online social media networks. Table 9 summarizes all practical indicators derived from the online social network analysis and describes possible inferences.

Table 9

Practical indicators derived from the online social network analysis

Indicator	Short description
	Network metrics
Graph density	Indicates how well connected a network is internally
Modularity	Indicates the internal community structure of a network
Connected components	Indicates potential isolation of sub-networks within a network
Diameter	Indicates the longest shortest path between all pairs of nodes
	Edge metrics
(average) Path lengths	Indicates the (average) distance between all pairs of nodes
	Node metrics
Degree	Indicates a node´s (general, in- and out-going) level of activity
Betweenness centrality	Indicates how often a node appears on shortest paths between nodes and potential control over information flow in a network (nodes as brokers)
Closeness centrality	Indicates a node´s (average) distance to all other nodes in the network and geographic position within the network
Eccentricity	Indicates the maximum distance of a node to its most distant node in the network
Eigenvector centrality	Indicates a node´s importance based on connections to other important nodes in the network
Clustering coefficient	Indicates how complete the neighborhood of a node is

The difference the researcher had to outline before analyzing the network data was that the online social media networks were defined in terms of communication networks. Actually, for the first time, the intangible concept of social capital became visible. This was earlier indicated in the literature review, and therefore, integrated in the conceptualization of social capital in online social media networks. The researcher defined relationship types according to this conceptualization. As soon as the indicators of the online social network analysis were defined, this technique was implemented by using the software tool Gephi. This tool offered state of the art network visualization and

all relevant network measurement facilities. The different measures were, thus, computed within this software tool.

The relationships mentioned above also formed the basis for the triad census used in this research. Therefore, the indicators derived from the triad configurations implied the definitions of relationship types transcribed to the context of online social media networks. These indicators were, thus, also applicable to online social networks. There are 16 different possible triad configurations. Table 10 shows the practical indicators derived from the triad census and it describes their general levels of (inter)activity.

Table 10

Practical indicators derived from the triad census

Indicator	**Short description**	**Level of activity**
MAN		**low**
003	Empty triad; indicates three null dyads	
012	Indicates only one asymmetric dyad	
102	Indicates only one mutual dyad	
021D	Indicates two downward asymmetric dyads	
021U	Indicates two upward asymmetric dyads	
021C	Indicates two cyclic asymmetric dyads	
111D	Indicates one mutual dyad and one downward dyad	
111U	Indicates one mutual dyad and one upward dyad	
030T	Indicates three asymmetric transitive dyads	
030C	Indicates three asymmetric cyclic dyads	
201	Indicates two mutual dyads	
120D	Indicates one mutual dyad and two downward asymmetric dyads	
120U	Indicates one mutual dyad and two upward asymmetric dyads	
120C	Indicates one mutual dyad and two cyclic asymmetric dyads	
210	Indicates two mutual dyads and one asymmetric dyad	
300	Indicates three mutual dyads	
		high

These 16 triad configurations remained valid, even if the interpretation of the relationship types relied on communication relationships. Therefore, the implementation of the indicators was a rather simple process. It was the conceptualization of social capital which had to be previously defined.

The researcher used content analysis as third analysis method. Content analysis can be a very flexible and adaptable approach to investigate many different kinds of research data. The development of practical indicators for this particular research integrated both conventional and directed approaches to content analysis in this research. The researcher used a bottom-up approach to the analysis of the LinkedIn content, thus, starting with reading and categorizing the content of the discussions. In a further step, the researcher tried to bring the categories in line with existing literature. This was an iterative process, resulting in an appropriate coding scheme for the LinkedIn content. For the Twitter content analysis, the researcher based the categories on an existing coding scheme but adapted it to the actual content of the tweets. This was also an iterative development process. Table 11 describes the indicators derived from the content analysis methods.

Table 11

Practical indicators derived from the content analysis

Indicator	**Short description**
	LinkedIn content analysis
Information	Indicates that the post or comment mainly contains information and was primarily created to share ideas, knowledge, or expertise
Identity	Indicates that the post or comment mainly contains supporting content and was primarily created to build or strengthen a common identity
Action	Indicates that the post or comment mainly contains appealing messages and was primarily created to motivate or activate others to participate and engage
	Twitter content analysis
Content	Indicates which information is actually shared through the tweets; resources, events, or personal expressions
Sentiment	Indicates the intention and the temper of the tweets; informative, supportive, appealing, questioning or neutral
Link	Indicates which links were added to extent the content of the tweets; news or project websites, social networking sites, the Google map, or government websites

Referring to the characteristics of different approaches to content analyses, the researcher recommends appropriate methodological adaptation in future research, according to contingently varying contents, depending on different cases. As the development of the indicators referring to the content analysis was much more complex than the implementation of the quantitative methods, the implementation of these indicators was also a more sophisticated process. Categories and codes had to be constantly evaluated and if necessary, adjusted during implementation.

Additionally, the researcher had to test the coding schemes by asking a second coder to apply the coding schemes to the research data.

6.5. Reliability and validity of the analysis methods

All data were manually accessed, collected, and formatted by the researcher. All data were publicly available and thoroughly recorded by the social media sites of LinkedIn and Twitter. Data were assumed to be complete as when they were gathered. Therefore, the reliability of the data was as high as possible at the moment of data collection. Furthermore, the thorough manual formatting of the data established the basis for the following analyses. This in combination with the conscientious development and implementation of the measurement indicators increased the validity of the analysis techniques. This research is a fundamental investigation of different practical indicators for measuring social capital in online social media networks. It is a first step to the development of a practical measurement method. Referring to this research project, the reliability of the data and analysis methods were sufficient. Furthermore, the researcher was able to analyze and interpret the data according to the research questions. Therefore, also the validity of the data and analysis methods was assessed as sufficient. The detailed documentation of this research allows others to evaluate these methods and to adapt them for future research projects which aim at investigating social capital in online social media networks. Therefore, these methods could also be used in other contexts.

6.6. Potential of online social media networks

Although it is difficult to generalize the results of the case study, the researcher tried to assess the potential to foster the creation of social capital through the use of the online social media tools of LinkedIn and Twitter. The objective of this section is to indicate in how far the measurement indicators for social capital in online social media networks were actually providing insight into possible interventions or practical recommendations when it comes to using online social media for the creation of social capital. Therefore, this section portrays the potential of LinkedIn and Twitter for building online social networks and for fostering the creation of social capital through these networks.

LinkedIn is an online social networking site oriented towards professionals of different business sectors. Users can become a LinkedIn member and a member of LinkedIn groups. These groups may or may not be open for everyone, and communication within these groups may be publicly accessible. Twitter, in general, is public by default. If users do not restrict their tweets from being displayed in public, communication on Twitter might be easier to follow than on LinkedIn. Furthermore, the use of a decent hashtag might help connecting more people with less effort than if a LinkedIn user would first have join a group to connect with others and communicate about a specific topic. Furthermore, participation in conversations and information spreading on Twitter seems almost effortless.

These aspects lead to a first general conclusion regarding the potential of building social capital on online social media sites. On the one hand, Twitter is an appropriate tool to publicly attract people to a specific topic. It can, therefore, be used for agenda-setting purposes, and to foster emerging communication about various concerns. Medium characteristics of Twitter allow spreading information rapidly, and it allows others to easily join a conversation. On the other hand, however, LinkedIn offers the opportunity to directly reach out to professionals in various businesses. Posts and comments on LinkedIn may contain more than 140 characters, and allow for a more detailed and differentiated information sharing than a tweet, even if this tweet contained a link for further information. In contrast to communication on Twitter, LinkedIn conversations can be used for thorough planning of projects, sharing and specifically explaining ideas and opinions, and for developing and defining a group identity and its purpose. It is not that this cannot be realized on Twitter as well, but LinkedIn offers more room for text and additional contents and through the creation of a group on LinkedIn, it sets the foundation for an actual sense of community right away. Members of the group feel that they belong there. This is a motivating aspect for joining a conversation and for actually contributing to the discussions more than once, probably continuously. Twitter does not create that feeling if people just step in the conversation and quickly drop out again. Therefore, Twitter is more a medium which can be used on the fly, whereas LinkedIn creates a more durable platform for more elaborate communication.

In the end, a combination of both social media tools could be an opportunity to create social capital. This idea remains challenging. As this research showed, it is not enough to just start a conversation on either of the social media sites. An appropriate communication strategy has to be developed beforehand, and then this strategy would have to be pursued consequently to be able to achieve a common goal. Building social capital in online social media networks relies strongly on the creation and strengthening of online relationships. These relationships are created by communication. It is not enough to send a specific message out to the public; one-to-many communication is not sufficient in online social media environments. In the end, interactivity and a conversation between many people promise a higher chance of creating social capital; many-to-many communication provides the potential of sharing information and developing knowledge, to motivate and activate people to pursue a common goal – and online social media networks feature this potential inherently.

7. Conclusions

The research objective of this fundamental investigation was the development of a practical method for measuring social capital in online social media networks. The central research question, therefore, focused on this specific objective. As most existing methods to measure social capital had their basis in offline social network contexts, the researcher faced the challenge to translate some of the frequently applied analysis methods into the context of online social media. An integrated literature review about network theory, social capital theory, and online social media led to an adapted conceptualization of social capital in an online social media environment. On the basis of this conceptualization and the presuppositions formulated according to the literature, existing measurement indicators were identified. Furthermore, these methods were implemented and evaluated by means of a case study.

7.1. Conceptualization of social capital

One of the sub-questions of this research responded to the fact that a clear conceptualization of social capital in an online social network environment was missing. Therefore, this sub-question was formulated as follows:

What is an accurate conceptualization of "social capital" in online social media networks?

The researcher reviewed existing literature and used deductive reasoning for developing the presuppositions for an adaptation of the concept of social capital. One aspect within this new conceptualization was the digital character of the online social relationships between individuals. These relationships are built upon online communication. This prerequisite was central in further research activities applied by the researcher. With this in mind, the adapted integrated conceptualization of social capital in online social media networks was formulated as follows:

Social capital in online social media networks is considered as the power of online social relationships built through online communication and the additional value online social networks offer to individuals within these networks, for whole or sub-networks, and between networks.

7.2. Indicators for measuring social capital

The second sub-question asked for measurement indicators of social capital in an online social media network environment. More specifically, the sub-question was formulated as follows:

Which indicators for measuring social capital are applicable to online social media?

As there were already existing methods to investigate social capital, the challenge was to identify practical indicators and to test them using case data from the online social media sites LinkedIn and Twitter. The objective of this question was to figure out in how far the indicators were actually measurable. Indicators were evaluated referring to their applicability to the online social network context. For the online social network analysis, the following practical indicators were identified and implemented: general network metrics, edge metrics, and node metrics. There are some general conclusions one can draw from different network measures. Distance between nodes is an important indicator; the shorter the path lengths, the closer the connection among nodes is, and the faster information can be conveyed between individuals. Thus, a node´s position within the network and its position on shortest paths between other nodes can indicate a structural advantage. For instance, when it comes to accessing information from distant nodes and sharing knowledge among individuals. Generally, a higher level of activity, indicated by a node´s degree, shows the importance of an individual. It at least shows that the individual is interested in and willing to participate and use its capacities to engage for the social goal.

The triad census method was implemented and all 16 triad configurations were identified as practical indicators. The triad configurations describe communication patterns in all triads and indicate global communication processes of the entire network. The less null dyads there are in a triad, the better connected a triad is. Asymmetric dyads are better connected than null dyads. They indicate at least some activity. Mutual dyads are even better connected than asymmetric dyads. Mutual dyads actually indicate interactivity.

There are some general conclusions one can draw from the triad census. The less empty triads there are in a network, the more social relationships there are. Furthermore, in a communication network, the higher the level of activity (null, asymmetric activity, or even mutual interactivity), the higher the chance of information and knowledge sharing is. Ultimately, more valuable communication relationships create more social capital.

Furthermore, the content analysis implemented two different coding schemes, each appropriate for the analysis of the different contents on the online social media sites LinkedIn and Twitter. As content analysis is a rather qualitative method, it is difficult to quantify the value of each indicator. What was important within the context of this research project was to identify sharing and exchange of information and knowledge as resources which individuals can access via their relationships with others within the online social media networks. Furthermore, the researcher identified social bonding and bridging processes through supportive or motivating contents which create or strengthen a commonly shared group identity. Moreover, also appealing and activating contents were identified to assess the level of mobilization within the online social networks. The next sub-chapter 7.3 illustrates the social capital of the Onder-Tussen initiative.

7.3. Social capital of the citizen´s initiative

All the indicators described above helped to investigate the social capital of the citizen´s initiative of Onder-Tussen. The third sub-question of this research focused on just that:

What is the social capital of the online social media networks of the citizens´ initiative?

The researcher implemented and evaluated these indicators and presented the results. This question focused in the objective in how far the indicators for measuring social capital in online social media networks were actually interpretable. The triangulation of analysis methods used in this research allowed for a detailed view on the online social network characteristics and communication patterns, and on the content of the discussions and tweets itself. It is difficult to put all results in a nutshell, but the researcher tried to draw certain conclusions with regard to the social capital of this specific citizen´s initiative in their online social networks.

Overall, both networks of LinkedIn and Twitter were rather sparse. Although they differed in their structures, there were few people who actually did take an important position within the networks. The LinkedIn group was created before the Twitter hashtag campaign started. It was visible that building the LinkedIn network was actually driven by a non-governmental professional who tried to attract other individuals to the group. For some time, professionals, citizens, and government professionals were actively communicating in the group. In contrast to the LinkedIn network, it was observed that the Twitter network was clearly driven by government professionals, due to the fact that the hashtag campaign was created by the city of Amsterdam. Most of the tweets were shared by only three persons. Communication patterns of both online social networks showed that most triad configurations were actually empty. Although there were some asymmetric dyads observed, mutual dyads, and thus, interactivity was very rare.

Contents of the conversations on LinkedIn and of the Twitter tweets were in large part informational and created to share knowledge with others. This finding showed that, although there was a rather small overall level of interactive communication, the online social media networks were actually used to access information and expertise. For this reason, social capital was created supported by building and strengthening some level of group identity. Mobilization and activation of people to actually engage in projects and to attend events was observed less, which shows that in online social media networks, information and knowledge sharing is central and that actual mobilization via these networks might be challenging. At least, this effect is difficult to observe and to measure, as projects and events are actually realized offline. Therefore, the primary objective of the social media usage of the Onder-Tussen initiative was more of an agenda-setting purpose. As all three sub-questions of this research have been answered and summarized in the above sub-chapters 7.1, 7.2, and 7.3, it is now time to draw some general conclusions about the main research question. The following sub-chapter 7.4 explains these conclusions derived from this design study.

7.4. Practical method for measuring social capital

All the questions answered through this research project helped to investigate which methods might be appropriate measurements for social capital in online social media networks. The main research question was formulated as follows:

What is a practical method for measuring social capital in online social media networks?

As Chapters 5 and 6 illustrated, there were two variations of results in this design study. On the one hand, the findings of the case study of the citizens´ initiative. These results indicated that the creation of social capital is actually possible through the use of online social media, but that this is not an automatic process. Individuals can build online social relationships through online communication and a foundation for social capital. The value and competitive advantages of social capital are, however, not effortlessly created. This is not a straight forward process, but requires a certain level of interactivity in the online social networks. In this way, online social media cannot guarantee the creation of social capital and potential additional values, but they can certainly be considered as platforms which can support the construction of online social networks.

On the other hand, the reflections on the method design of this research. This research project applied a practical approach to investigating different analysis techniques for measuring social capital in online social media networks. The researcher reviewed existing literature, developed an eligible conceptualization of social capital for an online context, and chose for triangulation of research methods. Online social networks were based on communication relationships. The thorough social network analysis in combination with the triad census appropriately described the network structures and communication patterns. The content analysis adequately investigated what individuals were actually communicating about. The indicators were actually measurable and interpretable. With these methods combined, the researcher was able to present a detailed picture of networking processes which create social capital in online social media. Furthermore, the results provided insight into practical recommendations regarding the use of online social networks for fostering the creation of social capital.

7.1. Future research

This research showed that it was essential to evaluate existing definitions of social capital and to develop an integrated conceptualization which fitted the context of an online social media network environment. Furthermore, existing methods for measuring social capital could also be adapted, as the researcher considered the specific conceptual characteristics. With every method and metrics the researcher elaborately chose, constant reflection was crucial.

Future research would have to choose practical indicators, maybe based on the analysis methods used in this research. In any case, these indicators would have to be carefully evaluated referring to the case or cases chosen, and if necessary,

the researchers would have to adapt the methodology before implementing it straight away. Especially, a content analysis method would have to be adapted to the specific case and its data. As mentioned earlier in this report, there are ways to use different data sources, such as other social media and social networking sites (e.g. Facebook, Google+, etc.). The methods used in this research are potentially applicable to other network data and contents. Depending on the amount of data, data collection and formatting methods would probably have to be automated. All in all, the researcher suggests to carefully define the concepts to be studied and to place these concepts into their appropriate contexts. Then, this research could actually serve as inspiration for future research projects for measuring social capital in online social media networks.

Literature

Aarts, H., & Dijksterhuis, A. (2000). Habits as knowledge structures: Automaticity in goal directed behavior. *Journal of Personality and Social Psychology, 78*(1), pp. 53-63. DOI: 10.1037//0022-3514.78.1.53

Aarts, H., Verplanken, B., & Knippenberg, A. (1998). Predicting behavior from actions in the past: Repeated decision making or a matter of habit? *Journal of Applied Social Psychology, 28*(15), pp. 1355-1374. DOI: 10.1111/j.1559-1816.1998.tb01681.x

Albert, R., & Barabási, A.-L. (2002). Statistical mechanics of complex networks. *Reviews of Modern Physics, 74*(1), pp. 47-97. DOI: 10.1103/RevModPhys.74.47

Barabási, A.-L. (2009). Scale-free networks: A decade and beyond. *Science, 325*(5939), pp. 412-413. DOI: 10.1126/science.1173299

Barabási, A.-L. (2014). *Linked: How everything is connected to everything else.* New York: Basic Books.

Barabási, A.-L., & Albert, R. (1999). Emergence of scaling in random networks. *Science, 286*(5439), pp. 509-512. DOI: 10.1126/science.286.5439.509

Barabási, A.-L., & Bonabeau, E. (2003). Scale-Free Networks. *Scientific American, 288*(5), pp. 50-59. DOI: 10.1038/scientificamerican0503-60

Barnes, J., & Hut, P. (1986). A hierarchical O(N log N) force-calculation algorithm. *Nature, 324*, pp. 446-449. DOI: 10.1038/324446a0

Bastian, M., Heymann, S., & Jacomy, M. (2009). Gephi: An open source software for exploring and manipulating networks. In *Proceedings of the Third International AAAI Conference on Weblogs and Social Media (ICWSM'09)*, San Jose, California. Retrieved on February 17, 2014 via: http://www.aaai.org/ocs/index.php/ICWSM/09/paper/viewFile/ 154Forum/1009

Berg, B. L., Lune, H. (2014). *Qualitative research methods for the social sciences* (8th edition). Essex, England: Pearson Education Limited.

Bernard, H. R. (2011). *Research methods in anthropology: Qualitative and quantitative approaches* (5th edition). Lanham, MD, New York, Toronto, Oxford, England: Altamira Press.

Blondel, V. D., Guillaume, J.-L., Lambiotte, R., & Lefebvre, E. (2008). Fast unfolding of communities in large networks. *Journal of Statistical Mechanics: Theory and Experiment, 10*, P10008. DOI: 10.1088/1742-5468/2008/10/P10008

Boase, J., Horrigan, J. B., Wellman, B., & Rainie, L. (2006). *The strength of internet ties*. Washington, D.C.: Pew Internet & American Life Project. Retrieved on January 20, 2015 via: http://www.pewinternet.org/files/old-media//Files/Reports/2006/PIP_Internet_ties.pdf.pdf

Bohn, A., Buchta, C., Hornik, K., & Mair, P. (2014). Making friends and communicating on Facebook: Implications for the access to social capital. *Social Networks, 37*, pp. 29-41. DOI: 10.1016/j.socnet.2013.11.003

Bolino, M. C., Turnley, W. H., & Bloodgood, J. M. (2002). Citizenship behavior and the creation of social capital in organizations. *The Academy of Management Review, 27*(4), pp. 505-522. Retrieved on February 17, 2014 via: http://www.jstor.org/stable/4134400

Bordewijk, J. L., & Van Kaam, B. (1982). *Allocutie: Enkele gedachten over communicatievrijheid in een bekabeld land*. Baarn: Bosch and Keuning.

Borgatti, S. P., & Molina, J. L. (2003). Ethical and strategic issues in organizational social network analysis. *Journal of Applied Behavioral Science, 39*(3), pp. 337-349. DOI: 10.1177/0021886303258111

Bourdieu, P. (1983). Forms of capital. In J. C. Richards (Eds.), *Handbook of Theory and Research for the Sociology of Education*. New York: Greenwood Press.

Bourdieu, P. (1986). The forms of social capital. In S. Baron, J. Field, & T. Schuller (Eds.), *Social Capital Critical Perspectives*. Oxford, England: Oxford University Press.

Boyd, D. M., & Ellison, N. B. (2007). Social network sites: Definition, history, and scholarship. *Journal of Computer-Mediated Communication, 13*(1), pp. 210-230. DOI: 10.1111/j.1083-6101.2007.00393.x

Brandes, U. (2001). A faster algorithm for betweenness centrality. *Journal of Mathematical Sociology, 25*(2), pp. 163-177. DOI: 10.1080/0022250X.2001.9990249

Brandes, U. (2008). On variants of shortest-path betweenness centrality and their generic computation. *Social Networks, 30*(2), pp. 136-145. DOI: 10.1016/j.socnet.2007.11.001

Brunsting, S. & Postmes, T. (2002). Social movement participation in the digital age: Predicting offline and online collective action. *Small Group Research, 33*(5), pp. 525-554. DOI: 10.1177/104649602237169

Burt, R. (1995). Structural Holes: The Social Structure of Competition. Cambridge, MA: Harvard University Press.

Burt, R. S. (2000). The network structure of social capital. *Research in Organizational Behaviour, 22*, pp. 345-423. DOI: 10.1016/S0191-3085(00)22009-1

Callaway, D. S., Newman, M. E. J., Strogatz, S. H., & Watts, D. J. (2000). Network robustness and fragility: Percolation on random graphs. *Physical Review Letters, 85*(25), pp. 5468-5471. DOI: 10.1103/PhysRevLett.85.5468

Castells, M. (2000a). *The rise of the network society. The information age: Economy, society and culture*. Cambridge, MA: Blackwell.

Castells, M. (2000b). Materials for an exploratory theory of the network society. *The British Journal of Sociology, 51*(1), pp. 5-24. DOI: 10.1111/j.1468-4446.2000.00005.x

Castells, M. (2012). *Networks of outrage and hope. Social movements in the internet age*. Cambridge, MA: Polity Press.

Castells, M. (2013). *Communication power*. Oxford, England: Oxford University Press.

Chang, H. H., & Chuang, S.-S. (2011). Social capital and individual motivations on knowledge sharing: Participant involvement as a moderator. *Information & Management*, *48*(1), pp. 9-18. DOI: 10.1016/j.im.2010.11.001

Chew, C. M. (2010). *Pandemics in the age of Twitter: A content analysis of the 2009 H1N1 outbreak* (Unpublished master´s thesis). Department of Health Policy, Management and Evaluation, University of Toronto.

Chew, C. M., & Eysenbach, G. (2010). Pandemics in the age of Twitter: Content analysis of tweets during the 2009 H1N1 outbreak. *PLoS ONE, 5*(11): e14118, pp. 1-13. DOI: 10.1371/journal.pone.0014118

Cohen, J. (1960). A coefficient of agreement for nominal scales. *Educational and Psychological Measurement, 20*(1), pp. 37-46. DOI: 10.1177/001316446002000104

Coleman, J. S., (1988). Social capital in the creation of human capital. *American Journal of Sociology, 94*, pp. 95-120. Retrieved on February 17, 2014 via: http://www.jstor.org/ stable/2780243

Coleman, J. S. (1990; 1994). *Foundations of social theory*. Cambridge, MA: Harvard University Press.

Cummings, J., Butler, B., & Kraut, R. (2002). The quality of online social relationships. *Communications of the ACM, 45*(7), pp. 103-108. DOI: 10.1145/514236.514242

Daft, R. L., & Lengel, R. H. (1984). Information richness: A new approach to managerial behavior and organizational design. In L. L. Cummings & B. M. Staw (Eds.), *Research in organizational behavior 6* (pp. 191-233). Homewood, Il: JAI Press.

Daft, R. L., & Lengel, R. H. (1986). Organizational information requirements, media richness and structural design. *Management Science, 32*(5), pp. 554-571. DOI: 10.1287/mnsc.32.5.554

Davis, J. A., & Leinhardt, S. (1972). The structure of positive interpersonal relations in small groups. In J. Berger (Ed.), *Sociological theories in progress: Volume 2* (pp. 218-251). Boston, MA: Houghton Mifflin.

Ellison, N. B. & Boyd, D. M. (2013). Sociality through social network sites. In W. H. Dutton (Ed.), *The Oxford Handbook of Internet Studies* (pp. 151-172). Oxford, England: Oxford University Press.

Fowler, Jr., F. J. (2009). *Survey research methods* (4th edition). Thousand Oaks, CA: Sage Publications.

Freeman, L. C. (1977). A set of measures of centrality based upon betweenness. *Sociometry, 40*(1), pp. 35-41. DOI: 10.2307/3033543

Freeman, L. C. (1979). Centrality in social networks: Conceptual clarification. *Social Networks, 1*(3), pp. 215-239. DOI: 10.1016/0378-8733(78)90021-7

Fulk, J., & Collins-Jarvis, L. (2001). Wired meetings: Technological mediation of organizational gatherings. In L.L. Putnam & F.M. Jablins (Eds.), *New handbook of organizational communication* (2nd edition., pp. 624-703). Newbury Park, CA: Sage Publications.

Fulk, S., & Steinfeld, C. (1990). *Organizations and communication technology*. Newbury Park, CA, London, New Delhi: Sage Publications.

Fulk, J., Steinfeld, C., Schmitz, J., & Power, J. G. (1987). A social information processing model of media use in organizations. *Communication Research, 14*(5), pp. 529-552. DOI: 10.1177/009365087014005005

Ganley, D., & Lampe, C. (2005). The ties that bind: Social network principles in online communities. *Decision Support Systems*, *47*, pp. 266-274. DOI: 10.1016/j.dss.2009.02.013

Gephi (2011a). Graph density [Wiki entry]. Retrieved on July 7, 2014 via: https://wiki.gephi.org/index.php/Graph_Density

Gephi (2011b). Modularity [Wiki entry]. Retrieved on July 7, 2014 via: https://wiki.gephi.org/index.php/Modularity

Gephi (2011c). Connected components [Wiki entry]. Retrieved on July 7, 2014 via: https://wiki.gephi.org/index.php/Connected_Components

Gephi (2011d). Diameter [Wiki entry]. Retrieved on July 7, 2014 via: https://wiki.gephi.org/index.php/Diameter

Gephi (2011e). Avg path length [Wiki entry]. Retrieved on July 7, 2014 via: https://wiki.gephi.org/index.php/Avg_Path_Length

Gephi (2011f). Degree [Wiki entry]. Retrieved on July 7, 2014 via: https://wiki.gephi.org/index.php/Degree

Gephi (2011g). Betweenness centrality [Wiki entry]. Retrieved on July 7, 2014 via: https://wiki.gephi.org/index.php/Betweenness_Centrality

Gephi (2011h). Closeness centrality [Wiki entry]. Retrieved on July 7, 2014 via: https://wiki.gephi.org/index.php/Closeness_Centrality

Gephi (2011i) Eigenvector centrality [Wiki entry]. Retrieved on July 7, 2014 via: https://wiki.gephi.org/index.php/Eigenvector_Centrality

Gephi (2011j). Avg clustering coefficient [Wiki entry]. Retrieved on July 7, 2014 via: https://wiki.gephi.org/index.php/Avg_Clustering_Coefficient

Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory. Strategies for qualitative research*. New Brunswick, NJ, London: Aldine Transaction.

Goffman, E. (1959). *The presentation of self in everyday life*. New York: Doubleday Anchor Books.

Granovetter, M. S. (1973). The strength of weak ties. *American Journal of Sociology, 78* (6), pp. 1360-1380. Retrieved on February 17, 2014 via: https://sociology.stanford.edu/sites/default/files/publications/the_strength_of_weak_ties_and_exch_w-gans.pdf

Granovetter, M. S. (1983). The strength of weak ties: A Network theory revisited. *Sociological Theory, 1*, pp. 201-233. Retrieved on February 17, 2014 via: http://www.jstor.org/stable/202051

Granovetter, M. S. (2005). The impact of social structure on economic outcomes. *Journal of Economic Perspectives, 19*(1), pp. 33-50. DOI: 10.1257/0895330053147958

Grootaert, C., Narayan, D., Jones, V. N., & Woolcock, M. (2004). Measuring social capital. World Bank Working Paper No. 18. Washington, D.C.: World Bank.

Helliwell, J. F., & Putnam, R. D. (2004). The social context of well-being. *Philosophical Transactions of the Royal Society B: Biological Sciences, 359*(1449), pp. 1435-1446. DOI: 10.1098/rstb.2004.1522

Hennig, M., Brandes, U., Pfeffer, J., & Mergel, I. (2012). *Studying social networks: A guide to empirical research.* Frankfurt, New York: Campus Verlag.

Heymann, S. (*n.d.*) Gephi. Unpublished Manuscript, LIP6, ComplexNetworks team, Université Pierre et Marie Curie, Paris, France. Retrieved on February 17, 2014 via: http://sebastien.pro/gephi-esnam.pdf

Holland, P. W., & Leinhardt, S. (1970). A method for detecting structure in sociometric data. *American Journal of Sociology, 76*(3), pp. 492-513. Retrieved on August 19, 2014 via: http://www.jstor.org/stable/2775735

Holland, P. W., & Leinhardt, S. (1976). The statistical analysis of local structure in social networks. In D. R. Heise (Ed.), *Sociological Methodology* (pp. 1-45). San Francisco, CA: Jossey-Bass.

Huberman, B. A., Romero, D. M., & Wu, F. (2009). Social networks that matter: Twitter under the microscope. *First Monday, 14*(1-5). DOI: http://dx.doi.org/10.5210/fm.v14i1.2317

Hsieh, H. F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research, 15*(9), pp. 1277-1288. DOI: 10.1177/1049732305276687

Julien, H. (2008). Content analysis. In L. M. Given (Ed.), *The SAGE encyclopedia of qualitative research methods* (Volumes 1 & 2, pp. 120-122). Los Angeles, CA, London, New Delhi, Singapore: Sage Publications.

Kadushin, C. (2012). *Understanding social networks: Theories, concepts, and findings.* Oxford, England: Oxford University Press.

Kaplan, A. M., & Haenlein, M. (2010). Users of the world, unite! The challenges and opportunities of social media. *Business Horizons, 53*(1), pp. 59-68. DOI: 10.1016/j.bushor.2009.09.003

Kaplan, A. M., & Haenlein, M. (2011). The early bird catches the news: Nine things you should know about micro-blogging. *Business Horizons, 54*(2), pp. 105-113. DOI: 10.1016/j.bushor.2010.09.004

Katz, J. E., & Rice, R. E. (2002). *Social consequences of internet use, access, involvement, and interaction*. Cambridge, MA, London: The MIT Press.

Lambiotte, R., Delvenne, J.-C., & Barahona, M. (2009). Laplacian dynamics and multiscale modular structure in networks. arXiv:0812.1770v3. Retrieved on February 17, 2014 via: http://arxiv.org/pdf/0812.1770.pdf

Latapy, M. (2008). Main-memory triangle computations for very large (sparse (power-law)) graphs. *Theoretical Computer Science, 407*(1-3), pp. 458-473. DOI: 10.1016/j.tcs.2008.07.017

Lenhart, A. (2009). *Adults and social networking websites*. Pew internet project data memo. Washington, D.C.: Pew Internet & American Life Project. Retrieved on January 20, 2015 via: http://www.pewinternet.org/files/old-media//Files/Reports/2009/PIP_Adult_social_networking_data_memo_FINAL.pdf.pdf

LinkedIn (2015a). About LinkedIn. Company Information. Retrieved on January 22, 2015 via: https://press.linkedin.com/about-linkedin

LinkedIn (2015b). About us. Retrieved on January 22, 2015 via: https://www.linkedin.com/about-us

LinkedIn (2015c). LinkedIn. LinkedIn profile. Retrieved on January 22, 2015 via: https://www.linkedin.com/company/linkedin

LinkedIn (2015d). Profile – Overview. Retrieved on January 22, 2015 via: https://help.linkedin.com/app/answers/detail/a_id/15493/kw/profile

LinkedIn (2015e). Editing your profile. Retrieved on January 22, 2015 via: https://help.linkedin.com/app/answers/detail/a_id/5/kw/profile/related/1

LinkedIn (2015f). LinkedIn public profile – Overview and settings. Retrieved on January 22, 2015 via: https://help.linkedin.com/app/answers/detail/a_id/83/kw/profile/related/1

LinkedIn (2015g). What people can see on your profile. Retrieved on January 22, 2015 via: https://help.linkedin.com/app/answers/detail/a_id/77/kw/profile/related/1

LinkedIn (2015h). Connections - Overview. Retrieved on January 22, 2015 via: https://help.linkedin.com/app/answers/detail/a_id/15495/kw/overview +connection

LinkedIn (2015i). Your network and degrees of connection. Retrieved on January 22, 2015 via: https://help.linkedin.com/app/answers/detail/a_id/110/ft/eng

LinkedIn (2015j). Controlling who sees your connections list. Retrieved on January 22, 2015 via: https://help.linkedin.com/app/answers/detail/a_id/52/ft/eng

LinkedIn (2015k). Groups – Getting started. Retrieved on January 22, 2015 via: https://help.linkedin.com/app/answers/detail/a_id/1164/kw/overview+group/ related/1

LinkedIn (2015l). Members-only groups and open groups - Overview. Retrieved on January 22, 2015 via: https://help.linkedin.com/app/answers/detail/ a_id/4780/kw/ overview+group

LinkedIn (2015m). Starting a discussion in groups. Retrieved on January 22, 2015 via: https://help.linkedin.com/app/answers/detail/a_id/1622/kw/discussions/ related/1

LinkedIn (2015n). Adding comments to group discussions. Retrieved on January 22, 2015 via: https://help.linkedin.com/app/answers/detail/a_id/1623/kw/discussions

LinkedIn (2015o). Like and unlike – Group discussions. Retrieved on January 22, 2015 via: https://help.linkedin.com/app/answers/detail/a_id/4091/kw/discussions

Marsden, P. V. (2005). Recent developments in network measurement. In P. J. Carrington, J. Scott, and S. Wasserman (Eds.), *Models and methods social network analysis* (pp. 8-30). New York: Cambridge University Press.

McCombs, M. E., & Shaw, D. L. (1972). The agenda-setting function of mass media. The Public Opinion Quarterly, 36(2), pp. 176-187. DOI: 10.1086/267990

McCurdy, D. W., Spradley, J. P., & Shandy, D. J. (2005). *The cultural experience: Ethnography in complex society*. Long Grove, IL: Waveland Press.

Mintz, B. A., & Schwartz, M. (1985). *The power structure of American business*. Chicago, IL: University of Chicago Press.

Morgan, D. L. (1993). Qualitative content analysis: A guide to paths not taken. *Qualitative Health Research, 3*(1), pp. 112-121. DOI: 10.1177/104973239300300107

Muniz, A. M., & O´Guinn, T. C. (2001). Brand Community. *Journal of Consumer Research, 27*(4), pp. 412-432. DOI: 10.1086/319618

Nahapiet, J., & Ghoshal, S. (1998). Social capital, intellectual capital and the organizational advantage. *Academy of Management Review, 23*(2), pp. 242-266. Retrieved on July 13, 2013 via: http://www.jstor.org/stable/259373

Newman, M. E. J. (2003). The structure and function of complex networks. *Society for Industrial and Applied Mathematics, 45(*2), pp. 167-256. DOI: 10.1137/S003614450342480

Newman, M. E. J. (2005). A measure of betweenness centrality based on random walks. *Social Networks, 27*(1), pp. 39-54. DOI: 10.1016/j.socnet.2004.11.009

Newman, M. E. J. (2006). Modularity and community structure in networks. *Proceedings of the National Academy of Sciences of the United States of America, 103*(23), pp. 8577-8696. DOI: 10.1073/pnas.0601602103

Newman, M. E. J. (2010). *Networks: An Introduction*. Oxford, England: Oxford University Press.

Newman, M. E. J., Watts, D. J., & Barabási, A.-L. (2006). *The Structure and Dynamics of Networks*. Princeton, NJ, Oxford, England: Princeton University Press.

Parks, M. (2010). Who are Facebook friends? Exploring the composition of Facebook friend networks. In 60th Annual Conference of the International Communication Association, Singapore.

Pieterson, W. (2009). *Channel choice: Citizens´ channel behavior and public service channel strategy* (Ph.D Thesis, University of Twente, Enschede). Retrieved on January 20, 2015 via: http://doc.utwente.nl/60789/1/thesis_W_Pieterson.pdf

Pieterson, W., & Van Dijk, J. A. G. M. (2007). Channel choice determinants; an exploration of the factors that determine the choice of a service channel in citizen initiated contacts. In *Proceedings of the 8th annual international conference on Digital government research: bridging disciplines & domains* (pp. 173-182). Philadelphia, PA. Retrieved on January 20, 2015 via: http://www.utwente.nl/ctit/cfes/docs/en_artikelen/2007-Channel_Choice_Determinants.pdf

Poortinga, W. (2012). Community resilience and health: The role of bonding, bridging, and linking aspects of social capital. *Health & Place, 18*, pp. 286-295. DOI: 10.1016/j.healthplace.2011.09.017

Putnam, R. D. (1995). Bowling alone: America's declining social capital. *Journal of Democracy, 6*(1), pp. 65-78. DOI: 10.1353/jod.1995.0002

Putnam, R. D. (1996). Tuning in tuning out: The strange disappearance of social capital in America. *PS: Political Science and Politics, 28*(4), pp. 664-683. DOI: 10.2307/420517

Putnam, R. D. (2000). *Bowling alone: The collapse and revival of American community*. New York: Touchstone.

Putnam, R. D. , Leonardi, R., & Nannetti, R. (1993). *Making democracy work: Civic traditions in modern Italy*. Princeton, NJ: Princeton University Press.

Quan-Haase, A., Wellman, B., Witte, J. C., & Hampton, K. (2002). Capitalizing on the net: Social contact, civic engagement, and sense of community. In B. Wellman & C. Haythornthwaite (Eds.), *The internet in everyday life*. Malden, MA, Oxford, England: Blackwell.

Robinson, J., DiMaggio, P., & Hargittai, E. (2003). New social survey perspectives on the digital divide. *IT & Society, 1*(5), pp. 1-22. Retrieved on January 20, 2015 via: http://www.ec.tuwien.ac.at/~dieter/teaching/GmA/Robinson2003.pdf

Rost, K. (2011). The strength of strong ties in the creation of innovation. *Research Policy, 40*, pp. 588-604. DOI: 10.1016/j.respol.2010.12.001

Rothbauer, P. M. (2008). Triangulation. In L. M. Given (Ed.), *The SAGE encyclopedia of qualitative research methods* (Volumes 1 & 2, pp. 892-894). Los Angeles, CA, London, New Delhi, Singapore: Sage Publications.

Sabidussi, G. (1966). The centrality index of a graph. *Psychometrika, 31*(4), pp. 581-603. DOI: 10.1007/BF02289527

Salverda, I., Van der Jagt, P., Willemse, R., Onwezen, M., & Top, J. (2013). *Sociale media: Nieuwe wegen naar sociale innovatie.* Zo Doen Wij Dat Hier. Retrieved June 20, 2013 via: http://www.wageningenur.nl/upload_mm/a/3/4/b0bf886a-5437-47fc-831f- 982dfa74452f_ZDWDH%20%234.pdf

Sassenberg, K., & Postmes, T. (2002). Cognitive and strategic processes in small groups: Effects of anonymity of the self and anonymity of the group on social influence. *British Journal of Social Psychology, 41*(3), pp. 463-480. DOI: 10.1348/014466602760344313

Schau, H. J., & Gilly, M. C. (2003). We are what we post? Self-presentation in personal web space. *Journal of Consumer Research, 30*(3), pp. 385-404. DOI: 10.2307/3132017

Shirky, C. (2008). *Here comes everybody*. New York, London: Penguin Books.

Shirky, C. (2010). *Cognitive surplus*. New York, London: Penguin Books.

Short, J., Williams, E., & Christie, B. (1976). *The social psychology of telecommunications*. London: John Wiley.

Shumate, M., & Lipp, J. (2008). Connective collective action online: An examination of the hyperlink network structure of an NGO issue network. *Journal of Computer-Mediated Communication, 14*, pp. 178-201. DOI: 10.1111/j.1083-6101.2008.01436.x

Spears, R., & Lea, M. (1992). Social influence and the influence of the "Social" in computer-mediated communication. In M. Lea (Ed.), *Contexts of computer-mediated communication* (pp. 30-65). Hemel Hempstead: Harvester Wheatsheaf.

Strogatz, S. H. (2001). Exploring complex networks. *Nature, 410*(6825), pp. 268-276. DOI:10.1038/35065725

Tarjan, R. (1972). Depth-first search and linear graph algorithms. *SIAM Journal on Computing, 1*(2), pp. 146-160. DOI: 10.1137/0201010

Twitter, Inc. (2014a). Getting started with Twitter. Retrieved on March 11, 2015 via: https://support.twitter.com/articles/215585-getting-started-with-twitter

Twitter, Inc. (2014b). Customizing your profile. Retrieved on March 11, 2015 via: https://support.twitter.com/articles/127871-how-to-change-your-profile-picture-or-information

Twitter, Inc. (2014c). The Twitter glossary. Retrieved on March 11, 2015 via: https://support.twitter.com/groups/50-welcome-to-twitter/topics/204-the-basics/articles/166337-the-twitter-glossary

Twitter, Inc. (2014d). About public and protected Tweets. Retrieved on March 11, 2015 via: https://support.twitter.com/articles/14016-about-public-and-protected-tweets

Twitter, Inc. (2014e). Using hashtags on Twitter. Retrieved on March 11, 2015 via: https://support.twitter.com/groups/50-welcome-to-twitter/topics/204-the-basics/articles/49309-using-hashtags-on-twitter

Twitter, Inc. (2014f). Using Twitter search. Retrieved on March 11, 2015 via: https://support.twitter.com/articles/132700

Twitter, Inc. (2014g). FAQs about following. Retrieved on March 11, 2015 via: https://support.twitter.com/articles/14019-what-is-following

Twitter, Inc. (2014h). What's a Twitter timeline?. Retrieved on March 11, 2015 via: https://support.twitter.com/groups/50-welcome-to-twitter/topics/204-the-basics/articles/164083-what-s-a-twitter-timeline

Twitter, Inc. (2014i). FAQs about Retweets (RT). Retrieved on March 11, 2015 via: https://support.twitter.com/groups/50-welcome-to-twitter/topics/203-faqs/articles/77606-faqs-about-retweets-rt

Twitter, Inc. (2014j). What are @replies and mentions?. Retrieved on March 11, 2015 via: https://support.twitter.com/groups/50-welcome-to-twitter/topics/204-the-basics/articles/14023-what-are-replies-and-mentions

Twitter, Inc. (2015a). A selection of memorable moments from our company. Retrieved on March 11, 2015 via: https://about.twitter.com/milestones

Twitter, Inc. (2015b). Our mission: To give everyone the power to create and share ideas and information instantly, without barriers. Retrieved on March 11, 2015 via: https://about.twitter.com/company

Twitter, Inc. (2015c). Using Twitter for social good. Retrieved on March 11, 2015 via: https://media.twitter.com/best-practice/five-steps-for-doing-things-well

Twitter, Inc. (2015d). Using hashtags for faith and nonprofits. Retrieved on March 11, 2015 via: https://media.twitter.com/best-practice/using-hashtags-for-faith-and-nonprofits

Van Deursen, A. J. A. M., & Van Dijk, J. A. G. M. (2010). Trendrapport computer en internetgebruik 2010, Een Nederlands en Europees perspectief. Enschede: Center for eGovernment Studies, University of Twente. Retrieved on January 20, 2015 via: http://www.utwente.nl/ctit/cfes/docs/rapporten/2010_11_trendrapportcomputersinternet.pdf

Van Dijk, J. A. G. M. (1993). The mental challenge of the new media. *Medienpsychologie, Zeitschrift für Individual- und Massenkommunikation, 5*(1), pp. 20-45.

Van Dijk, J. A. G. M. (2005). *The deepening divide, inequality in the information society*. Thousand Oaks, CA, London, New Delhi: Sage Publications.

Van Dijk, J. A. G. M. (2012). *The Network Society* (3rd edition). London, Thousand Oaks, CA, New Delhi, Singapore: Sage Publications.

Van Laer, J., & Van Aelst, P. (2010). Internet and social movement action repertoires. *Information, Communication & Society, 13*(8), pp. 1146-1171. DOI: 10.1080/13691181003628307

Viera, A. J., & Garrett, J. M. (2005). Understanding interobserver agreement: The Kappa statistic. *Family Medicine, 37*(5), pp. 360-363. Retrieved on February 17, 2014 via: http://www1.cs.columbia.edu/~julia/courses/CS6998/Interrater_agreement.Kappa_statistic.pdf

Walther, J. (1992). Interpersonal effects in computer-mediated communication. *Communication Research, 19*(1), pp. 52-90. DOI: 10.1177/009365092019001003

Walther, J. (1996). Computer-mediated communication: Impersonal, interpersonal and hyperpersonal interaction. *Communication Research, 23*(1), pp. 3-43. DOI: 10.1177/009365096023001001

Wasserman, S., & Faust, K. (1994). *Social Network Analysis: Methods and Applications.* Cambridge, England: Cambridge University Press.

Watts, D. J., & Strogatz, S. H. (1998). Collective dynamics of 'small-world' networks. *Nature, 393*, pp. 440-442. DOI: 10.1038/30918

Woolcock, M. (1998). Social capital and economic development: Toward a theoretical synthesis and policy framework. *Theory and Society, 27*(2), pp. 151-208. Retrieved on February 17, 2014 via: http://download.springer.com/static/pdf/923/art%253A10.1023%252FA%253A1006884930135.pdf?auth66=1403961778_96d011a15346ded0cc44d197e149b4ea&ext=.pdf

Woolcock, M. (2000). Managing risk and opportunity in developing countries: The role of social capital. In G. Ranis (Eds.), *The Dimensions of Development*. New Haven: Yale University Press.

Woolcock, M. (2001a). The place of social capital in understanding social and economic outcomes. *ISUMA Canadian Journal of Policy Research, 2*(1), pp. 11-17. Retrieved on February 17, 2014 via: http://www.oecd.org/innovation/research/1824913.pdf

Woolcock, M. (2001b). *Using social capital: Getting the social relations right in the theory and practice of economic development*. Princeton, NJ: Princeton University Press.

Woolcock, M. (2010). The rise and routinization of social capital, 1988-2008. *Annual Review of Political Science, 13*, pp. 469-487.
DOI: 10.1146/annurev.polisci.031108.094151

Woolcock, M., & Narayan, D. (2000). Social capital: Implications for development theory, research, and policy. *The World Bank Observer, 15*(2), pp. 225-249.
DOI: 10.1093/wbro/15.2.225

List of Tables

Table 1. Dyad configurations in directed networks....42
Table 2. Short description of LinkedIn content categories....52
Table 3. Cohen´s Kappa values for LinkedIn content categories....53
Table 4. Short description of Twitter content categories....54
Table 5. Cohen´s Kappa values for LinkedIn content categories....55
Table 6. Summary of LinkedIn network measures of central persons....62
Table 7. Summary of Twitter network measures of central persons....76
Table 8. Triad configurations of the LinkedIn and Twitter networks....90
Table 9. Practical indicators derived from the online social network analysis....95
Table 10. Practical indicators derived from the triad census....96
Table 11. Practical indicators derived from the content analysis....97

List of Figures

Figure 1. Classification of online social media; adapted and integrated from Kaplan and Haenlein (2010, 2011); additional examples. 23
Figure 2. Triad configurations in directed networks; adapted from Davis and Leinhardt (1972), and Holland and Leinhardt (1976). 43
Figure 3. Percentages of the LinkedIn content categories. 58
Figure 4. LinkedIn graph with nodes´ sizes based on degree and nodes´ colors representing the modularity classes. 59
Figure 5. Percentages of the LinkedIn content categories of LIPerson1. 64
Figure 6. Ego-network of LIPerson1. 65
Figure 7. Percentages of the LinkedIn content categories of LIPerson2. 66
Figure 8. Ego-network of LIPerson2. 67
Figure 9. Percentages of the LinkedIn content categories of LIPerson3. 68
Figure 10. Ego-network of LIPerson3. 69
Figure 11. Percentages of the Twitter content categories. 70
Figure 12. Percentages of the Twitter sentiment categories. 71
Figure 13. Percentages of the Twitter link categories. 72
Figure 14. Twitter graph with nodes´ sizes based on degree and nodes´ colors representing the modularity classes. 73
Figure 15. Percentages of the Twitter content categories of TWPerson1. 77
Figure 16. Percentages of the Twitter sentiment categories of TWPerson1. 77
Figure 17. Percentages of the Twitter link categories of TWPerson1. 78
Figure 18. Ego-network of TWPerson1. 79
Figure 19. Percentages of the Twitter content categories of TWPerson2. 80
Figure 20. Percentages of the Twitter sentiment categories of TWPerson2. 81
Figure 21. Percentages of the Twitter link categories of TWPerson2. 81
Figure 22. Ego-network of TWPerson2. 83
Figure 23. Percentages of the Twitter content categories of TWPerson3. 84
Figure 24. Percentages of the Twitter sentiment categories of TWPerson3. 84
Figure 25. Percentages of the Twitter link categories of TWPerson3. 85
Figure 26. Ego-network of TWPerson3. 86
Figure 27. The edges sums of LinkedIn and Twitter in time. 87
Figure 28. The LinkedIn group network (left) in comparison to the Twitter hashtag network (right). 89

Appendices

I. LinkedIn coding scheme

Information: knowledge/information sharing:

Sharing ideas, opinions, examples and sources/links, asking for information; proposing definition for specific terms/concepts (tijdelijkheid), sharing expertise;
The tone of the post/comment is informative; goal of the post/comment is to inform others about something (a project/update etc.);

- Example: "*Final thesis wanted – My name is* [name]*, I´m studying HBO Leisure Management and am expecting to finish this study this college year. For the purpose of graduation, I´m orienting on a final project for January 2014. I am searching for a project in the leisure branch. Do you know anyone who offers an interesting final project, I appreciate hearing from you.*"

Identity: forming a common/group identity:

Supporting each other's ideas, like someone´s post, acknowledge/approve/affirm someone, expressing hope; proposing a common usage of the group; defining the groups´ purpose/content;
The tone of the post/comment is supportive; the LinkedIn user describes something as good/nice/interesting (positive attributes); the LinkedIn user expresses humor and by companionably interacting with others, contributes to the social identity;

- Example: "[Name] *thank you for the initiative of the discussion. I think it was a great experience! The contents discussed as well as the people who were there. It gave me something to think about.. A procreative meeting. I think it would be reasonable to have this kind of talk/discussion more often..*"

Action: appealing for mobilization/collective action:

Appealing for certain action, call for activities, announcing events/projects and asking for participation/movement;
The tone of the post/comment is appealing; the LinkedIn user may try to encourage others to do something (come to an event/think about new ideas/help at a project etc.); the LinkedIn user may provide information about a goal (and might present an idea how to reach it);

- Example: "[Name]*, I´m happy to think about it! Can be there on 11 December.";* *"Today we will seed a temporary bed at the parish hall."; "REMINDER Vacancy debate 18 May How to deal with vacancy in Amsterdam? Debate with different stakeholders (owners, developers, users, municipality, advisors, politicians). Location: Arcam, Beginning 20.00. Entrance free. ---"*

Other: all posts that cannot be put into one of the other categories

II. Twitter coding scheme

Content:

This category describes the content of each tweet. What is the topic? What do the Twitter users talk about?

Resource:

The content of the tweet describes details about the topic of #blt020, wastelands (braakliggende terreinen); the tweet contains #blt020 news, updates, or information; tweet may contain the title of an article, a website title, or the title of a video or picture; tweet may also refer to a project;

- Example: *"Kaart braakliggende terreinen metropoolregio amsterdam wordt regelmatig geupdate, binnenkort ook kleinere kavels in Zaanstad #blt020"*

Event:

The content of the tweet describes an event, or includes a notification for an upcoming/recent event; the event may refer to communication about the topic of the temporary use of wastelands (meeting, presentation, conference, etc.); tweet may contain a concrete date or name of an event;

- Example: *"#Stadsloods: Meeting 30 January temporary initiatives on wastelands #blt020 and fiscal obstacles #020 http://bit.ly/XyZEvj"*

Personal expression:

The content of the tweet describes the personal opinion/experience and/or interest of the twitterer; the twitterer may mention a direct or indirect **personal experience** with a #blt020 topic (a project and/or event he or she attained to); the tweet may contain the **personal opinion** of the twitterer about something referring to #blt020; the tweet may contain indications for **personal interest** in the topic and/or the need for more information about the topic;

- Example: *"Nice that founders #blt020* [username] [username] *were at* "No time to waste land" *on Thursday. Unfortunately* [username] *prevented. #wasteland"*

Other:

The content of the tweet cannot be clearly assigned to one of the other categories mentioned above; jokes and/or spam (tweets not referring to #blt020);

Sentiment:

This category describes the tone of the tweet. What sentiment do the twitterers express in their tweet? If the tweet may be assigned to more than one of the following categories, the most striking sentiment is to be chosen.

Informative:

The tone of the tweet is informative; goal of the tweet is to inform others about something (a project/event/update etc.);

- Example: *"Ceuvel volharding in buiksloterham becomes new hotspot Amsterdam North: Breeding area space and matter #blt020"*

Supportive:

The tone of the tweet is supportive; the twitterer describes something as good/nice/interesting (positive attributes); the twitterer expresses his or her own intention to engage;

- Example: *"Well done* [username]*! Making wastelands #green. pic.twitter.com/ LOkHhAtdDk #blt020"*

Appealing:

The tone of the tweet is appealing; the twitterer may try to encourage others to do something (come to an event/think about new ideas/help at a project etc.); the twitterer may provide information about a goal (and might present an idea how to reach it);

- Example: *"#Stadsloods Register today and come to* [username] *for TALK OF THE TOWN on Thursday http://bit.ly/11oUaZN NO TIME TO WASTE LAND #BLT020"*

Question:

The tweet contains a question;

- Example: *"It´s a pity we missed #blt020 in Pakhuis de Zwijger. Is there going to be a report?"*

Neutral:

The tone of the tweet is neutral; the tweet does not seem to express any specific tone;

- Example: *"Vanmeernaarbeter.nl: http://www.vanmeernaarbeter.nl/ nieuws/braakliggende-terreinen-zoeken-tijdelijke-gebruikers … #blt020"*

Other:

The tone of the tweet may be skeptical/humorous/sarcastic/ironic, etc.; the tweet may express concern or frustration or any other sentiment that does not fit into one of the other categories described above;

Link:

This category describes the links (if any) in the tweet. Where do the links lead to?

News website:

The link leads to a news website/blog; the website may be hosted by a local/regional or international TV/radio/print/internet news service;

- Examples: www.destentor.nl; http://debrugkrant.nl; http://at5.nl; http://dicht.by; etc.

Project website:

The link leads to a website/blog referring to a project and/or to a project/activist group (neighborhood/students/activists etc.);

- Examples: www.tijdelijkandersbestemmen.nl; www.uitjeeigenstad.nl; http://zuidasgroeit.nl; http://degezondestad.org; www.spoorzonedelft.nl; etc.

SNS ("Social Networking Site"):

The link leads to a social networking site; the link may lead to a picture shared via SNS (Twitpic/Yfrog/Flickr etc.) and/or to a video shared via SNS (YouTube/Vimeo etc.); the link may also lead to other SNS, such as Twitter, Facebook, MySpace, Google+ etc.; (ATTENTION: If a picture or video is posted on another website than SNS (e.g. a news website/project website), the tweet is to be assigned to that other specific link category);

- Examples: pic.twitter.com/LOkHhAtdDk; http://flic.kr/p/dARy6E; http://vimeo.com/29044228; http://twitpic.com/6oskj7; etc.

Map:

The link leads to the Google Map containing the #blt020/wasteland projects (http://maps.amsterdam.nl/braakliggende_terreinen/); only this specific map is assigned to this category; possible other maps have to be assigned to another category;

Government:

The link leads to an official governmental website; governmental websites are websites of a municipality/province/ministry or other governmental departments;

- Examples: http://www.amsterdam.nl/gemeente/gemeenteraad/; http://www.ikcro.nl; http://www.zuid-holland.nl; etc.

No reference:

The tweet does not contain any reference/link;

Not accessible:

The link is not accessible (anymore);

Other:

The link does not fit into one of the other categories;