NETWORKING FOR LEARNING

The role of Networking in a Lifelong Learner’s Professional Development
The research reported in this thesis was carried out at the Open Universiteit (NL) in the Centre of Learning Sciences and Technologies and was partly carried out within the LTfLL project, the Tellnet project and the CEFcult project. The LTfLL project was partially funded by the European Union under the Information and Communication Technologies (ICT) theme of the 7th Framework Programme for R&D. The CEFcult project was partially funded with support from the European Commission, Education, Audiovisual & Culture Executive Agency, under KA2 – Multilateral Projects of the Lifelong Learning Programme. The TellNet project partially funded with support from the European Commission, Education, Audiovisual & Culture Executive Agency, under KA4 – Dissemination and Exploitation of Results of the Lifelong Learning Programme.

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SIKS Dissertation Series No. 2013-32
The research reported in this thesis was carried out under the auspices of SIKS, the Dutch Research School for Information and Knowledge Systems.

ISBN/EAN 9789491825088
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Cover Design:
Layout: Datawyse
Printed by Datawyse, Maastricht, The Netherlands
NETWORKING FOR LEARNING
The role of Networking in a Lifelong Learner’s Professional Development

PROEFSCHRIFT

ter verkrijging van de graad van doctor aan de Open Universiteit op gezag van de rector magnificus prof. mr. A. Oskamp ten overstaan van een door het College voor promoties ingestelde commissie in het openbaar te verdedigen

op vrijdag 22 november 2013 te Heerlen

om 13.30 uur precies

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Where the mind is without fear and the head is held high;
Where knowledge is free;
Where the world has not been broken up into fragments by narrow domestic walls;
Where words come out from the depth of truth;
Where tireless striving stretches its arms towards perfection;
Where the clear stream of reason has not lost its way into the dreary desert sand of dead habit;
Where the mind is led forward by thee into ever-widening thought and action –
Into that heaven of freedom, my Father, let my country awake.

Rabindranath Tagore,
poem 35, *Gitanjali*, 1912
Acknowledgement

This doctoral journey has in many ways been a bit of a dream for me. Growing up in a university town with socially very active parents, I have seen many researchers and scientists embark on their PhDs. Although I did not know much about their fields of study or their day-to-day activities, I was drawn to the learning process that the doctorate journey seemed to offer. This triggered my enthusiasm to embark on the journey myself, and I was extremely lucky to find the topic and the research team at the Centre for Learning Sciences and Technologies (CELSTEC) at the Open Universiteit that were interdisciplinary enough to keep up my interest for four years.

Of course, this journey could not have reached its successful end without the help and encouragement of many. At this point, I would very much like to thank a few people who have supported me over the past years.

My first thanks goes to my supervisors who have guided and challenged me at different parts of the study. I am very grateful to my promotor Peter Sloep, who encouraged me to participate in various external projects, apart from my PhD. This forced me to place my own research in a wider context and seek out the links between the research and applications in practice, which I feel is an added value in my work. I was in the unique situation of having the benefit of working with three supervisors. I thank Peter van Rosmalen for guiding me in the initial stages of my PhD and encouraging me to work on the things that carry my interest. I thank Desiree Joosten-ten Brinke for her support and guidance in translating the ideas in my head to actual research activities. I thank Jan van Bruggen for guiding me through the last two and a half years of my PhD, for challenging me to question my ideas continuously and for the many interesting discussions on language and the classics.

I am grateful to Mieke for her invaluable advice at the right time and her moral support.

My fellow CELSTEC students have been a valuable source of support for me through the ups and downs of my PhD. Amy, Sibren, Rory, Ellen, Soude, Howard, Sebastian, Dirk and Birgit, I enjoyed our breaks, talks and discussions immensely. I am also very grateful to my (ex-) colleagues, in particular Adriana, Steven, Peter, Jo, Marlies, Kees, Francis, Christian, Marion, Wim, Stefaan, Wolfgang and Wen, who were always ready for a chat, a discussion and a cup of coffee. You have all contributed to this work in different ways.

A special thank you to my carpool-friends Steven and Bieke: your moral support and advice over the past four years have helped finish this PhD, and liven up the long drives to Heerlen. Steven, this journey would not have started without you: thanks for keeping me in mind when the right position came up at CELSTEC and your guidance.
There are some fellow PhD students who have hugely shaped my understanding of the field and contributed to me growing as a researcher: Wolle, Cristina, Peps, Daniel and Beni – thank you for sharing a drink with me. I learnt a lot from you.

I would also like to thank some project partners Lut, Lutgart, Jan and Riina who offered their broader perspective on my work and encouraged me to look beyond academics to educational practice. They continue to inspire me to be open and creative and to undertake new projects:

Some people without whose support I could not have finished this dissertation:

A special thanks to Sally and Mathy for giving me the opportunity to participate in the Media and Learning conference and collect data for my first study. Also a huge thanks to all the NGO representatives for sharing their networking experiences in their projects.
A special thanks to Riina for giving me the opportunity to participate in the eTwinning conference, which added another dimension to my thesis.
A special thanks to Lutgart for pushing me to go that bit further.
A special thanks to Wim, Armand and Loes for giving me the opportunity to conduct my studies and experiment at the CEI conference. Also, a huge thanks to all the teachers and students at the conference for their enthusiastic participation.
A special thanks to Leon, Anton and Wim for managing the development of software under time pressure.
A special thanks to all the Scoop.IT users who took time to participate in my experiment.

Finally, this journey would not have been possible without the unconditional support from my family. I would like to thank my parents Raj and Usha who have encouraged me for as long as I can remember in pursuing my interests and dreams; and my brother Prabhu who has always been ready to provide the outsider’s view and help me stay in touch with the real world. And the person who has stood by me through everything, my husband Ganesh. Thanks for your enthusiasm, encouragement, and support. Thanks for forcing me to stick to it when it got tough and forcing me to take timely breaks when I needed to - you know me better than I know myself.
Chapter 1: Introduction

Our society is transforming itself into a networked society (Castells, 2011; Toffler, 1990; Van Dijk, 2006). The networked society has grown roots in many aspects of modern life, the implications thereof become very pertinent when viewed from an individual’s perspective. Therefore, let us first look at the network society through the eyes of individuals, focusing on their personal and professional life:

Lisa D’Souza is an architect associated with a design agency in the Netherlands. Her agency specializes in projects that focus on sustainable design and constructions for commercial and public spaces. Her job has taken her to various cities around the world in the last 10 years. Networking is a big part of her job. The most exciting thing about her job, in her own words, is the way every city challenges her to match her design with the local environment, people and culture. After every trip, she comes back with a lot of energy to finish the project successfully, together with her local contacts.

Lisa has consulted her network for various personal and professional choices throughout her life. After many conversations with her friends, peers and tutors during her advanced studies in Paris, she decided to specialize in sustainability in architecture. She is still in touch with them, with some of them even on a daily basis, through social media. She can trust them to give their honest opinions on her ideas.

Her family ties too stretch across the world, as Lisa’s mother is Spanish and her father is Indian. She grew up between cultures, and her parents made sure she got to know both of them as her own. This encouraged her from an early age to explore different cultures, and engage in discussions with people from different cultures. As a hobby, she is a member of the Zunia Knowledge Exchange Network, an online network that discusses various topics related to social development across the world. Although she joined the network without any expectations, she has found a lot of information on local initiatives and ongoing policy changes in the cities that she is working in. This has proven to be invaluable for her professionally. However, she has not yet been able to really connect with people through the network.

With this complex of networks, it is important to recognize the different meanings that are given to the word “network” - all of which contribute to the experience of a networked life. I will start with distinguishing three meanings of network: the network as an environment, the network as a designed object and the network as a social activity. I will present all three meanings, before zooming in on the last.
Network as environment

Social networks have been recognized as environments that stimulate knowledge creation and knowledge sharing. They are the organizational structures where innovation can thrive through the spark of individual creativity (Eraut, 2004; Kessels, Verdonschot & De Jong, 2011). The idea of the lone genius has very much been replaced by the idea of the “right person at the right time in the right environment” (Boden, 2009).

With this recognition of networks as idea-stimulating environments, much research has focused on determining the environmental aspects of a network. What does a network look like? What characterizes different networks? Can structures of networks tell us something about the past of a network, its present and potentially, its future? Computational techniques such as social network analysis and simulations are being increasingly used to gain insight into the growth and evolution of various networks (Newman, Barábasi & Watts, 2006; Sie, Ullmann, Rajagopal, Cela, Bitter-Rijpkema & Sloep, 2012).

Understanding the power of social networks has been very important for modern society, as it has opened our eyes to the potential of existing networks to achieve various goals. Because of their qualities, social networks are employed to tackle various societal problems, from the creation of economic innovation via dealing with climate change and managing crime even to improving wide-scale citizen participation in government. If successful, such use of social networks could prove to be very powerful. Moreover, by understanding how networks function in their finest details, existing networks could be made even more efficient in achieving these goals.

In this dissertation, I am particularly interested in the individual’s perspective on social networks. Taking this view, the social networks around a person determine to a large degree what that person is and becomes. A personal network can be seen as the complex social environment in which the person is situated.

Network as an object

When a social network is used intentionally as an environment for change, it becomes an object that is created, populated and facilitated with the support of various instruments and tools.

The primary function of an intentionally created social network is to support the communication between the various people concerned, usually after a need for more collaboration and interaction between them has been deemed necessary or desirable. For some societal problems (e.g. behavior change for tackling climate change), social networks are often the only viable method to a solution to the problem, purely due to the number of people that need to be affected.
The mere creation of a social network brings with it the dilemma of “inside” and “outside”. Non-participation of the members in designed social networks therefore poses a hurdle to achieve the intended goal of the social network.

Creating a social network as a designed object implies that there are people who are its creators, members and facilitators. These people influence the look-and-feel of the resulting network to a great deal. In this dissertation, it is important to remember that networks can be created, maintained and activated by individuals, at different levels. Given the specific circumstances and goals, individuals may choose to participate in a network as an individual (e.g. in professional associations such as ASME\(^1\)), as a group (such as the design labs in the DESIS Network\(^2\)) or as an organization (such as the global airline network Star Alliance\(^3\) or DSP Valley\(^4\), a network of companies working in the field of microelectronics in Flanders (Belgium) and the Netherlands).

Various formats are used to achieve the orchestrated interaction within a designed network. It can happen through organizing face-to-face seminars, workshops, networking sessions and other types of meetings. Communication between participants is encouraged through the use of various structured working formats, to gain the most value from the discussions and conversations held. Online support is also employed through the use of social networking technology in which communication becomes very tangible through various supportive functionalities. These online social networks are spaces where members of the site can meet and interact, where they can exchange information, where innovation can happen. Instruments and tools created for the support of social networks can evolve into independent platforms that surpass individual social networks.

This dissertation focusses on social networks that are intentionally created by an individual. This person then becomes the designer of the personal network, establishing contacts, maintaining them and activating them when necessary. When this personal network is created with the purpose of supporting learning for personal growth, it becomes a Personal Learning Network. By participating in and contributing to such a network, the individual can actively take part in innovation and knowledge creation.

**Network as activity**

This brings us to the third meaning of network, namely the social activity of an individual participating in a network, in common terms referred to as *networking*. Networking is the natural way of communicating with acquaintances and strangers for most people, seeking out common ground and understanding differences. It is characterized by its typical free,
uninhibited conversations, with no explicit goal except for gaining mutual knowledge and a potential exploration of the connection. Through networking, people achieve three things:

- They expand and strengthen their personal network, by increasing shared knowledge between themselves and their ties and building trust between them (Rusman, 2011; Krattenmaker, 2002)
- They discover and create aspects of their own identity. The restatement and reinforcement of their individual contributions increases personal confidence (Margar-yan, Miligan & Littlejohn, 2009; boyd & Heer, 2006, Berlanga & Sloep, 2011)
- They also engage in knowledge building and learning through networking activities. However, there is very limited literature on what constitutes the learning value of networking (Johnson, 2008).

These three aspects of networking play a role in all networking activities and interactions, although they may be highly intertwined. There are several dilemma’s associated with the social practice of networking.

Firstly, there is a social perception that networking is something that “needs to be done”, rather than something that people “want to do”. As professionals, lifelong learners know, it is important to engage in networking, but not necessarily pleasant.

Secondly, networking carries a negative connotation as something pursued for personal gain alone, in other words, as something artificial and calculated.

Thirdly, networking is WORKing, i.e. as something that takes effort, but it is also a natural way of communication (Nardi, Whittaker & Schwarz, 2000; Nardi, Whittaker & Schwarz, 2002). A consequence of this dual face of networking is that there is an expectation that creating the necessary contextual requirements in an intentionally designed social network will naturally stimulate participation of its members in the form of networking.

Fourthly, networking is highly individual: everyone networks in a different way and there are no clear rules about how you should network. As a result, there are individual differences in how networking is done, and what is achieved through networking.

Fifthly and perhaps, most significantly, we actually do not really understand what happens in networking when encouraging people to move from the relationship of ‘strangers’ to the relationship of ‘acquaintance’ and further on to even closer relationships.

With the rise of the Internet, the social practice of networking has also moved online. Since the early beginnings of the Internet, it is a platform that not only enables access to information, but also to people. Online social networking has overtaken the Internet, with the rise of several social networking sites over the last years, using various forms of communication methods (Alexa, 2013). Although many of these sites are very popular, their ability to support the social practice of networking seems to be limited. Evidence for this is the blended nature of online networks (boyd & Ellison, 2007; Brandtzaeg, 2012; Reich, Subrahman-yam & Espinoza, 2012) and the still very relevant face-to-face social gatherings of seminars, workshops, conferences, fairs etc. (Rockmann & Northcraft, 2008; Hardwick, Cruickshank, &
Anderson, 2012). If online social networks fulfill the needs of networking completely, then these physical meetings would be made unnecessary purely by virtue of their cost.

Consequently, there are many instances where participation in intentionally created online social networks remains low. Several reasons have been sought for non-participation, such as mismatch between topics and attracted audience, lack of communication skills and/or media literacy skills of the members, etc. (Jenkins, 2009; Kim & El Saddik, 2013; Bitter-Rijpkema, Didderen, Sie, Rajagopal, Manche & Van Betten, 2012). However, dedicated support for none of these does not seem to have produced really widespread changes in the participation in intentionally created networks.

**Networking and Learning: some theory**

The networking activity offers a learning experience for many professionals (Eraut, 2004; Kessels et al., 2011; Bitter-Rijpkema, Verjans, Didderen & Sloep, in press). But why does a lifelong learner experience such a networking conversation as valuable for her learning?

In this dissertation, I explore how learning value is created in networking, with the purpose of designing better technology to allow lifelong learners to have more complete online networking experiences. This thesis starts from the premise that, to improve participation in intentionally created social networks, we need to understand the learning aspect of networking better, as this activity is the central method in which most people participate successfully in networks (Sloep, in press). We can define suitable support mechanisms to support these drivers using technology by understanding why people participate in social networks and what motivates them to network. The main research question of this thesis is:

> To what extent is learning in the social practice of networking facilitated by current online social network technologies? How can these technologies be designed to improve the support they offer to the user’s personal learning through networking?

There are a number of theoretical concepts that can help us consider why this social practice contributes to professional learning. I already mentioned trust (Rusman, 2011) and identity (Berlanga & Sloep, 2011), two other ones are peer support (Van Rosmalen, Sloep, Kester, Brouns, De Croock, Pannekeet & Koper, 2008; Fetter, Berlanga & Sloep, 2010) and coalition formation (Sie, Bitter-Rijpkema & Sloep, 2010). These concepts all address the conditions for learning, but not the mechanism of networked learning itself. Here I therefore want to focus on two new concepts, namely, the concept of breakdown and the concept of common grounding. In my opinion these concepts are descriptive of what constitutes the experience of networked learning, at least in part.

The first concept is breakdown, found in literature on the independent, autonomous learner and professional (Koschmann, Kuutti & Hickman, 1998; Schön, 1983; Winograd & Flores,
1986). It presumes that learners hold certain mental views about a particular topic or a process. As long as reality matches this learner-constructed mental view, there is no problem. However, when something happens in reality that is in conflict with the learner’s mental view, she is forced to reassess and adapt her view. A useful definition of the term breakdown is the “disruption in the normal functioning of things forcing the individual to adopt a more reflective or deliberative stance toward ongoing activity” (Koschmann, Kuutti & Hickman, 1998, p26).

Stahl (2006) refers to the initial, tacit and preconceived learner’s understanding as personal understanding. Figure 1.1 represents the cycle of understanding according to Stahl. As long as their tacit pre-understanding is unchallenged, learners continue to hold their personal focus, which is articulated to others. However, when the personal understanding is confronted with others’ understandings through interaction (or in other words, breakdown occurs) the learner enters in a social process of interaction, shared understanding and knowledge-building. A shared understanding is crafted together with peers, and this understanding is made tangible through socially created artifacts, and internalized to create a renewed personal comprehension. In the end, it is accepted as one’s own, again to become tacit personal understanding.

![Figure 1.1 After Stahl’s diagram of knowledge-building processes](Stahl, 2006, p203)

We also find the concept of breakdown in literature on organizational knowledge management and sensemaking. Weick, Sutcliffe & Obstfeld (2005) see breakdown as the trigger for the continuous social activity of sensemaking. When a member of some organization experiences breakdown with respect to her understanding of how things work in the organization, she starts communication with her colleagues to explain, clarify, and individually and
collaboratively construct a new understanding. Weick et al. (2005) emphasize the central role conversation has in this sensemaking process.

The second theoretical concept of importance for this thesis is that of common grounding. Breakdown is inherently linked to a follow-up process of remedying the breakdown, by individually or collaboratively constructing a new understanding. In collaborative circumstances, this process starts with the creation of common ground between the participants concerned, i.e. a restatement of the shared information that both participants agree on and that can be used as a starting point for further discussion. Grounding is constructed through dialogue and conversation between the participants. (Weick et al., 2005; Kintsch & Van Dijk, 1978). This is a natural occurrence in conversations where misunderstandings happen and need to be overcome (Byram 1997; Clark & Brennan, 1991). The main strategy to eliminate misunderstandings in conversations is to reformulate and rephrase, to elaborate on assumptions and to explicitly explain connections. It is also known that the greater the differences between the participants (such as between people with different cultural backgrounds), the easier the misunderstanding can originate from various unexpected assumptions (Byram, 1997). Adapted communication strategies are the key to overcome these large differences, to allow for the participants to engage more closely in their conversations (Van Maele, Baten, Beaven & Rajagopal, 2013).

In this dissertation, I hypothesize that professionals who engage in networking for learning welcome experiences of breakdown through their networking activities and in particular, their networking conversations. The learning value occurs in the subsequent common grounding they engage in with others to establish commonalities and collaborate in knowledge building. In other words, I conjecture that professionals as lifelong learners use the social practice of networking as a learning strategy, namely to open their attention to breakdown, to engage in common grounding and, thereby, to participate in knowledge building. Within this process, I conjecture, that interpersonal conversation, with its to-and-fro messaging and reformulating of phrases around misunderstandings, is the primary instrument they use.

If these hypotheses are supported by the results presented in this dissertation, they pose challenges for the design of social networking technology that is intended to support learning. Social networking technology would need to bring learners together in situations where they can interact with each other in such a way that breakdown can occur. It needs to support learners in their common efforts in common grounding and knowledge building, and offer sufficient resources to understanding the differences in their understanding of a topic.

Research Approach and Structure of the thesis

This research is conducted in two parts, using a design research methodology. The first part aims to understand the social activity of networking itself better, particularly with regard to
its learning value as experienced by lifelong learners. The following sub-questions guide us through this part:

1. What benefits do individual learners perceive in networking with others, with regards to their learning?
2. What are the underlying drivers that contribute to the creation, maintenance and activation of a personal contact?
3. What are the underlying dynamics of the social activity of networking itself? How do these relate to the learning value experienced by networkers?

The first part of this thesis consists of two chapters:

PART I: THE VIRTUE OF THE SOCIAL ACTIVITY OF NETWORKING FOR LEARNING

Chapter 2 Understanding Networking for Learning

This chapter investigates how individual learners perceive the value of their personal network. This theoretical chapter is augmented with results from a questionnaire and in-depth interviews, which investigate the underlying drivers of networkers. A model of networking for learning for the lifelong learner is proposed at the end of this chapter.

Chapter 3 Networking As a Learning Activity: Individual value perception and value creation

This chapter digs deeper into the cognitive aspects of networking for individual learners, to discover, through a linguistic analysis of reflective interviews of conference participants, which factors contribute to their perception of value in a networking event. We draw up guidelines for the technological design of social networking technology that is capable of supporting an online networking experience.

In the second part of this thesis, the lessons learnt from part 1 are translated into design principles and technological implementations for instruments. They are to be used in the context of social networking sites that are designed to promote individual learning. The following sub-questions guide us through this part:

4. What are the characteristics of social networking technology that support effective networking online?
5. How can social networking technology trigger experiences of breakdown?
6. In which way can current social networking technologies be improved to imitate the networking experience online?
   - With active participation of the network members?
   - With passive participation of the network members?
Part 2 of this thesis consists of two chapters.

PART II: SUPPORTING NETWORKING FOR LEARNING ONLINE

Chapter 4 User-created Tag Sets as components of User Profiles in Social Matching Systems

In this chapter, the learner’s active participation is achieved through the facilitation of ongoing content-based conversations between learners. By performing the typical online activity of tagging in a face-to-face networking environment, learners were requested to make their individual sensemaking tangible and shareable. The results of this chapter show that user-created tag sets are useful in representing the user-perceived relations between the semantic content contained in a tag. This opens up various opportunities for the use of tag sets in applications for learner support systems.

Chapter 5 People recommender based on curation activities on Scoop.IT

In this chapter, the texts learners themselves have written are taken as evidence of their active engagement of learners. The texts have been added as contextualisations of the links they share on their Scoop.IT pages. With these Scoop.IT-based user profiles, two people recommender methodologies are investigated: one matching methodology based on similarity between people, and the other based on dissimilarity between people. The results of this experiment show that people who experience breakdown through the recommended feed, are interested in connecting with the curator of the feed. It also shows that relevant content only partly contributes to the experience of breakdown. Furthermore, it is also apparent that matching based on dissimilarity is more successful in bringing about the experience of breakdown.

Finally, the thesis concludes with a concluding chapter and an outlook on future research.

A final chapter (Chapter 6) summarizes the contribution this thesis seeks to make to educational research. It also offers some avenues and considerations for future research.
PART 1
Chapter 2:
Understanding Personal Learning Networks: their structure, content and the networking skills needed to optimally use them

Rajagopal, K., Joosten-ten Brinke, D., Van Bruggen, J., & Sloep, P. B. (2012). Understanding personal learning networks: Their structure, content and the networking skills to optimally use them. First Monday, 17(1), 1-12

Abstract

Networking is a key skill in professional careers, supporting the individual’s growth and learning. However, little is known about how professionals intentionally manage the connections in their personal networks and which factors influence their decisions in connecting with others for the purpose of learning. In this article, we present a model of personal professional networking for creating a personal learning network, based on an investigation through a literature study, semi-structured interviews and a survey.
Introduction

In modern working life, professionals need to perform flexibly and independently in ever-changing environments (Castells, 2011). To be able to do this effectively, they depend on various lifelong learning skills, among others autonomous and self-directed learning. As they are partly supported in their learning by interaction with their peers, an essential lifelong learning skill they need to develop, is the ability to find and to connect with relevant others, i.e. professional networking (Johnson, 2008; Nardi, Whittaker & Schwarz, 2000).

We define the activity of professional networking as the act of making connections with other professionals, with or without the intention of making long-term ties with them (Compton, 2009; Tempest & Starkey, 2004). In our understanding, the skills at the centre of networking involve an ability to identify and understand other people’s work in relation to one’s own, and to assess the value of the connection with these others for potential future work. The result of networking is a personal professional network, i.e. an egocentric, personally and intentionally created network of people set up by an individual specifically in the context of her professional activities. This network gathers a heterogeneous circle of people, distributed across different groups and places, and connected to the individual with connections of varying strengths (Granovetter, 1983; Nardi et al., 2000).

Professional networking offers various benefits. From the individual’s perspective, it supports the development and growth of professionals’ careers (Cross, Davenport & Cantrell, 2003; Dulworth, 2006; Krattenmaker, 2002). Your networks also allow you to find appropriate, constant support when the need arises (Haythornthwaite, 2002; Ru & Ortolano, 2009; Van Ryzin et al., 2009). From the organisation’s perspective, networking and networks are vital in innovation and crucial in linking to new trusted partners when dealing with changing business priorities (Birkinshaw, Bessant & Delbridge, 2007; Pulley & Wakefield, 2001; Vertest, van Liere & Dunn, 2009). Networking supports group formation for the purpose of awareness-raising and/or socio-economic progress (see Compton, 2009; Fesko, Temelini & Graham, 1997; Gupton & Appelt Slick, 1996; Hays, Wynd, Veitch & Crossland, 2003). Professional networking can also be used as a means to continuously support professionals’ lifelong learning in practice (Johnson, 2008). Once created, personal professional networks are platforms in which conversations and dialogue can occur, thus allowing for individual (non-formal) learning (Eraut, 2000). This learning is especially prevalent in practice, where tacit knowledge is built through experience and reflection and shared through social interaction with others (Bolhuis & Simons, 2001; Hearn & White, 2009). Furthermore, the ability to make conversations possible between people when needed is recognised as a key enabler of knowledge creation in organisational settings (Von Krogh et al., 2000).

Both strong and weak connections contribute to the individual’s learning: strong ties allow for active collaboration on knowledge creation, whereas weak ties are sources for new information, knowledge and ideas (Bell, 2010; Gargiulo & Benassi, 2000; Jones, 2008; Jones, Ferreday & Hodgson, 2008; Ryberg & Larsen, 2008; Wenger, 1998). As the dichotomy of
strong versus weak ties is not self-evident, more refinement is needed (Lin, 2008). For personal networks, Grabher and Ibert (2006) propose a three-layered approach consisting of a communality layer (strong ties), a sociality layer (weak ties) and a connectivity layer (very weak ties).

It has also been recognised that ties and networks can be intentionally built, created and maintained as resources for learning and working (Burt, 1992). The structure of a personal network can change in ways best benefiting the needs of professional learners throughout different stages of their careers (Margaryan, Milligan & Littlejohn, 2009). By including weak links in their personal networks, learners can create an environment for learning (Kester & Sloep, 2009). We believe the intentionality of the professional is the strongest at the sociality layer, as contacts in this layer are the most mobile within someone’s personal network. Depending on the intentions of the professional, these ties have the potential to become stronger connections or develop into even weaker ties. An individual can therefore create and orchestrate ties to effectively support learning needs and potentially use technology to support this network, effectively making it a personal learning network (PLN).

This article aims to understand how professionals determine the networking actions they undertake. In other words, how does the support offered by different ties in a professional’s personal learning network change and evolve with the intentional actions of the professional? We present a model describing the act of personal professional networking for creating a personal learning network based on the results of a literature study of academic and informal resources and two empirical studies. After briefly presenting the research method, we will discuss the factors that influence the decisions professional learners take while navigating a personal learning network. This then results in a description of the Personal Learning Network model and related technology needs. Finally, we’ll discuss some directions for further research.

**Method**

In order to develop a model of how the dynamics of ties play out in supporting individual learning, we collected data from different sources. We first looked for existing research reports on professional networking, with a focus on relationship building and network building from an individual’s personal perspective. Our specific interest was to discover the personal drivers of an individual in networking situations in order to gain insight into how personal relationships and networks are built for learning purposes. We started looking at academic literature, covering a broad spectrum of scientific domains, including informal learning, lifelong learning, continuous professional development and relationship management in business. As this literature review turned up limited results regarding the practical aspects of network building from the point of view of the individual, we also turned to informal literature. The inclusion of informal literature (such as magazines and blogposts) enlightened us on the value of networking as experienced by individuals and gave us some tips and tricks.
from these professionals in practice. Our literature study identified an initial list of factors that influence networking decisions.

Additionally, two small-scale qualitative studies were conducted to establish the individuals’ strategies to create, maintain and use their personal networks for learning. A first small-scale study used explorative semi-structured interviews with 10 interviewees, who had a minimum of 5 years’ experience in the social development sector working in projects on a daily or weekly basis. They were questioned on the project itself, their personal learning experiences regarding the project and the role of their personal networks in these experiences. The interviews, conducted in Dutch and English, were audio-recorded, transcribed and analysed in the following way: first, the texts were systematically screened for mentions of people; then, these passages were clustered into roles of others in the learning experiences of the interviewee. From this first analysis, it emerged that interviewees differed greatly in the way they describe their contacts. This difference was deemed relevant and taken up in the results. Dutch quotes further on in this article have been translated into English. A second small-scale study was conducted consisting of short surveys at two networking events (the EAPRIL conference – 2010, in Lisbon and the Media and Learning Conference – 2010, in Brussels). Sixteen at random chosen participants were asked to consider their personal networking activities at the event, focusing on those contacts they expected to remain in touch with after the conference and their reported reasons for this. These reasons were coded with the initial factors identified in the literature study. The list was completed with additional factors that emerged as being significant from the survey.

The learner as the orchestrator of her personal learning network

Learning professionals can actively undertake measures to make the best use of the learning opportunities in their layered personal learning networks. They need to perform three important (primary) tasks that form the basis for all other further activities within the network: building connections (adding new people to the network so that there are resources available when a learning need arises); maintaining connections (keeping in touch with relevant persons); and activating connections with selected persons for the purpose of learning (Nardi et al., 2000; 2002). In this section, we will present the factors influencing the decisions of a professional in these tasks. In doing this, we will also uncover the specific attitude of a professional that lies at the root of this type of learning.

Factors influencing choices in building, maintaining and activating their personal learning networks

The literature search for factors that influence the stages of building, maintaining and activating connections revealed topics related to the context of networking. A clear value for professionals emerged: they design and navigate their network to bring them the most professional and educational benefit at each stage of their career (Dulworth, 2006; Cross et al.,
2003; Steiny & Oinas-Kukkonen, 2007). They undertake specific activities for networking, such as joining (online and face-to-face) professional associations, participating in conferences, workshops, seminars or networking events to meet new people or to reconfirm existing ties (Bauman, 2008; Deleskey, 2003; Valenza & Johnson, 2008). In addition, increasingly, web-based technologies play a role in connecting with new people (on social networking sites such as LinkedIn and Facebook) (Vermeiren, 2011) or for maintaining relations after events (Hamm, 2007). The literature study, however, gave little information on the practical strategies that encourage and establish successful professional relationship building. This was then researched by the survey and the in-depth interviews.

The survey results confirm the factors identified in the literature study and additionally indicate that individuals often connect with people whom they have collaborated with before or with people whom they know and want to collaborate with. Several factors that influence the building, maintaining and activating of connections within a personal learning network are identified. The factors can be divided into three groups: (i) the professional learner’s personal interests, (ii) the contact’s qualities and (iii) external environmental characteristics.

The first group of factors relates to the professional learner’s personal interests.

- **Communality** While creating new connections, people look out for common ground with an unknown person. This can be in the form of topics of interest, organisation or common connections (network) (Adamic & Adar, 2005; Douglas, 1994). The survey results indicated that professionals also use communality on topic and organisation to decide whom to maintain connections with in a personal learning network. In activating a connection within a personal learning network, the key factor that emerged from the survey is the suitability of that person’s experience or expertise for the particular topic or need sought (cf. experts, zone of proximal development, etc.). The personal attachment between the individual and the person also plays an undeniable role. The location where new connections are created is also important: a trusted, known environment is often chosen to expand networks (Paulos & Goodman, 2004).

The next group of factors on the contact’s qualities relate to features of the contact in question (the contact’s organisation, network or reputation), or indicate the personal attachment between the learner and the contact (benevolence, like-mindedness). They can also indicate the professional’s assessment of the potential value of the tie (potential for collaboration or learning).

- **Organisation of the contact** The organisation the contact belongs to may influence choices made regarding the nature of a tie (Morrison, 2002).
- **Network of the contact** The network the contact gives access to may also be a decisive factor in the management of professional ties (Jackson & Rogers, 2007).
• **Reputation** Reputation plays a role in the network ties with others in general, and also in the creation of a new connection (Davies, 2003; Podolny & Baron, 1997).

• **Benevolence** Another factor that plays a crucial role is benevolence or the general “good contact” between the individual and the new contact (Rusman, Van Bruggen, Sloep, Valcke & Koper, 2010). People connect with others whom they like or trust, or whom they feel a particular connection with.

• **Like-mindedness** The surveyed interviewees often mentioned that sharing a common vision on the domain of work creates a trusted platform where they feel comfortable further pursuing the conversation. Further discussions could reveal more communality, and thereby new scope for connecting. Building new connections in a personal network consists of identifying relevant skills and competence in others and establishing a trusted platform through conversation where the potential of the connection can be explored.

• **Real potential for collaboration** Discussions could deal with the details of common interest and reveal a clear potential for collaboration.

• **Real potential for learning** More than that, through an extended conversation, the interviewees indicated they could identify a potential for learning through maintaining the connection.

The final group of factors relate to external characteristics of the work environment in which the tie between the professional learner and the contact is situated.

• **Trends in work environment** The professional interests of a learner can be largely determined by circumstances and trends in the work environment of the professional (Birkinshaw et al., 2007). For example, the increasing popularity of a particular domain might make it more relevant to connect to ties working in that domain.

Although these nine factors emerged from the studies, it was not possible to identify conclusively to what extent each factor influences each stage of networking. However, the results show that benevolence, like-mindedness and real potential for collaboration and learning play an important role in the building phase. Further research is necessary to refine this aspect of the model. Figure 2.1 illustrates the three stages of the networking process, with the factors that influence each of these stages.
**Networking attitude of a learner**

Although the factors identified in the studies relate to the learner’s practical decisions, informal literature and the in-depth interviews revealed that networking itself is linked to a deeper cognitive level, namely, the attitude of the learner (Vermeiren, 2008).

When asked to reflect on their learning experiences and the role of others in those learning processes, the interviewees displayed clear differences in the way they interact with contacts in their personal networks and the way they learn from these interactions. The results are presented here with quotes from the interviews.

The first observation is that some interviewees were able to describe the contributions of their contacts to their learning in a much more detailed and contextualised way than did others: the learning experiences were identified with the contact’s qualities. An example from the interviewee below, who appreciates having access to a wide network of contacts:

“ [...] that we have the possibility to ask advice from certain people. And one person is more suitable for a certain type of advice, and another person for another type of advice, but it does help a lot. It certainly helps.”

Also, they portray some insight into their contact’s strengths and weaknesses as well as of their own:

“ [...] because she not only asked, but she also had a vision behind those questions. And her vision and my vision correspond, they fit. And a vision that corresponds, that is very important. If you want a project, you absolutely need to be able to fall back on people who have the same vision as you. [...] You need to want to evolve in the same direction. And that’s clearly the case with her.”
“I like people who want to go against the tide, without wanting to be extreme in that. But it shows that they have a particular character and a certain dare to go further. I think that is important.”

These narratives presented a clear picture of the contacts - strong, weak and very weak ties - in the learner’s personal network and their contributions to learning. However, this contextualising of others’ experiences and their relevance for own learning purposes is not general. For example, the quote below from another interviewee:

“You have a school for the rich, a beautiful building, I can show you photos later, and then at 500m distance, you have a school for the poor and I asked: ‘are you not just reinforcing this difference?’ But they said, ‘on the one hand, yes, we are, but on the other hand, this is the only way the children of the poor people have access to education. [...] what they also do is morning assembly, which is very important, they do that together. So you see, on the one hand you can say that they are reinforcing the difference, but on the other it does give them the opportunity to go to school.’

This interviewee also interacts with others to understand the situation, but these contacts remain hidden in the narrative, purely appearing as sources of information or general opinion.

The second observation is that the effects of networking are not limited to face-to-face interactions with the contacts: even when others are not present, their words, messages and perspectives can influence the reflections of the learner. This results from two conditions: (i) the reflective behaviour of the learner and (ii) the extent to which the learner views the contacts as visible entities (or learning resources) in her personal network. Reflective behaviour with regard to one’s own practice is recognised in literature (Bolhuis & Simons, 2001; Schön, 1990). In our opinion, detailed contextualising of a contact is an indication that the contact is visible in the learner’s personal network. For example, the following learning experience by one of the interviewees describes the results of her reflection together with others. However, despite requests for further clarification, she did not develop a further detailing of various perspectives on the issues in the interview:

” [...] that trip in X was really an eye-opener for me, when you see what those people have to do locally under what circumstances. Because in X we also visited a slum and leprosy colony. That really sticks to you. You have to be very tough not to be affected by that. So when we came back, we thought “this cannot be the case that we have such a good life here; we have to do something.”

Although this interviewee used reflection to develop her understanding, she did not identify the contributions of various contacts to her learning nor provide further context for those contributions. Interviewees with a seemingly further evolved networking skill use the informational and knowledge building benefits of their personal learning network almost on a daily basis, affecting all aspects of their professional life. Each contact is seen as a potential
person to learn from or to collaborate with. In this sense, networking can be viewed as an attitude to learning and working, i.e., the position taken towards learning and the role that their networks and networking plays in that learning.

These two observations allow us to conclude that networking for networked learning is not only a skill to be developed, but also an attitude on learning to be cultivated. The interviews confirmed that networking revolves around a complex ability of (i) recognizing and identifying the other’s qualities and of (ii) making (valuable) associations of these qualities with the learner’s own qualities that could take place when interacting with a contact or even in the contact’s absence. Learners have different levels of proficiency in this skill, but can also differ in the actual application of the skill, due to the attitude with which they approach learning. Proficient networkers use dedicated events and environments where networking has the prime focus (such as professional conferences, seminars and, more recently, online social networking sites) to trigger their mind into making valuable associations.

The interviews supported findings that this attitude emerges with people who a) experience the value of their network at first hand (Hamm, 2007) and/or people who b) reflect on their work and learning in a broader perspective than their day-to-day practice (Margaryan et al., 2009). This is exemplified by the quote from one interviewee below:

... [...] yes, no one is free of the luxury to ask someone for advice. I think it is important for everyone to be able to ask advice. And that it is also a privilege to be able to ask advice. There is nothing wrong with it. On the contrary, I think it is an advantage rather than a handicap to be able to ask advice...”.

The Personal Learning Network model

The nine factors just identified that influence personal professional networking, as well as the networking attitude just described that governs networking activities, can be schematically represented in a Personal Professional Networking Model (illustrated in Figure 2.2).
This three-layered model relates the attitude of a professional learner towards networking to the actual networking skills she displays in day-to-day practice. Attitudes and skills are different types of qualities: an attitude is something of the mind, a perspective with which a person views the world; a skill is a practical, developable ability to do something. Because of this difference, it is not possible to directly link the two layers. To do so, requires two important intermediary steps in our view. The first one is the translation of this attitude in the mind to a deliberate intention (attitude-to-intention layer). When professionals have developed an attitude of approaching their professional life and learning in a networked way, they build, maintain and activate their contacts intentionally.

The second step is to translate that intention into actions (activity layer). The professional’s intention manifests itself through the activity of networking, where the professional engages in practices enabling and supporting networking. These include activating strong ties (e.g. brainstorming with colleagues), activating weak ties (e.g. reaching a known contact), building or maintaining weak and very weak ties (e.g. joining networking events or an online social networking site). The activity of networking depends on the complex skill of being able to make associations between the contact’s qualities and one’s own (skill layer). This com-
plex skill is in turn influenced by the different factors identified earlier in this article at the different phases of networking. As such, the attitude trickles down as it were to affect the professional’s actions and the required skills.

A Personal Learning Network (PLN) is a network of people set up by an individual specifically in the context of her professional activities through online platforms to support her professional non-formal learning needs. Therefore, a professional who intentionally builds, maintains and activates her strong, weak and very weak ties with contacts within her personal network for the purpose of improving her learning – and uses technology to support this activity - is creating a Personal Learning Network. The learner at the centre orchestrates the whole environment, browsing, selecting and choosing the most relevant information resources (Conole, de Laat, Dillon & Darby, 2008; Schaffert & Hilzensauer, 2008; Wilson, Liber, Johnson, Beauvoir, Sharples and Miligan, 2006). To support orchestration, learners need to have a high level of control on tools they use and the way they use them.

Discussion and Conclusion: Supporting personal networking and future research

Technologies included in PLNs offer basic to advanced functionalities (such as search, access to content, user-made content classification, personal knowledge creation and presentation and communication with peers and others), which learners can employ, change and adapt to suit their learning needs (Attwell, Cook, & Ravenscroft, 2009). These tools allow learners to structure and manage the complex environment of people and content around themselves according to their own personal preferences.

Currently, technological solutions exist supporting different aspects of the networking model. In the skill layer, existing technologies for social network management on social networking platforms focus on:

- enhancing communication with people in the network (e-mail; communication functionality on networking platform; privacy management to determine who can contact who)
- remaining “in touch” with known people in the network: informal information pull to remain connected with others in the network
- positioning an individual in the network
- finding hidden people and expertise in the network: basic user search functionality (name, profile characteristics); advanced functionality, e.g. recommendation of peers (Guy, Ronen. & Wilcox, 2009), identification of relevant people to help with a particular learning problem (Fetter, Berlanga & Sloep, 2010b; Van Rosmalen, 2008).

Although these functionalities fulfill the general stages of networking, technology does not yet support the deeper understanding of networking practice. For example, the distinction between strong, weak and very weak ties with respect to content of the relationship is not
always visible in online social networking sites. The technology therefore offers minimal support in developing ties in a meaningful way. Also at the level of networking activity, technology provides common platforms where people can connect (general social networking sites (SNS) such as LinkedIn, Facebook, Hyves and Twitter; domain-specific SNS, such as UNESCO-UNEVOC eForum and the Zunia network; event-specific SNS such as platforms for online conferences, workshops and webinars). Face-to-face events are also increasingly supported by web-based technologies, to enable people to make more valuable weak ties on a longer-term (see for example, the “Follow the Sun - Learning Futures Festival Online 2011” initiative (Follow the Sun, 2011)).

A Personal Learning Network Model, including the technological support for the different aspects of networking, is illustrated in Figure 2.3.

Although technological solutions facilitate many aspects of networking, it is unclear if technology supports or indeed, affects the networking attitude of professionals, nor the related intention to build, maintain and activate the strong and weak ties in their personal network for the purpose of learning. This brings us to the next steps to take.

Further research steps include studies investigating the networking practice of professionals to gain a better understanding of the networking attitude; a further development of technology to support professionals better in identifying relevant others and in developing relations online as and when necessary. Finally, an investigation is also necessary into the effects of networking technology on the networking attitude of professionals.
Chapter 3: Understanding the perceived value of interpersonal social networking


Abstract

In this article, we investigate the value of the social activity of networking, as it is perceived by network members of a designed social network around a wicked problem. Through semi-structured interviews, we analyze network members’ articulations of their perceptions of value in networking interactions. The qualitative data analysis was conducted with two points of attention. A content analysis aimed to discover which underlying factors defining social complexity in a designed social network were valued most by network members. A linguistic transitivity analysis based on Systemic Functional Grammar focused on gaining insight into the networking experience of value. This study contributes to the limited existing research on the social activity of interpersonal networking. The results of this study suggest that support in designed social networks should focus on the design and development of individual and collective cognitive activities, rather than on currently prevalent strategies of merely connecting members or on high-level network analytics.
Introduction

In today’s society, issues such as the design of new metropolitan transport system or a global strategy for climate change, are considered “wicked problems”, i.e. ill-structured complex problems where each solution presents new aspects of the problem itself. For such problems linear, analytical problem-solving methods are unfit (Rittel & Webber, 1973; Conklin, 2006b). Wicked problems pose issues that continuously evolve in a dynamic, large social context, in which every stakeholder contributes to their mere understanding (Voss, Wiley & Sandak, 1999; Ritchey, 2011). Social interaction offers the only method of dealing with these types of problems (Rith & Dubberly, 2007; Ferlie, Fitzgerald, McGivern, Dopson & Bennett, 2011). However, a continuous, socially distributed approach to solving wicked problems introduces a host of communication and interpersonal differences at every stage of the journey towards solving the problem (i.e. gathering data, analyzing data, formulating solutions and implementing solutions). These need to be addressed first (Conklin, 2006b).

One way to facilitate social interaction around a wicked problem is through specially designed social structures that gather the stakeholders in question. One such social structure is the social network. These designed social networks may differ significantly from naturally occurring social networks (e.g. network of people working in the same organization or living in the same geographical area). Networks also differ significantly from other types of designed social structures such as groups or teams, in that they facilitate open and distributed interaction between free, autonomous participants, without the obligation for these participants to share common goals (White, 2002). In recent years, designed social networks are increasingly supported by web-based social networking technologies, effectively creating learning networks (Sloep, Van der Klink, Brouns, Van Bruggen & Didderen, 2011).

However, these designed social networks (both the face-to-face and online versions) have a disadvantage: their role as communicative platforms can only be fulfilled if the network members deliberately choose to engage in and contribute to the network’s dialogue on the wicked problem (Bitter-Rijpkema, Verjans, Didderen, & Sloep, in press; Bitter-Rijpkema, Didderen, Sie, Rajagopal, Manche, & Van Betten, 2012; Vuorikari, Garoia, Punie, Cachia, Redeker, Cao, Klamma et al., 2012). In general, engagement in the dialogue happens in the form of interpersonal networking, which we define as a social practice in which an individual engages in repeated conversations with known and unknown people in a designed social network; they do so to share and receive information, to potentially learn and to make long-term and short-term connections (Nardi et al., 2000; Johnson, 2008; Rajagopal, Joosten-ten Brinke, Van Bruggen & Sloep, 2012).

So, designing support that facilitates interpersonal networking could increase network participation, thereby allowing this purposefully designed social structure to fulfill its aim (Sloep, in press). Although this type of networking support is employed in face-to-face net-
work activities with minimal effort⁵, it seems to be more difficult to facilitate and support similar interpersonal networking appropriately in online networks. The creation of new interactions and connections online happens primarily through offline means and sometimes through online, sometimes moderated, activities (Rainie, Purcell & Smith, 2011; Salmon, 2011; 2013).

One reason why there have not been more successful designs for networking support tools is our lack of understanding of the social practice of networking itself (Johnson, 2008). Even though networks are perceived as environments that support value creation for its members (Wenger, Trayner & de Laat, 2011) and networking is recognized as an important aspect of personal and professional human relationships and as a key learning skill in the 21st century (Cigognini, Pettenati & Edirisingha, 2011; Jenkins, 2009; Weller, 2011), we know little about how individual network members perceive networking, and what exactly brings value to the individual network member in a networking situation.

As we are interested in the networker’s point-of-view in these networking situations, the most appropriate resources for investigation are their narrative reports of their experiences of value. However, our previous research in this regard has shown that gathering narrative experiences of value from networkers after the event does not elicit enough detail to inform support strategies (Rajagopal, Joosten-ten Brinke, Van Bruggen & Sloep, 2012).

A more suitable form of the narrative for this research is the form of ‘small stories’ (Bamburg & Georgkopolou, 2008; Georgkopolou, 2007). Small stories, as opposed to isolated and decontextualized ‘big stories’ or ‘grand narratives’, are the fleeting stories told by people in interaction with others and in particular settings or situations. Small stories have been shown to be good resources for investigating power relations, context influences and participant identity (De Fina & Georgkopolou, 2012). These stories allow us to step away from the individual idiosyncrasies of individual people’s experiences, and focus on the characteristics of the stories defined by context. Small stories collected from networkers in a networking event are therefore suitable resources for analyzing networking experiences. In particular, we can consider the content of networkers’ narrative on the experience of value, and the form in which they talk about these experiences of value.

In order to form a hypothesis regarding the content of networking interactions, we deduced some topics from the literature on wicked problems, starting from Conklin’s work on social complexity in wicked problem solving (Conklin, 2006b). He distinguishes four steps: (i) gathering data, (ii) analyzing data, (iii) formulating solutions and (iv) implementing solutions (Conklin, 2006b). Whereas he looks at challenges in project management on these steps to reach a common solution, we are more interested in the individual’s perspective on these steps. This is where social diversity and complexity play a role: every member of Conklin’s

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⁵ Think of the many coffee breaks, lunches and dinners are professional networking events. Very often, these unstructured events are experienced as the most valuable networking interactions by networkers.
project team uses a different approach with certain tacit assumptions to solve the wicked problem. In other words, every member of the project team has a different reading or method to gather data, to analyze this data, to formulate the solution and to implement it. This diversity in approach stems from the project members individual backgrounds and situations, but usually remains unarticulated. Conklin then proposes a solution to unearth these assumptions to facilitate an open discussion (namely dialogue mapping) (Conklin, 2006a).

Although Conklin positions his solution in the context of a project team, the need to uncover hidden assumptions also plays a role in a designed social network around a wicked problem, as it has the same (if not higher) levels of social complexity. We propose making these unarticulated assumptions more concrete and tangible in the form of a coding scheme. This will enable us to qualify the value that network members perceive in networking interactions. The factors in such a coding scheme can be identified using Conklin’s example of the design of a “safe car” by a newly assembled project team at Volvo (Conklin, 2006b) (see Table 3.1). Due to the situation in a network environment, we deliberately take a very broad view on the descriptions of the factors, to accommodate as much diversity as possible.
### Table 3.1 Five Content Factors in Social Complexity of Wicked Problem, elements of a coding scheme

<table>
<thead>
<tr>
<th>Factor</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONTEXT</td>
<td>The factor Context refers to all the major and minor entities that create the intricate setting in which a network member is situated. Some aspects of this setting were intentionally chosen by the network member (such as academic and professional background), whereas other aspects are out of the network member’s control (such as family background, economic situation of employer and spatiotemporal settings).</td>
<td>Bob (Marketing) plans an innovative approach to sell the new ‘safe car’ in order to compete with other car companies. However, Volvo plans to cut the budget of the Marketing department, which will influence Bob’s available budget for this project. Christine (Engineering) views the project as an exciting opportunity to work with new, expensive technologies. The project team meets a day after Volvo announces big profits, which creates much enthusiasm and expectation in the team.</td>
</tr>
<tr>
<td>STRATEGIES</td>
<td>The factor Strategies refers to solution methods, tools and instruments that the network member uses to approach the wicked problem and the discussions around it.</td>
<td>Harry (Management) needs to keep the costs for the end-user low following the new strategy of affordability, whereas Alan (IT) wants an investment in CAD systems to improve the quality of their design work and to upgrade to current IT standards. To work out the strategy of the team, Alan and Harry sit together in a 1-to-1 discussion, before presenting their proposal to the whole project team. The team then decides to divide in subgroups to tackle certain parts of the project.</td>
</tr>
<tr>
<td>DOMAIN</td>
<td>The factor Domain refers to the domain’s specific knowledge, expertise and constraints that a network member brings to the table in a discussion.</td>
<td>For Bob (Marketing), a new ‘safe car’ is a car with more safety features than the upcoming models of other companies. For engineer Christine, safety depends on the use of certain newly tested technologies and materials. The new design will only be innovative in technologist Alan’s eyes when the CAD design standards are maintained.</td>
</tr>
<tr>
<td>NETWORK</td>
<td>The factor Network refers to the people in the personal network of the network member. These are not all the people the network member is connected to (such as all people in an organization are connected to each other), but those people who the network member remembers and has some relevant, tacit, often incomplete knowledge of.</td>
<td>Alan of the IT department has his other IT colleagues in Volvo, but he is also part of CAD-related networks outside the organization (e.g. an online network for CAD developers).</td>
</tr>
<tr>
<td>GOALS</td>
<td>The factor Goals refers to the network member’s explicit and implicit goals, which drive the actions of the network member.</td>
<td>Engineer Christine wants to gain innovative design experience, as this would be beneficial to her career. The IT department wants to introduce CAD design, in order to improve turnover in their department. All project team members want to design a competitive, affordable ‘safe’ Volvo car).</td>
</tr>
</tbody>
</table>

---

6 In this example, the Volvo project team consists of members from different departments among whom Bob (Marketing), Christine (Engineering), Harry (Management representative), Alan (IT) and others.
With these factors as the ingredients of our coding scheme, we can investigate small stories by networkers and pinpoint what matters most to them in the experience of value in a networking activity. These results would enable us to design more suitable support for networking. Our first research question is:

*Which of the five content factors is mentioned most in the individual’s perception of value in a networking activity?*

We expect that the networkers will respond most to the diversity in field, background etc. of the other participants at the networking activity. Our hypothesis is that the factor Context of all five factors will be mentioned the most by network members, given that this factor refers to the most striking differences between people, such as nationality, profession, etc.

To determine the hypothesis on the form in which networkers articulate their experience of value in networking in their small story narratives, we need to make visible the underlying drivers of networkers’ perception of value. In other words, we need to qualify the ways in which networkers gain value in networking settings, in terms of the cognitive activities they experience. There are many ways to approach this issue, including an observational study of networking behaviour or a longitudinal study of networking and related decision-making. As our aim is to design suitable support for networkers online, we are interested in understanding the individual’s experience in a networking setting to a great degree of detail. For this purpose, one linguistic analysis approach is highly appropriate, namely Systemic Functional Linguistics and Systemic Functional Grammar (SFG) (Halliday, 1994). In SFG, language is viewed as a collection of systems that can be used to express different forms of meaning or *metafunctions*. Each metafunction is expressed in language through a grammatical system. Halliday identifies three metafunctions:

- **Ideational metafunction**: refers to how language is used to construe human experience of reality. This function tells us something about how the speaker perceives the world in general and their environment in particular. The ideational metafunction is expressed through the grammatical system of TRANSITIVITY (see below).
- **Interpersonal metafunction**: refers to how language is used to express the social relations between the participants. Th metafunction is expressed through the grammatical system of MOOD.
- **Textual metafunction**: refers to how language is used to direct the internal organisation and communicative nature of a text. The textual metafunction is expressed through the grammatical system of THEME.

An analysis of the ideational metafunction is particularly useful for our purposes, as it allows us to unearth the drivers in a person’s perception of a networking activity. In the grammatical system of TRANSITIVITY, Halliday distinguishes six process types that articulate different types of perceptions and experiences of the world (Table 3.2). Whereas material processes indicate the speaker’s activity in the world (*doing*), mental processes point to what the speaker senses and perceives about their environment (*sensing*). Through relational processes, speakers identify entities in the world and their qualities (*being, having*). With verbal
processes, the speaker reports on certain verbal exchanges (*expressing, indicating*). Behavioural processes are a hybrid of a material and mental processes and existential processes indicate existing or happening. Each process type has a number of Participants that express the entities that play a part in the Process. Circumstances can also qualify a Process by adding some information about time, place, manner or reason.

**Table 3.2 Halliday’s Process Types and related Participants**

<table>
<thead>
<tr>
<th>Process</th>
<th>Denotes</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>Doing and creating</td>
<td>Actor, Goal, Scope, Recipient, Client</td>
</tr>
<tr>
<td>Mental</td>
<td>Sensing – feeling, thinking, perceiving</td>
<td>Senser, Phenomenon</td>
</tr>
<tr>
<td>Relational</td>
<td>Being, having</td>
<td>Carrier, Attribute</td>
</tr>
<tr>
<td>Verbal</td>
<td>Expressing, indicating</td>
<td>Identifier, Identified</td>
</tr>
<tr>
<td>Behavioural</td>
<td>Behaving</td>
<td>Sayer</td>
</tr>
<tr>
<td>Existential</td>
<td>Existing, happening</td>
<td>Behaver, Behaviour, Existent</td>
</tr>
</tbody>
</table>

By analyzing network members’ articulations of value with this linguistic coding scheme of process types and related participants, we can discover which processes are used most to describe the experience of value in a networking activity. Understanding which activities create the most value for a network member in a networking activity will subsequently enable us to design more suitable support that facilitates networking. Our second research question is:

*Which experience-defining processes constitute an individual’s perception of value in a networking experience?*

Our hypothesis is that all of Halliday’s six process types will appear in networkers’ articulations of value perception, but in different proportions. In the value perception of networking experiences, the occurrence of material processes would indicate that particularly activities (*doing*) create value for the networker. Mental processes would rather point to an important role of the thought processes and reflective processes (*sensing*). Relational processes would indicate the perception of identity, quality and characteristics in the world (*being, having*). We expect that value articulations of networking experiences will display a high degree of mental processes, reflecting the preponderance of the individual networker’s thought processes in a networking activity.

In short, we will investigate the content and linguistic properties of networkers’ small stories of what value they perceive in a networking setting. The results of this study will help us create better support mechanisms to increase network participation.
Methodology

Data collection

Our previous research experience described in Chapter 2 showed us that post-hoc descriptions of a networking experience do not go into sufficient detail on why networking learners pick up on certain new relationships or ties, while others are not pursued. Therefore, it was imperative to collect the data for testing our two hypotheses in situ in a face-to-face networking situation. Additionally, we chose to interview participants rather than record the direct conversations between the participants. The reason for this was twofold: on the one hand, we wanted to understand the choices made by the participants, which required their reflection on the conversations they had during the networking event. On the other hand, recording raw data in the form of conversations between participants would introduce many additional factors that would have been difficult to control. These considerations shaped the organization of our data collection, as is described below.

We studied the annual conference of the CEI Caretakers of the Environment Network\(^7\). This designed social network of students and teachers, works on the (wicked) problem of environmental education, awareness and activism in an international setting. Teachers and pupils interact with each other for a week in face-to-face fashion, discussing local student projects. Since the start of the network 26 years ago, more and more international collaborative projects have been conducted. Also, the network has grown considerably since its start in 1986, attracting many new members from across the world. The network has a formal structure, with a Board responsible for the structural and financial health of the network. The CEI network has also undertaken efforts to create a web presence, formally through an informative website, and informally through a page on the social networking site Facebook and peer-to-peer online interactions. The success of these initiatives has been limited, as activity often peaks around the occurrence of a face-to-face conference. Each conference also has a separate online presence. The nature of the CEI network allows us to observe the differences between novice and more experienced networkers easily, due to its combination of pupils and their teachers. Making this distinction in a more traditional network would be more cumbersome.

The 2012 CEI conference was held in Maastricht, the Netherlands. It gathered 253 teachers and students from 24 countries. We audio-recorded 28 interviews with 39 conference participants (18 adults and 21 teenagers) over the 6 days to reflect on their activities at the conference in semi-structured interviews, choosing those activities that they personally perceived as having been the most valuable ones at the conference. For organizational reasons, young people were primarily interviewed in pairs. This resulted in 19 individual interviews, 7 interviews of pairs and 2 interviews of 3 individuals, ranging from 1’01” to 9’50” in duration. The interviews typically started with an open question (“Of all the activities you have done

\(^7\) http://www.caretakers4all.org/conf2012/Home.html
and experienced at this conference, what have you found most interesting?”). The interviewer (first author) asked additional questions, probing for reasons and underlying considerations. No questions were asked on the five factors explicitly. This open structure of the interviews meant that the participants were prompted to reflect on the networking event and on their experiences with it and their role in it.

Data analysis

We divided the dataset into 3 groups of interviews: junior networked learners (11), intermediate networked learners (3) and senior networked learners (14). The group of intermediate learners consisted of 2 students and 1 junior employee, who had been given the specific task of viewing their participation in the conference as a learning experience. Given the small size of this group, we will disregard it in the comparative analysis.

The recorded interviews were transcribed and annotated with the UAM CorpusTool8. We annotated the data in two ways: (i) a content analysis to uncover which of the five factors underlying social complexity were mentioned, and (ii) a transitivity analysis, focussing on process types and participants to gain insight into the networker’s experience of the interactions. We use Krippendorff’s alpha coefficient as a measure of inter-rater reliability for both coding systems with two trained coders (Freelon, 2010). Both coders were trained in the use of the coding schemes and had access to background information on the interviewees and the audio-recordings of the interviews. 10% of the total dataset was coded independently and the inter-rater reliability was calculated. The content coding scheme had high alpha coefficients for all the factors: (α between 0.80 and 0.86). The linguistic coding scheme showed a high reliability for the categories mental (α= 0.88), material (α= 0.85) and relational (α=0.91). Reliability in the other categories fluctuated more. Behavioural has an undefined α, with 100% agreement between the two coders, which can be explained due to the fact that the 10% sample form the complete dataset did not contain any behavioural processes. In the verbal category, α is 0.49, with 98% agreement. Here too, the sampling contained very few examples of verbal processes, which were sometimes coded differently. In the existential category, α is equal to one, as the coders were in full agreement.

Results

We will first discuss the results of the content analysis, and then the results of the linguistic analysis.

Results of the content analysis

In the 28 interviews, 485 passages (units of content) were identified and annotated. None of the interviews indicates one factor as uniquely responsible for the experience of value. In

8 http://www.wagsoft.com/CorpusTool/
other words, multiple factors are responsible for the experience of value. In fact, all interviewees mention a minimum of 3 factors and most of them mention all 5 (Table 3.3).

<table>
<thead>
<tr>
<th>Number of factors mentioned</th>
<th>Number of interviews</th>
<th>Percentage of occurance</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>17.8%</td>
</tr>
<tr>
<td>4</td>
<td>10</td>
<td>35.7%</td>
</tr>
<tr>
<td>5</td>
<td>13</td>
<td>46.4%</td>
</tr>
<tr>
<td>Total</td>
<td>28</td>
<td>100%</td>
</tr>
</tbody>
</table>

The distribution of the passages over the five factors is as follows (Table 3.4):

<table>
<thead>
<tr>
<th>Content code</th>
<th>N</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Context</td>
<td>219</td>
<td>45.1%</td>
</tr>
<tr>
<td>Strategy</td>
<td>115</td>
<td>23.7%</td>
</tr>
<tr>
<td>Domain</td>
<td>51</td>
<td>10.5%</td>
</tr>
<tr>
<td>Network</td>
<td>43</td>
<td>8.9%</td>
</tr>
<tr>
<td>Goal</td>
<td>57</td>
<td>11.8%</td>
</tr>
<tr>
<td>Total</td>
<td>485</td>
<td>100.00%</td>
</tr>
</tbody>
</table>

Strategy (23,%) and Context (45,1%) clearly emerged as the factors most often mentioned in the perception of value in networking activity. In fact, Context is referred to by all interviewees, often at the start of the interview.

The distribution of factors across the three subgroups (novice, intermediate, and advanced) in Table 3.5 reveals a number of differences. The most striking ones are in the categories Goal (6.9% in novice networked learners vs. 16,0% in advanced networked learners), and Context (difference of nearly 5% between novices and advanced).

<table>
<thead>
<tr>
<th>Content code</th>
<th>Novice</th>
<th>Percentage</th>
<th>Advanced</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Context</td>
<td>96</td>
<td>47.5%</td>
<td>101</td>
<td>42.6%</td>
</tr>
<tr>
<td>Strategy</td>
<td>48</td>
<td>23.8%</td>
<td>55</td>
<td>23.2%</td>
</tr>
</tbody>
</table>
A further investigation shows a significant difference in the distribution between the novice networked learners and the advanced networked learners ($\chi^2(4, 439) = 10.97, p<0.05$). The standardised residuals indicate that the factor Goal contributes most to the significance (Table 3.6).

Table 3.6 Cross-tabulation of Level Networked Learners and Content Factors (df=4, n=439)

<table>
<thead>
<tr>
<th>Usage of Content Factors</th>
<th>Level of Networked Learning</th>
<th>$\chi^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Novice</td>
<td>Advanced</td>
</tr>
<tr>
<td>context</td>
<td>0.6</td>
<td>0.52</td>
</tr>
<tr>
<td>strategy</td>
<td>0.1</td>
<td>0.08</td>
</tr>
<tr>
<td>domain</td>
<td>0.2</td>
<td>0.21</td>
</tr>
<tr>
<td>network</td>
<td>1.2</td>
<td>1.10</td>
</tr>
<tr>
<td>goal</td>
<td>2.0</td>
<td>1.87</td>
</tr>
</tbody>
</table>

* $p<0.05$

Results of the linguistic analysis

A total of 1805 processes were identified and annotated across the 28 transcribed interviews. The overall distribution is given in Table 3.7.

Table 3.7 Distribution of linguistic processes in interviews across 6 Hallidayan process types

<table>
<thead>
<tr>
<th>Process Type</th>
<th>N</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mental</td>
<td>411</td>
<td>22.77%</td>
</tr>
<tr>
<td>Material</td>
<td>644</td>
<td>35.68%</td>
</tr>
<tr>
<td>Relational</td>
<td>619</td>
<td>34.29%</td>
</tr>
<tr>
<td>Verbal</td>
<td>87</td>
<td>4.82%</td>
</tr>
<tr>
<td>Behavioural</td>
<td>20</td>
<td>1.11%</td>
</tr>
</tbody>
</table>
The distribution shows that the interviews contain primarily mental (22.77%), material (35.68%) and relational processes (34.29%). The number of instances of verbal, behavioural and existential processes is an order of magnitude smaller, which means that the networkers do not report in much detail about what is going on at the conference. They focus primarily on the activities, the thought processes and the perceived relationships in the networking activity.

No significant difference was observed in the distribution between the junior networked learners and the advanced networked learners in this linguistic analysis. This might indicate that the observed distribution across the process type is typical of small stories on networking experiences. More similar research is needed to confirm this.

A next step in the analysis is to understand which process-related Participants are present in the interviews. The analysis (Table 3.8) showed that the majority of grammatical subjects or implied subjects to the processes in the interviews are pronouns (52.58% of the 1805 (implied) subjects). Of these pronouns, 69.76% are 1st person pronouns (434 instances of I and 228 instances of we). Remarkably, only 20.97% of the pronouns refer to third persons (he, she, they). The first person pronoun subjects mostly take the participant role of Sensers (participant of mental processes – the one who feels (emotionally), thought about or perceives) and Actors (participant of material processes – the one performing the act). There are no significant differences noticeable between the different groups in their use of pronouns.

<table>
<thead>
<tr>
<th>Kind of pronoun used</th>
<th>Total number of pronouns</th>
<th>Total number of pronouns as Sensers or Actors</th>
<th>Percentage of pronouns as Sensers or Actors</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>434</td>
<td>319</td>
<td>73.50%</td>
</tr>
<tr>
<td>We</td>
<td>228</td>
<td>157</td>
<td>68.86%</td>
</tr>
<tr>
<td>He/She</td>
<td>31</td>
<td>10</td>
<td>32.26%</td>
</tr>
<tr>
<td>They</td>
<td>168</td>
<td>109</td>
<td>64.88%</td>
</tr>
</tbody>
</table>
Discussion

Our first research question asked which of the five content factors is mentioned most in the individual’s perception of value in a networking activity. The content analysis speaks to this question and reveals what networkers value in a networking activity. Firstly, all five content factors (Goal, Strategy, Context, Domain and Network) are mentioned in the value-describing interviews. This indicates the usefulness of our coding scheme. We hypothesized that the factor Context would be mentioned most often, which the results confirm. Secondly, the results show that none of the interviewed network members mentions just one factor as the sole valuable aspect of the networking event, but always mention multiple factors, indeed, often all of them. This leads us to believe that the value that network members perceive in networking events stems from the combination or even the alignment of these different factors; that is, from the individual networker’s perspective, the separate factors begin to “make sense together" or “be connected.” Thirdly, advanced networkers use the factor Goal significantly more than novice networkers. This suggests that, as they gain more networking experiences, advanced networkers become more purposeful in their networking interactions.

Our second research question inquired after the experience-defining processes that constitute an individual’s perception of value in a networking experience. The linguistic analysis reveals how networkers experience value in a networking activity. Firstly, through their language use the networkers reveal that their participation is indeed a very personal experience. The majority of grammatical subjects in the interviews are personal pronouns, of which the 1st person pronouns are the most prevalent. The majority of the 1st person singular pronouns (I’s) belong to mental and material processes. This kind of usage indicates that the speakers value taking on multiple roles in their networking activities: (i) as participants of material processes (Actors) where they participate in what is going on around them and (ii) as participants of mental processes (Sensors) where they are using their reflective ability to see, feel and think about or “make sense of” what is going on around them. Secondly, the linguistic analysis reveals that the networking experience is a combination of activity, thought and identification or categorization. Mental, material and relational processes together form the overall majority in the interviews; there are no significant differences between different groups within the dataset. The high numbers of mental and material processes can be explained through the conference activities: the networkers engage in activities which are designed to evoke thought processes and problem solving. The high number of relational processes is particularly relevant, as it shows that the networkers are actively involved in the characterization of what they see and hear around them in their networking.

The results of the content and linguistic analyses lead us to conclude that the perceived value in a networking activity from the individual’s point of view lies in the high level of individual agency of the networker, as someone who participates in the network activities, is mentally engaged in problem solving and categorizes what is perceived.
Conclusions

One of the major challenges of social networks that have been designed around a wicked problem is the creation and implementation of appropriate support. This support is to increase network members’ engagement in the dialogue intended to solve the wicked problem. In this section, we will formulate guidelines for appropriate support, along with the limitations of our suggestions and some directions for future research.

This study showed that the social practice of networking revolves around a personal alignment or re-assessment of the five content factors we derived from Conklin’s work (2006b). Our findings are in line with the role Weick and co-workers see for communication and conversation as places and moments for sensemaking (Weick et al., 2005). They also revealed that networkers perceive value in their networking activity when they are active participants, both when carrying out actions, as well as when thinking about, feeling and perceiving what is around them. With these initial conclusions, we now formulate three guidelines for appropriate support to be given to networkers to enhance their networking effectiveness.

Possibly the most important guideline is to entice networkers into becoming active participants, both cognitively (as sensers) and physically (as doers). Networker activity is most easily achieved by making them partake in conversations with other participants. When conversations progress to the point of breakdown, the networkers will reassess the plausible stories held, effectively engaging in sensemaking (Weick et al., 2005). The significant difference in purposeful networking between novice and advanced networkers makes the case for mentoring junior networkers. However, the form of this mentoring is not straightforward.

In face-to-face networking situations, activation of novice networkers happens through much more subtle and ad-hoc methods (that are still largely not studied). As observed at the CEI conference, the focus of this support is on helping an individual novice networker improve her communication with other novice networkers. This can happen through foreign language tips and tricks, reformulating and rephrasing statements, giving examples that clarify or in-depth discussions with the novice networker. In online networking, activation of novice networkers has often been achieved through ‘moderating’, i.e. the guidance of new networkers by a more experienced one through general follow-up and specially organized activities (Salmon, 2011; 2013; Bitter-Rijpkema, Verjans, Didderen & Sloep, in press). Very often they take place in a classroom setting, with a fixed (and often trusted) group of peers, under the lead of a senior. The scalability of these activities often happen through a pyramid model, where a previous mentee who has undergone guidance becomes a mentor. Although successful, this process is relatively slow to take off.

It is important to recognize the difference between the way mentoring is shaped in face-to-face and online networking situations. The role of the supporting moderator seems to be
completely different in both contexts: in face-to-face networking, it is someone on the sidelines of the conversations whereas in online networking, it is someone who is central to the communication, facilitating the conversation. However, more research is needed to establish the differences in more detail.

Mentoring support can also be offered in the form of tools (Sloep, in press). Examples such as the AHTG tool (Fetter et al., 2012) and the CoCoon tool (Sie, 2012) show that support can be automatized, in order to reach a larger number of people. Our findings also provide some conceptual guides for the design of tools to mentor novice networkers in their networking. Firstly, supportive tools can start from the content factors derived from Conklin (2006b) to guide the novice networker to more purposeful networking conversations. This would require some form of technical translation of the five content factors (e.g. through natural language processing or marker words). Secondly, the active participation of the novice networker, both physically and cognitively, can be instigated through various individual and group activities. Game-based designs could also be useful here.

A second advice for guiding support is to create situations where networkers can engage in conversations with participants with diverse backgrounds. As the confrontation with multiple and different contexts is valued the most in a networking session, meeting with and talking to different people across the social spectrum of the wicked problem is required. This advice is echoed in existing research (Sie, 2012) and our own previous research (Rajagopal, Verjans, Costa, & Sloep, 2012).

A third and final guideline for support is to encourage the networkers to engage in both individual and collaborative sense making. In other words, the exploration of the wicked problem in the dialogues needs to result in some preliminary conclusions (such as meanings given, issues understood, planning next steps, etc.).

Table 3.9 gives an overview of our three guidelines together with some opportunities and shortcomings of current support for networking in face-to-face networking settings (such as domain-specific conferences and seminars) and online networking settings (such as learning networks and designed social networking platforms).

<table>
<thead>
<tr>
<th>What we need</th>
<th>Face-to-Face</th>
<th>Online</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active Networkers engaged in Dialogue</td>
<td>+ various activities, ranging from 1-to-n interactions (e.g. presentation) to n-to-n (often moderated) interactions (e.g. workshops). + unstructured social events (coffee breaks, lunches, dinners) encourage most dialogue</td>
<td>+ nature of online communication may remove or minimize some individual inhibitions + potential to engage in intensive dialogue (e.g. comments, blogs, forum etc.), but their use depends on the motivation of individual networker.</td>
</tr>
<tr>
<td>Dialogue with Diverse Participants</td>
<td>Sense making</td>
<td></td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-------------</td>
<td></td>
</tr>
</tbody>
</table>
| + targeted activities combining people of diverse backgrounds around new themes are regular. These groups push the boundaries of social complexity around a wicked problem  
− Again, good moderation is required to encourage relevant dialogue  
− individual inhibitions might keep some networkers from engaging in diverse Groups | + networking organizers usually formulate general statements on outcomes of the networking activity and next steps. Individual networkers may also formulate personal lessons learnt.  
− preliminary conclusions are made on individual and collective level  
− Articulation of sense-making remains a conscious effort on the part of the network organizers or certain motivated individual networkers. They are not a natural outcome.  
− follow-up often remains scattered. Individual initiatives might remain tacit or might never effectuate. |
| − intense dialogue is not primary form of communication on an online platform.  
− online communication is often restricted to superficial actions such as connecting (friending, following) broadcasting (status updates, sharing), and a show of interest (liking, retweeting).  
− when moderation is used, its focus is primarily on creating activity in the community. The minimal form of this occurs when the moderator engages in dialogue with few others. | + technology affords individual and collaborative expression through a variety of instruments (based on text, image, audio, video, etc.) and methods (private to public, shared spaces with one, some, many, all).  
+ continuous and ubiquitous platform affords long-term follow up on networking events  
− to be successful, technology depends on the articulation of tacit sense-making conclusions, but this remains highly dependent on the individual networker’s motivation, interest, time, etc.  
− there are few network-based sense-making support tools (mind-mapping; interesting concepts from IBS but not in networked contexts yet) |

+ even fewer vocal participants (the *listeners*) can be engaged in intensive cognitive activity

− individual inhibitions in unfamiliar social settings might prevent some from engaging

− in n-to-n conversations, the quality of moderation can make or break an activity.

− online has farther reach and potentially attracts many more people with diverse backgrounds than face-to-face (provided access)

− there are no or few activities with (human or automated) moderation

− too large a network brings about issues of lack of trust, dissuading networkers from engaging in deep dialogue with participants

− networkers connect with known people or people who are similar to them, thereby undermining the value-bringing factor *Context*. As a result, they minimize or stop participation within the network

− follow-up often remains scattered. Individual initiatives might remain tacit or might never effectuate.
Whereas face-to-face settings are good at facilitating the value-creating conversations between the participants, online settings offer a wider range of interaction opportunities between the participants. As a result, intensive conversations on an online platform remain subject to the individual networker’s motivation and intentions. Whereas face-to-face sessions have dedicated networking-encouraging activities, online networking platforms do not (yet) use such activities widely. Some notable exceptions are A Tutor Locator (Van Rosmalen, 2008), and Ad-Hoc Transient Groups (Fetter, Rajagopal, Berlanga & Sloep, 2011; Sloep, 2008), which start the design of the technology from the premise of creating meaningful interactions (Sloep, in press). The tension between a technology’s functionality and a technology’s application is also the subject of much action research of practitioners using networks as part of their teaching practice and for their personal development (Conole & Dyke, 2004; Harris, Earl, Beale & Phethean, 2012; Ivanova, Grosseck & Holotescu, 2012).

Limitations

A first limitation to this study lies in our choice of the five content factors. We wanted to use these factors in an effort to understand the act of interpersonal networking better, with the ultimate aim to create appropriate support. We do not pretend to be exhaustive, there may be factors that influence the social complexity of a wicked problem that we failed to take into account. A second limitation is that this qualitative study was done with interviews of 39 people at a conference. This study is a precursor to a larger study with more quantitative data, derived from larger groups, which would bring additional reliability. Thirdly, we already mentioned that the CEI conference is an atypical conference, as it brings together teachers and pupils of Environmental Education in the same, predominantly physical networking space. As these groups are aware of each other’s role in the conference, a non-neutral relationship exists between them. Therefore, the differences between the groups may be more pronounced here than at other conferences. To nuance this difference, this study needs to be replicated at other conferences. Fourthly, in light of the analysis method used in this study, it is important to mention that the conference participants were not native speakers of English, although they were quite proficient at the language. It is possible that a similar investigation with native English speakers might give different results. However, given the nature of the transitivity analysis, we expect the differences to be minimal.
Directions for Future Research

This study adds to the limited existing research on the social activity of interpersonal networking. In particular, this study:

- focuses on the qualitative aspects and content of networking interactions. It places attention ostensibly on the central role of conversations between networkers.
- proposes a move away from the quite fuzzy (and often negatively connotated) concept of networking, in order to discuss networking in more concrete terms.
- offers us more insight into the social practice of networking and the value that networkers perceive from it. It poses that networking, rather than just connecting with others, is a form of cognitive activity and sensemaking.
- suggests that support in designed social networks should be focused on the design and development of individual and collaborative cognitive activities.

A first possible route for future research is to remedy the limitations to the present study, by considering more content factors and involving larger as well as different kinds of groups. A second route involves continuing the descriptive qualitative studies better to understand the social act of networking. Especially, a focus on content of networking interactions is required to complete the proposed content coding scheme and to further refine it. A third possible avenue for future research is to design activities focused on mentoring novice networkers online, and facilitating and encouraging networking for online designed social networks.
Part 2
Chapter 4: 
User-created Tag Sets as components of User Profiles in Social Matching Systems


Abstract

User-created tags are increasingly used as components of user profiles in various learner support systems in learning networks. Despite their many advantages, user-created tags become problematic when they are used in an augmented form, through various automatic analytics. We posit that such automatic augmentation decreases the intentionality of the user profile, which consequently cannot be considered representative of the user anymore. Nonetheless, there is a need to capture the understanding of a learner (in the forms of topics and concepts and the perceived connections between them) as we see that learner support systems need to enable conversations for sensemaking up to and after a breakdown has occurred, i.e. a mismatch in understandings of two people. We propose the use of user-created tag sets as an additional component in user profiles. We present the results of a study where we investigate if user-created tag sets succeed in stimulating the articulation of tacit connections between topics and concepts. The results of the study show that user-created tag sets have the potential to contribute to a more comprehensive user profile, that better captures an individual’s understanding.
Introduction

Learning networks are online environments that support non-formal networked learning (Sloep, Berlanga, Grelle, Stoyanov, Van der Klink, Retalis & Hensgens, 2012). A key aspect of non-formal learning is sensemaking, an ongoing cognitive activity in which humans engage to construct rational structures retrospectively around their experiences, thereby giving meaning to observations, which can be shared with peers and others (Weick, Sutcliffe & Obstfeld, 2005).

Weick et al. (2005) mention three aspects of sensemaking that indicate the importance of interpersonal dialogue in these interactions with peers and others. The first aspect is that this retrospective cognitive action is often instigated by a mismatch in understandings or breakdown, which occurs when an “expectation of continuity is breeched” (Weick et al., 2005, p 414). Breakdown occurs when something unexpected happens, thereby triggering a re-assessment of the constructs held (Winograd & Flores, 1986). The second aspect is that sensemaking centres around communication, where tacit knowledge is articulated in conversations. The third aspect is that sensemaking inherently supports individual motivation: when the plausibility of a held construct is breeched by a new experience, the rational structure is subject to change again and there is scope to search for a more plausible structure (Weick et al., 2005). Taken together, these three aspects indicate that conversations are often the spaces where breakdown occurs, and where a search for new more plausible rational constructs is triggered.

As conversations are such an important factor in sensemaking, they become a central activity in learning networks. Members of learning networks participate by engaging in conversations with others. These online interactions can be seen as a form of interpersonal networking, i.e. a human social act in which a person deliberately engages in consecutive conversations with known and unknown professional peers to share and receive information, to potentially learn and to make long-term and short-term connections with them. Interpersonal networking has been indicated to be an important activity in lifelong learning (Jenkins, 2009; Weller, 2011).

Conversations for sensemaking need to be content-rich: they need to go beyond the social interactions to discuss the different opinions and understandings of the dialogue partners. As such, online platforms need to facilitate and support these types of conversations. If conversations for sensemaking and the discovery of breakdown are a primary reason for lifelong learners’ participation in learning networks, technological support needs to focus on uncovering the differences between two people’s understandings of a topic, thereby triggering learning or reassessment for both. In this article, we will see how these types of conversations can be facilitated.
In the past, several approaches were attempted to get learners to interact about a topic of interest in more explicit ways. A first commonly used solution is through the use of prescriptive scripting in CSCL (O’Donnell & Dansereau, 1992; Dillenbourg, 2002). In this approach, learners are guided to articulate their understanding by following strict guidelines in their conversations with others. This is implemented through prescribed, pre-formed sentences or the answering of predefined questions. In this approach, the form of the conversation is controlled to enable the dialogue partners to concentrate on content. Examples are online moderation (Salmon, 2011; 2013), IBS and dialogue mapping (Conklin, 2006a; Selvin, Buckingham Shum, Seirhuis, Conklin, Zimmerman, Palus & Li, 2001), etc.

Another approach is the automatic identification of conversation patterns (Dascalu, Rebidea & Trausan-matu, 2011). There, support can take shape in two forms:

- As navigation support: Through the monitoring of conversation patterns and topics, ongoing discussions and conversations can be identified and recommended to learners for whom they might be of interest. In this approach, the engagement into the conversation is facilitated by suggesting potential dialogue participants with conversations that match their interests.
- As targeting certain predefined conversation goals: By monitoring an ongoing conversation between one learner and others, group facilitators or teachers can step in when necessary and suggest new topics for discussion to enrich the conversations.

Although these two approaches are successful in guiding users into good conversations, they presume that the technology designer has some knowledge of which conversation, to be held by the dialogue partners, would be beneficial for learning purposes. In other words, there are expectations built-in into the tools and instruments about what a ‘good’ conversation for learning is.

However, in many situations, it is not known what form conversations should take. Moreover, the contents of conversations are dynamically emerging, on the fly, and shaped by the interest of the dialogue partners. A conversation can therefore take directions unpredicted and unpredictable by the designers. Current technological support does not encourage open conversations where the topics of interest may or may not emerge from the interaction. Indeed, current support starts from the presupposition of a goal for the conversation and methods to achieve that goal.

Open methods of facilitating conversations often remain at a superficial level of enabling learners to discuss and interact with each other, or mere recommendation of ongoing conversations or potential dialogue partners, where the user is invited to join in because topics may be of interest to him/her.

In this article, we propose a conceptual and technical solution to support open conversations between learners in a more sophisticated way, through the use of tags and activities with tags.
If we consider an open conversation to be an interaction at the content level between two people and their respective understandings of a topic, the first step in a technical solution is to map these understandings in a technical format. One much used component to describe users in online learning networks, apart from their static user profile, are user-created tags, i.e. keywords assigned to a chosen resource, by the user (Schoefegger & Granitzer, 2012). Tags are used in two ways: (i) as an indication of what the person is interested in or knows, and (ii) as an indication of the content of the resource. User-created tags make three interesting characteristics possible in user profiles.

- They allow a user profile to be dynamic with regular updates of user data, in particular, with regards to user content and interest.
- They allow user profiles to be free-in-form, without any predefined content.
- They allow a user profile to be close to the user’s own world, with users employing their personal terminology (words and grammatical structures) to describe themselves and other resources.

Nonetheless, user-created tags as such have limited informative value: they only refer to some topics. For this reason, tags have always been augmented with some semantic context. On the one hand, tags are inherently part of a semantic relation between a person, a topic and a resource in the outside world, such as media content, events, places or people. This three-way relation has been used intensively to improve categorization (Zubiaga, Körner & Strohmaier, 2011), search of educational resources (García & Bender, 2012; Vuori-kari, Pődolja & Koper, 2010; Westerhout, Monachesi, Markus & Posea, 2010), and recommendation of people (Guy, Ronen & Wilcox, 2009; Fazeli, Drachsler, Brouns & Sloep, 2013). On the other hand, tags also have tacit semantic relations with other tags, which can be elicited through various semantic analyses. Such augmentation with semantic relations introduces elements that are not user-created, abstracting away from the user’s own terminol-ogy.

In short, user-created tags can be considered as good indicators of a user’s interest and proficiency on topics, but automatic semantic augmentation of these tags is necessarily at variance with user intentionality. This is a serious shortcoming in the current use of user-created tags. Therefore, user-created tags can become useful tools to represent a user’s understanding of a topic, and can also be of use in our goal to facilitate open conversations.

User-created tags could be especially useful in representing the sensemaking mind, with the dynamic, fluid constructions that a person makes in order to make sense of something (plausible stories in Weick’s et al.’s terms). This vision of the mind is also supported by Knowledge Building Theory. Bereiter (2002) sees understanding as an essential relation between the individual and the topic of the understanding, that emerges in a self-organising mind that continuously tries to make sense of events in the outside world. Connections in this mind are continuously made and re-evaluated by the learner herself or in collaboration with others (Scardamalia & Bereiter, 2006). These constructions of the mind are called un-
derstanding in Knowledge Building Theory (Bereiter, 2002). Therefore, a modeling instrument that represents this image of a sensemaking mind needs to fulfill the following cognitive criteria: (i) it needs to change with the user’s changing understanding; (ii) it needs to cover an ever-increasing number of topics, and also an ever-changing number of connections between the topics; and (iii) the topics and the connections between the topics in the instrument stem from the intentions of the learner, representing the connections the learner sees between content/topics. Technically, the instrument needs to sufficiently represent these cognitive requirements and additionally also be usable in a network environment, i.e. scalable and extendable as required. Table 4.1 summarizes these requirements.

Table 4.1 Cognitive and Technical Requirements of the user profile

<table>
<thead>
<tr>
<th>Cognitive Requirements</th>
<th>Technical Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Represents the dynamic changing of the user’s understanding</td>
<td>Dynamic</td>
</tr>
<tr>
<td>2 Covers an ever-increasing number of topics, an ever-changing number of connections between the topics</td>
<td>Accommodates an ever-increasing number of topics and an ever-changing number of connections between the topics</td>
</tr>
<tr>
<td>3 Stems from the intentions of the learner, representing the connections the learner sees between content and topics</td>
<td>Is user-instigated or user-created</td>
</tr>
<tr>
<td>4 ( )</td>
<td>Scalable and extendable in network environment</td>
</tr>
</tbody>
</table>

The user-created tags discussed above fulfill most of the technical requirements, supporting dynamic user profiles, that are free-in-form and employ the user’s own terminology. They are good indicators of a user’s interest in and proficiency on topics. However, tags on their own do not support the user-perceived connections between the topics. As mentioned before, current semantic augmentation of tags impeaches the user intentionality, and therefore is not a suitable choice here. To include user-perceived connections between topics, we propose the use of a new component of a user profile, namely, intentionally created collections of tags put together by the user, which we will call user-created tag sets.

Our hypothesis is that user-created tags and tag sets make for a comprehensive model of the sensemaking mind of an individual user. In this article, we will investigate if user-created tag sets fulfill the cognitive requirements as a representation of the user’s understanding. From the user’s point-of-view, tags represent topics and concepts, independent of the resource they are related to. The user perceives semantic relations between tags, irrespective of the resources they belong to and were created for. A tag set expresses the connections a user perceives between topics and concepts. When the user elaborates on the tag set in natural language, she introduces and articulates concepts that are not present in the original tag set.
We will consider the following research hypothesis:

*User-created tag sets stimulate the user to articulate the tacit connections she sees between different topics and concepts.*

and these sub-hypotheses:

- The existence of ‘rise-above’ tag sets, i.e. tag sets that collect tags from different resources, taking the tags outside of the context they were made in, shows that from the user’s point-of-view tags represent topics and concepts, independent of the resource they are related to.

- The occurrence of more concepts in the elaboration than in a chosen tag set shows that the user perceives connections between the tags in a chosen tag set that are not originally present in this tag set.

**Methods**

As we are looking at tags and tag sets in the context of modeling the sensemaking mind of a user, we chose to test the hypotheses in a networking workshop. In several ways, we endeavoured to gather a large number of participants through an online platform to create tags and tag sets following networking conversations. However, these trials returned meagre results mainly due to low participation. The primary reason for this is that participants needed to build in the use of the new platform into their regular online activity, which proved to be too demanding a task. We therefore chose a face-to-face setting, for reasons of convenience. Our assumption is that face-to-face networking offers an authentic setting of sensemaking in conversations and would therefore also give us more authentic observations of tagging and tag set creating. However, we have no reason to doubt that similar if not identical observations would have been made in an online setting. Our decision to work in a face-to-face environment did have consequences for the number of participants we could attract, which is reflected in the results.

We conducted the workshop at the eTwinning conference in 2012, in Berlin, Germany. The eTwinning network is a network of European schools and teachers currently counting more than 160000 teachers across Europe. Since its start in 2005, the network has grown immensely and its members consider their participation in its face-to-face activities and online platform⁹ as a significant part of their personal continuous professional development (Vuorikari, Gilleran & Scimeca, 2011).

**Participants**

⁹ http://www.etwinning.net
The workshop was open to all 500 attendees of the eTwinning conference. We attracted 26 participants, and data was gathered of 23 participants, including 20 teachers and 3 others (including representatives of ministries and school principals).

Materials

Each participant was given a folder with a number of supportive materials:

- An envelope with 30 cards. The cards were printed on one side with a unique motif and numbered on the same side with the numbers 0, 1, 2, 3, 4 and 5 (5 cards per number). The motif was used to be able to trace the data of each participant. The numbers indicate the interaction engaged in during the workshop. In the rest of this article, we will refer to these cards as cards0, cards1, cards2, cards3, cards4 and cards5. Each card had one blank side, where the participant could write on.
- A paper form entitled “Questionnaire”, asking for the participant’s personal details, and a description of their professional context (function, responsibilities and school). The participants who were from the national support agencies or educational ministries (not teachers) were asked to write about their efforts to introduce eTwinning in the curriculum in their countries. At the bottom of the form, participants were asked to give 5 tags describing their unique situation that they have just introduced.
- A paper form entitled “About me”, starting from the 5 tags they just defined and 1 large box for writing a text describing themselves.
- A paper form entitled “My Baskets”, with a 2-column-grid to fill in.
- 2 paper forms entitled “eTwinning and me: My Journal Post”. This form consisted of a textbox to write a series of tags in, a box for writing a larger text and a box at the bottom of the page to add additional tags.
- A pen to write with.

Procedure

The activity of the participants was guided through a series of seven steps:

Step1: Each participant received a pre-prepared package of supportive material and was asked to check if the contents were complete.

Step2: Each participant filled in the Questionnaire, answered the last question on the basis of their own school context, and defined 5 keywords that describe the situation at their school.

Step3: Each participant noted down the 5 keywords from the previous step on 5 cards (one per card) marked with the number “0” (cards0).

Step4: Each participant engaged in 4 1-to-1 conversations, each time with a new partner. The facilitator kept time: each conversation was 5 min in length, followed by 1 min in which participants were asked to write down keywords describing the conversation on the cards marked with the corresponding number (so, conversation 1 on cards1, conversation 2 on
cards2 and so forth). The participant collected a maximum 5 cards-with-keyword per conversation. Although originally 5 rounds of 1-1 conversations were planned, it was restricted to 4 rounds due to time considerations. This part of the activity took about 30 minutes in total.

**Step5:** Each participant took their 5 cards0 and wrote a short text elaborating on the connection between the tags on these cards, using the template “About me”.

**Step6:** Each participant then took all their used cards and grouped the cards into tag sets or baskets, based on the question “Which topics belong together, in my opinion?”. The participants were given about 5min to do this, using the template “My baskets”.

**Step7:** The participant then selected one tag set out of their list and wrote a short text elaborating on the connection between the tags in this tag set, using the template “My Journal Post”.

**Step8:** The session ended with a short debriefing of working format, to discuss networked knowledge building online and face-to-face.

This preparation and approach to the workshop allowed us to trace 3 products of each participant: tags, tag sets and elaborations. Our hypotheses can now be operationalized as follows:

1. For the user, tags represent topics and concepts, independent of the resource they are related to. The user perceives semantic relations between tags belonging to different resources.

This hypothesis predicts that we will observe a high number of tag sets that include tags from different conversations, which we named a rise-above tag set (cfr. Scardamalia, 2002; Zhang & Scardamalia, 2009). The existence of rise-above tag sets indicates that the user has taken tags out of their original context (the conversation which they stem from) and has created new relations with them and between them. We distinguish three types of rise-above tag sets:

- **Rise-Above Type1**: these are tag sets in which at least one tag was related to the participant’s own situation (at least one of the cards is from cards0).
- **Rise-Above Type2**: these are tag sets in which all the tags in the set are from a same conversation, but do not stem from the participant’s own context (so for example, all cards in the tag set are marked with cards1; there cannot be any Type 2 tag sets with only cards0). Although it does not strictly combine tags from different conversations, we see this as a special type of tag set because it points to a stronger semantic bond between the tags and the conversation.
- **Rise-Above Type3**: there are tag sets that contain tags from different conversations, but are not related to the participant’s own context (so the tag set includes for example cards from cards1 and cards2).
2. For the user, a tag set expresses the connections she perceives between topics and concepts. When the user elaborates on the tag set in natural language, she introduces and articulates concepts that are not present in the original tag set.

This hypothesis predicts that we will observe that the elaborations of a tag set in natural language contain more semantic concepts that the tag set itself. We define a semantic concept in linguistic terms, as the stem of a lexical word. The use of a new lexical stem introduces a new semantic concept. In numbers, the number of concepts in elaborations would be higher than the number of concepts in the tag set.

Results

We will first give some general descriptive statistics of the data gathered, and then present the relevant results to the hypotheses set above.

General descriptive statistics

Of the 26 participants in the workshop, 23 handed in their data for analysis. Collectively, they created 504 tags: 102 describe their situation (Step3) and 402 from their 4 conversations (Step4). They collectively created 99 tag sets (baskets from Step 6). Finally, we received 23 short elaborations of tag sets (journal posts from Step7), chosen and written by the workshop participants. All outcomes can be traced to the participant who wrote them.

The 23 participants collectively created 504 tags: 102 describe their own personal situation (Step3) and 402 from their 4 conversations. We see that the average is slightly lower than expected, which might point to some effort on the part of the participants in tagging the entities of conversations or unfamiliarity with the activity of tagging itself (Table 4.2).

Table 4.2 Distribution of Tags created by workshop participants

<table>
<thead>
<tr>
<th></th>
<th>Total number</th>
<th>Mean per participant</th>
<th>Expected mean (as per instructions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tags describing own situation</td>
<td>102</td>
<td>4.44</td>
<td>5</td>
</tr>
<tr>
<td>Tags from conversations</td>
<td>402</td>
<td>17.48</td>
<td>20</td>
</tr>
</tbody>
</table>
Content-wise, we counted 422 unique tags, which ranged from one-word terms to multiple-word noun phrases and even complete verb phrases and sentences. The tags express singular ideas or concepts.

The 23 participants collectively created 99 tag sets, creating an average of 4.30 tags per participant ($SD = 2.97$). The size of the tag sets ranged from a minimum of 1 tag to a maximum of 8 tags, with an average tag set size of 3.21. Of the 99 tag sets, 78 (or 79%) are rise-above tag sets. This means an average of 3.39 tag sets per participant are rise-above tag sets ($SD = 1.55$). We observed the following distribution in types of rise-above tag sets (Table 4.3).

Table 4.3 Distribution and Statistics of Rise-Above Tags across Rise-Above Tag set types

<table>
<thead>
<tr>
<th>Rise-Above type</th>
<th>Total number</th>
<th>Average per participant</th>
<th>SD</th>
<th>Percentage (n=78)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 1</td>
<td>35</td>
<td>1.52</td>
<td>1.06</td>
<td>44.87%</td>
</tr>
<tr>
<td>Type 2</td>
<td>7</td>
<td>0.30</td>
<td>0.46</td>
<td>8.97%</td>
</tr>
<tr>
<td>Type 3</td>
<td>36</td>
<td>1.57</td>
<td>1.38</td>
<td>46.15%</td>
</tr>
</tbody>
</table>

The high percentage of rise-above tag sets shows that the participants see the tags created in Steps 3 and 4 independent of the conversations they had in these steps. The ‘real’ rise-above tag sets (Type 1 and Type 3) occur the most with respectively 44.87% and 46.15%. Only 8.97% are of type 2. The high number of rise-above tag sets, and especially the high percentages of Type 1 and Type 3 rise-above tags, indicates that creating tag sets does focus the attention of the participants on the semantic content of the tags, rather than their relation with the original conversation. This supports our first sub-hypothesis.

21 of the 23 participants chose 1 tag set each from their collection of tag sets to elaborate on (Step 7). One participant wished to take together 3 tag sets in one elaboration. One participant did not submit an elaboration. This gave us 21 tag sets, with their related elaboration. We reduced the tag sets and the elaborations to the lexical words mentioned. Each lexical word was then stemmed, to be able to consider the concepts in the tag sets and elaborations. We were then left with the number of concepts in the tag set and the number of concepts in the elaboration for each tag set-elaboration pair.
Table 4.4 Differences in distribution of Concepts in Tag Sets and in their related Elaborations (n=21)

<table>
<thead>
<tr>
<th></th>
<th>Concepts in Tag Set</th>
<th>Concepts in Elaboration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean per pair</td>
<td>6.83</td>
<td>14.13</td>
</tr>
<tr>
<td>SD</td>
<td>4.49</td>
<td>5.16</td>
</tr>
</tbody>
</table>

Table 4.4 shows that, on average, we can see a higher number of concepts in the elaborations than in the tag sets (6.83 vs. 14.13). In Table 4.5, we can also see that there are more concepts introduced in the elaboration than there are taken over from the tag set or left out from the tag set.

Table 4.5 Descriptive Statistics of the occurrence of Concepts in Tag sets and their related Elaborations (n=21)

<table>
<thead>
<tr>
<th></th>
<th>Concept occurs in both tag set and elaboration</th>
<th>Concept occurs only in elaboration</th>
<th>Concept occurs only in tag set</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>4.36</td>
<td>10.41</td>
<td>2.77</td>
</tr>
<tr>
<td>SD.</td>
<td>2.84</td>
<td>4.27</td>
<td>2.76</td>
</tr>
</tbody>
</table>

The higher number of semantic concepts in an elaboration, in relation to its respective tag set, indicates that the participant introduces and articulates concepts that are not present in the original tag set. As there is much variation in the data set (indicated by the standard deviations in Table 4.5), we cannot affirm the second sub-hypothesis with high certainty. Given that the primary aim of this experiment was to determine the value of a user-created tag set as a component of the technical design, no further results of statistical tests are reported here, as such results would be trivial. Nonetheless, we can say that the descriptive statistics reported here show that user-created tag sets did stimulate the participants to articulate the tacit connections they saw between different topics and concepts expressed in the tags.
Discussion

As expected, the results of this experiment support the use of user-created tag sets as an added technical component of user profiles to represent a person’s understanding. They can be used to discover different learner perceptions of connections between the same topics and concepts. Moreover, like tags, tag sets also fulfill the other technical requirements: they are dynamic, free-in-form, user-created and particularly suited for a network environment. User-models with tag sets can be used in several forms of learner support systems. A first possible implementation is a version of the workshop in which human online, technological interventions (mostly) replace face-to-face human interventions. The subsequent activities of tagging, creating tag sets and elaboration can be used to support learners in expressing their tacit knowledge on certain topics. The elaborations can be the starting point of a discussion between learners. A second possible implementation is the use of tag sets in the user profiles of a social matching system. The user profile would then consist of the collection of tags and of tag sets that a person has created, apart from general information. Other implementations of user profiles with user-created tag sets could include question-answering systems and navigation support on learner platforms.

10 A prototype of this implementation has been created under the name of the ‘Connect The Dots!’ toolkit and is available for download (Rajagopal, Schaepts & Finders, 2012).

11 Further potential examples of the use of user profiles with user-created tag sets can be found in the TELLNet deliverable 3.2 (Berlanga, Brouns, Fetter, Rajagopal, Sloep, Van der Vegt & Vuorikari, 2012)
We see two major points for considerations in the use of user-created tag sets in supportive technology. A first issue is that user-created tag sets flatten the nature of the connections between the tags in a tag set to a binary relation. There is no qualification of the connection between the tags in a tag set. In some previous research on sensemaking technology, the focus has been primarily on the qualification of relations between concepts, creating taxonomies of connections and positive and negative relations (Brown, Downie & Buckingham Shum, 2012; De Liddo & Buckingham Shum, 2010). Although the strategies and results of this previous research are valuable for group sensemaking activities, they are not appropriate for sensemaking in a networked environment (Kirschner, Buckingham Shum & Carr, 2002): these strategies do not fulfill the technical requirement of scalability and extendibility. However, user-created tag sets hold (unqualified) semantic information and they offer many technical advantages in a network context.

A second issue is the comparison of users in supportive technology. An important feature of learner support is the ability to calculate the distance between two people using their user profiles in applications such as social matching systems. Very often, such distance is qualified in terms of similarity between learners. Similarity in the use of tags is calculated in several ways: e.g. using the same tags, tagging the same resources, being tagged by the same people, etc. (Guy, Jacovi, Perer, Ronen & Uziel, 2010). Mathematically, this calculation translates into the calculation of distance between vectors representing the tag usage, using var-
ious measures of similarity, such as cosine similarity, Euclidian distance, Jaccard coefficient, etc. However, using user-created tag sets opens up many more opportunities for estimating similarity, and more importantly, it allows one to identify in more detail the differences between users. A better identification of the differences between users would also allow one to investigate where the more interesting differences lie, which in turn would allow the support of learners having conversations in which breakdown for sensemaking can emerge. Another, more practical consideration is that the similarity or distance in this case needs to be calculated between sets of tag sets. Mathematically, this is the calculation of distance between two vector spaces. The literature shows few examples of where this has been done (Zuccon, Azzopardi & Van Rijsbergen, 2009).

**Limitations**

This study has its limitations. Firstly, we investigated the user-created tag sets of only a limited number of participants, due to our choice to work in a face-to-face setting. Studies using more participants are needed to increase validity. Secondly, as explained in the method section, our interest in sensemaking through interpersonal networking, and for practical reasons determined our choice for a paper-based study. We still endeavor to recreate this study in an online setting, as reaching more people and gathering more data in this way would also extend the study into another domain of human interaction.

**Conclusions and Future Research**

This study has shown the interesting properties and potential of user-created tag sets as components of user profiles in learner support systems. A first route for further research is the replication of this study using a web-based system that gathers more data from more participants. A second route is to extend the original tags to user-created tags assigned to other types of entities and even collaborative tag clouds. Finally, a third route for future research is to investigate the modalities of similarity and distance/difference between collections of tag sets, in order to design various forms of learner supportive technology.
Chapter 5: “I connect with people who think differently from me”: People Recommenders that Match on Dissimilarity


Abstract

People recommenders are a widespread feature of social networking sites and educational social learning platforms. However, when these systems are used to extend learners’ Personal Learning Networks, they often fall short of fulfilling their purpose. This article proposes a design of a people recommender based on content-based user profiles and a matching methodology based on dissimilarity. It presents the results of an experiment conducted with users of the content curation site Scoop.It, where users rated personalized recommendations. The main conclusion of this article is that people recommenders should aim to trigger experiences of breakdown for their users, as these experiences encourage learners to connect to their recommended peers. Also, the study showed that matching on dissimilarity is more successful in providing experiences of breakdown for the user than is matching on similarity.
Introduction

Personal Learning Networks (PLNs) are online social networks that are used to support the continuous professional development of lifelong learners, in a personalized manner (Van Harmelen, 2008; Granovetter, 1983). Like most online social networks, these networks are dense with people and resources with which its members connect online and offline (Reich, Subrahmanyam & Espinoza, 2012; Brandtzaeg, 2012). Consequently, one of the most common forms of personalized support in PLNs concerns navigation through the network, to offer learners the most relevant content or contacts efficiently and effectively. A popular form of personalized navigation support are recommender systems i.e. systems that filter out the most relevant content or fellow-networkers for an individual based on their previous activities in the network (Resnick & Varian, 1997; Manouselis et al, 2012). When recommender systems focus on connecting people in the network with each other, they are called social matching systems or people recommenders

Of these, the matching algorithm is the interest of this article. Most recommender systems are based on the principle of similarity: they are designed to seek out people or resources that have similar traits to a user’s background or to things that the user has an interest in (Resnick & Varian, 1997). Content-based matching algorithms find content that is similar to content that the user has already used. Collaborative filtering matching algorithms look for items used by others who have used items similar to the ones used by the target user. Even social network-based matching starts from similarity: the assumption is that if user A has several ties in common with an unconnected user B, the odds are high that user A also knows and wants to connect with user B. The similarity lies in the promotion of common ties with others (Liu & Lee, 2010). Features of matching algorithms can be combined to create hybrid systems (Burke, 2002; Sie, Drachsler, Bitter-Rijpkema & Sloep, 2012).

Crucially, though, the principle of similarity is flawed when it comes to connecting people for learning purposes. In general, when connecting with other people, learners look for someone who can give a different perspective on a topic (Rajagopal, Verjans, Costa & Sloep, 2012). Also, they look for content or perspectives that are unlike the content that they have already seen, or unlike their own perspectives. As indicated, this stands in stark contrast

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12 The phrases ‘people recommender’ and ‘social matching system’ are used interchangeably in much of the literature. They both refer to a system that recommends people to each other, based on particular matching criteria.
with for example movie or book recommenders, where the assumption is that a viewer or reader is interested in more of roughly the same.

In literature, the experience of this mismatch between a learner’s current understanding and the different element challenging this understanding is called ‘breakdown’ (Winograd & Flores, 1986; Schön 1983; Weick, Sutcliffe & Obstfeld, 2005). Breakdown can be triggered through many factors and in many environments, such as unexpected behavior from others, a comment in a conversation with another person or through new, relevant content. When breakdown occurs, a learner’s held understanding appears to be insufficient and consequently, she starts re-assessing her current thoughts. When a learner follows up such breakdown with discussions with other learners to re-establish common ground and a shared understanding, the learner engages in collaborative knowledge-building and sense-making (Clark & Brennan, 1991; Dubberly & Pangaro, 2009; Dillenbourg, 1999).

For the design of people recommenders, this experience of breakdown points to the need for a new matching methodology, namely that of dissimilarity. Matching on the principle of dissimilarity boils down to identifying meaningful differences between user A and user B. ‘Meaningful’ in this context refers to the user’s need to share parts of her understanding, but also the need to be different in a significant way so as to potentially experience breakdown.

This gives us the first hypothesis of this article: we hypothesize that relevant content, as evaluated by the user, leads to an experience of breakdown. Likewise, an experience of breakdown leads to the desire to connect with a recommended person. This is illustrated in Figure 5.1. We expect that selecting content by matching on dissimilarity rather than by matching on similarity is more likely to create an experience of breakdown and a subsequent desire to connect.

HYPOTHESIS 1: People recommenders with content-based user profiles and matching methodologies work on the following model of recommendation:

1. Content that is deemed relevant creates an experience of breakdown for the user. *We will see this in a high correlation score between how relevant users score recommended content and to what extent users indicate that they have experienced breakdown, i.e. that they have re-assessed their thoughts on a topic because of the recommended content.*

2. A user who experiences breakdown provoked by some recommended content deemed relevant wants to connect with the user who has provided this content. *We will see this in a high correlation score between the report of an experience of breakdown and an indication of a desire to connect with the recommended user, through a discussion.*

3. Proving content that is deemed relevant indirectly leads to users wanting to connect with each other. *We will see this in a high correlation score between the estimation of the relevance of recommended content and the desire to connect.*
A matching strategy of dissimilarity for people recommenders can be operationalized in several ways. We will look at methods capable of revealing meaningful differences between users’ understandings. The first step for this is to define a method to determine how a user understands a particular topic and how she relates this topic to other topics. This will enable us to determine the similarities and dissimilarities between different people’s understanding. A simple way is to take a closer look at what a user is talking about at any particular moment. We can take the words a user employs to express her thoughts to gain some insight into how she relates the concepts that the words describe together. This follows theoretical concepts from the field of knowledge building closely, where the mind is seen as an environment where concepts are connected, disconnected and reconnected continuously (Bereiter, 2004). To be assured that the words represent the understanding of the user, it is necessary that we start from expressions of the user’s own thoughts. The most frequently used expressions of thoughts in online environments are self-authored short written texts in natural language. So, suitable resources can be platforms where users are actively writing short written texts, on their understanding of a topic.

There are several online platforms that match these requirements, and thus could be useful resources. For this research, we chose to work with curation websites, such as Scoop.it, Pinterest and Storify:

- They are all social networking sites, where the users have their own personal account, and can discover each other.

- They offer their users the tools to share resources, but with some personalized meta-level context. It is especially interesting when the users can add context in textual format, as this gives us insight into how the learner positions the topic of the curated link, with regard to other links and/or other topics.

- We interpret a user’s activity on a curation website as their personal user profiles consisting of resources and their own contextualizing short self-authored texts. These texts are useful for a people recommender as they unveil some clues of the unique perspective of the curator on the content of the curated links. The user is not merely sharing links, but contextualizing these links, thereby becoming an actively sharing participant.
Short written texts can be reduced to sets of words using natural language processing techniques, by extracting lexically important words from the learner-authored texts. Although these techniques are technically heavier than e.g. using platforms with user-given tags, there is an added value, which we will illustrate with an example, in which the lexical words have been italicized. Suppose the following situation:

Person A’s comment: “this article shows that human intelligence is related to upbringing”  
Person B’s comment: “we see that human intelligence depends on natural talent and upbringing”

In this example, person B is talking about more concepts than person A. But more importantly, the collection of lexical words indicates that person B talks of a different (more nuanced) type of relation between the concepts (namely, depends vs. related). This subtle but semantically significant difference cannot be captured through the use of user-given tags alone, as tags are primarily used to describe something on a general level.

In this way, we can create a content-based user profile of the users within our people recommender. As these user profiles stem directly from the user’s texts and vocabulary use, we may presume that they are close to the learner’s understanding of the topic. The profiles can then be matched according to similarity and dissimilarity:

*Word-space similarity:* We can measure to what extent two learners are talking about the same concepts.\(^{13}\) To achieve this, we can group all the keywords a learner uses in their authored texts together. The user profile of the learner then consists of one large set of keywords, which we can compare with another learner’s set. This type of similarity has been used before, often using Jaccard similarity or cosine similarity. In this research, we have used Jaccard similarity.

*Tagset dissimilarity:* We can measure to what extent learners agree with each other in the relations they see between concepts. We assume that the co-occurrence of two lexically important words within one learner-authored text snippet is an indication that the learner sees a direct relation between the concepts described by the words. We do not necessarily know in which way the learner relates the concepts, but we do know that the learner perceives some relation between the concepts as they occur in the same text snippet. This is plausible as the learner-authored text snippets we use are limited in length\(^{14}\), thereby making the likelihood of a user-perceived relation between the concepts higher.

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\(^{13}\) There are several ways to define the difference between concepts and words. In this article, we keep this distinction minimal, by aligning words with a common stem to the same concept.

\(^{14}\) This is the prevalent situation in most social networking sites, apart from learner weblogs where the length of the learner-authored text can be longer.
A simple method to achieve this is to group together the keywords emerging from the same-authored text, thereby creating separate collections of keywords for a same individual. The content and the contextualization added by the user can be described in terms of “tags”, the term we use to describe lexical words with a unique semantic value. A collection of tags, that we call a “tagset”, indicates that the user sees some relation between the semantic values of the tags in the tagset. In other words, the tags in the tagset have some semantic or pragmatic relation, which has been imprinted on them by the user. Each tagset can be traced back to the combination of a resource and a contextualizing authored text. Consequently, the learner is then represented by several smaller tagsets, instead of one large set of keywords. Tagsets can be created for all authored text snippets of a learner. Tagsets of different users can be compared in several ways. For our purposes, we look for users who have partially overlapping tagsets. This would indicate, that they both see relations between two or more concepts but individually also relate these concepts to other concepts, which would be new to the other learner.

Figure 5.2 illustrates the two types of user representations, for Jaccard similarity and tagset dissimilarity. As both these methodologies start from the same types of user profiles (keywords extracted from learner-authored text snippets) and work with similar concepts of matching (overlap in sets), we expect that the resulting matches will be similar for most users. However, as both methodologies emphasize different aspects in the recommendations, it is expected that both methodologies will bring up differences in their relevance to and appreciation by the user. This brings us to the next hypothesis:
HYPOTHESIS 2: Matching based on similarity and matching based on dissimilarity achieves different user-perceived results.

1. Matching users on the basis of similarity will provide more relevant content to users than matching them on the basis of dissimilarity.

2. Matching users on the basis of dissimilarity will give users the perception of a higher experience of breakdown than matching them on the basis of similarity.

3. The more tags are shared between users, the more the recommended content is deemed relevant, and the more experiences of breakdown are reported.

Methods

Participants

We selected the content curation website Scoop.IT for this experiment, as it is one of the most widely used and well-known curation websites. But more importantly, it is primarily based on text, and thus conducive to lifelong learning. On Scoop.IT, users can manage a page dedicated to a topic of their choice and select and gather relevant resources on this topic. Moreover, the user can add to the content of the resource by giving some meta-level insights or comments, contextualizing the content of the resource.

The participants of our experiment were Scoop.IT users, or curators, maintaining at least one topic page on the website. To select these participants, we followed the following procedure:

We selected the topics “educational technology”, “networked learning” and “higher education” as the domains of interest for our experiment. Then, we searched for Scoop.IT pages on these topics, through a general keyword search on the Scoop.IT homepage. The keywords used were “Higher Education” (306 results), “Networked Learning” (10), “Educational” (567) and “Learning” (3452). The results were filtered on the following criteria:

- the page is curated by individuals and not by a group of people or an organization.
- The page has a Scoop.IT score above 35.
- The primary language of the page is English. This means most posts are English posts and most user-added insights are in English.
This resulted in a list of about 240 selected Scoop.IT pages, associated with its curator. This was our initial list of 240 participants (List1). From these 240 Scoop.IT pages, we filtered out those with user-authored insights or meta-reasoning texts. This created a subset of 149 Scoop.IT pages (List2). When reducing these subsets to tags and collections of tags and grouping the people with multiple Scoop.IT pages in List1, the list further reduced to 138 pages and curators (List3). These 138 curators were approached to fill in a personalized survey to evaluate recommended matches; we received 46 filled-in usable surveys (List4).

**Instruments and Measures**

We created two instruments to collect measurements for this experiment: a recommender system and a personalized set of probes.

I. RECOMMENDER SYSTEM

The first instrument was a people recommender with its user database and two matching algorithms, which was created as follows:

*Content-based User profile.* For each Scoop.IT page on List1, the last 200 scoops of each collected Scoop.IT feed were gathered to create a user database, consisting of a total of 32,360 collected Scoop.IT posts. This list of Scoop.IT posts was then reduced to contain only those posts with a user-added meta-reasoning in the form of an *insight*. This created a smaller subset of 2957 Scoop.IT posts from 149 Scoop.IT pages. This subset was then transformed to tagsets through the application of three natural language processes. Firstly the text of each post was tokenized using the Natural Language Toolkit (NLTK in Python) to create token-tagsets (illustrated in Figure 5.3).
To retain lexically relevant words and to remove outsiders, we then removed the most frequent (more than 150 occurrences) and least frequent words (less than 3 occurrences) from these token-tagsets. To relate words with common stems, such as e.g. “collaborate” and “collaboration”, the tokens were then stemmed with the Porter stemmer, inbuilt in the NLTK. Duplicates were then removed to create tagsets with unique tags, resulting in 2715 unique lexemes over the whole dataset.

This allowed us to create two types of content-based user profiles for each of the 138 participants: (i) a set of tags W for the Jaccard matching and, (ii) a set of tagsets S for the tagset matching.

In the retained user database of 148 users, containing 2957 Scoop.IT posts with user-added insights, we found a total of 197,120 alphabetical tokens, of which 15,560 are unique. This gives an average of 66.66 tokens per scoop or an average 5.26 unique tokens per post, showing a high proportion of lexical words in the authored texts. In other words, the user representations are of high quality.

After stemming and removing the tokens with high and low frequencies, we retained 2886 Scoop.IT posts or tagsets. We retained 4002 unique lexical words, which came to 2715 unique stemmed tags or concepts. Proportionally, this is about 0.94 tags (concepts) per Scoop.IT post. The representations are adaptable and scalable for all lengths of text.

For each person, we have two user profiles, consisting either of a number of tagsets, or one set of keywords (Table 5.1), which varies in length. There is a medium correlation between these two distributions.

Table 5.1 Distributions User profile for participants (n=139), r = 0.572, p < 0.01
<table>
<thead>
<tr>
<th></th>
<th>Minimum</th>
<th>Maximum</th>
<th>M</th>
<th>Variance</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of tagsets</td>
<td>1</td>
<td>210</td>
<td>20.76</td>
<td>1137.65</td>
<td>33.73</td>
</tr>
<tr>
<td>Length of keyword set</td>
<td>2</td>
<td>1385</td>
<td>172.7</td>
<td>49930.79</td>
<td>223.452</td>
</tr>
</tbody>
</table>

Figure 5.4 shows a plot of the length of a keyword set to the number of tagsets associated to a same person. The high density of dots in the bottom-left corner of the plot indicates that most people write posts (tagsets) using a limited numbers of concepts (keywords).

![Figure 5.4 Plot of length of keyword sets to number of tagsets (n=139)](image)

**Matching algorithms.** With these user profiles, we next calculated recommendations between the people in the user database using two methodologies: (i) Jaccard similarity using
one large set of keywords per user, and (ii) tagset similarity employing multiple tagsets per user.

1. Jaccard similarity

In this method, we calculated similarity between two users based on their common usage of tags, using the Jaccard coefficient. Jaccard similarity coefficients were calculated between all users and a distance matrix was created. Per user in the database, we ranked the matches according to their matching scores establishing a best Jaccard match and a worst Jaccard match.

2. Tagset dissimilarity

In this method, we calculate similarity between two users based on how they use tags together, for each of their tagsets. We distinguish four types of overlaps between two tagsets T and S: (i) completely equal tagsets T=S (typeA), (ii) one is the subset of the other T ⊂ S (TypeB), (iii) the two tagsets share some elements but both also have their own elements ¬(|T ∩ S| = 0) AND (|T| > |T ∩ S| OR |S| > |T ∩ S|) (TypeC); (iv) the two tagsets do not share any elements T ∩ S = ∅ (TypeD). In particular, the distribution of Type C shows the extent to which two users are talking about the same topics, but each relates these common topics to other topics. This form of overlap brings to the fore critical differences in understanding between two users.

The proportion of TypeC overlaps in the tagsets of two users can be used as a distance measure to match users. However, this measure needs to take into account the great disparity in the number of tagsets per participant (ranging from 1 to 188). To minimize the effect of this disparity, we take the 10-base logarithm of the number of matched tagsets per pair of participants. A greater number of matched tagsets (and subsequently a higher log) indicates more evidence for the match. This results in the following formulation of a matching score $\sigma$:

\[
\text{For person A with } |S(A)| = a \text{ and person B with } |S(B)| = b:}
\]

\[
\sigma (A,B) = \frac{\log (a*b)}{a \times b}
\]
With this matching score, we calculated distances between all users and created a distance matrix. Per user in the database, we ranked the matches according to their matching scores establishing a best tagset match and a worst tagset match.

In the tagsets, we calculated a total of 7,404,820 matched tagset pairs between the 139 participants, which are distributed across the 4 types of overlap as in Table 5.2. The vast majority of matched tagset pairs are of type D (no overlap) (79.34%), followed by type C (some overlap) (20.55%). There are extremely low proportions of Type A (full overlap) and Type B (subset).

<table>
<thead>
<tr>
<th>Type</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type A</td>
<td>19</td>
<td>0.00%</td>
</tr>
<tr>
<td>Type B</td>
<td>8386</td>
<td>0.11%</td>
</tr>
<tr>
<td>Type C</td>
<td>1521503</td>
<td>20.55%</td>
</tr>
<tr>
<td>Type D</td>
<td>5874912</td>
<td>79.34%</td>
</tr>
<tr>
<td>Total</td>
<td>7404820</td>
<td>100%</td>
</tr>
</tbody>
</table>

Considering each unique matched pair of participants (n=9593), we have two matching scores (a Jaccard score and a tagset score) per matched pair. Table 5.3 shows a summary of the distributions of these scores. There is a strong correlation between them, as is also visible in Figure 5.3.

<table>
<thead>
<tr>
<th></th>
<th>Minimum</th>
<th>Maximum</th>
<th>M</th>
<th>Variance</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jaccard scores</td>
<td>0</td>
<td>0.501</td>
<td>0.0559</td>
<td>0.0037</td>
<td>0.0612</td>
</tr>
<tr>
<td>Tagset Scores</td>
<td>0</td>
<td>2.637</td>
<td>0.3683</td>
<td>0.1142</td>
<td>0.3379</td>
</tr>
</tbody>
</table>
The results show the relationship between the two matching algorithms. The distribution of the matched tagsets across the 4 types of overlaps shows that nearly 80% of the tagsets are not related to each other. The second largest group is formed by those matched tagsets that have a partial overlap (20.55%). A remarkable observation is that total overlap or subsets are practically non-existent. The use of partial overlap between matched tagsets (Type C) therefore is a good indicator for the relationship between two participants’ understanding of a topic. The tagset scores have a greater variance than the Jaccard scores. The high correlation (r=0.72) between the Jaccard scores and the tagset score shows that both matching methodologies uncover similar factors from the comparisons. However, there are differences between the methodologies.

II. PROBES

The second instrument was a set of personalized probes per participant to evaluate the recommendations made for them in our experiment. Through 3 5-point Likert-scale questions, we wanted to gauge to what extent the recommendations fulfill the following needs for an individual user:

- **CONTENT RELEVANCE (CR):** This feed contains new and relevant information for me.
- **EXPERIENCE OF BREAKDOWN (BD):** The comments and opinions expressed in this feed make me re-assess my thoughts about this topic.
- **DESIRE TO CONNECT (DC):** I would like to engage in a discussion with the curator of this feed.
Research design

The research design covers two stages. First, we calculated the matches between the participants, according to the methodologies of similarity and dissimilarity.

Then, we evaluated the calculated matches by presenting them to the participants in personalized sets of probes. As presenting all matches to all users would be cumbersome, we selected 4 recommended matches for each participant. To judge which ones to select, we took a closer look at the results of the tagset and Jaccard matches. The following emerged:

- For 130 of the 139 users in the database, the best tagset match is one of a limited set of 4 users. The 9 remaining users have 9 different best tagset matches.
- The best matches in the Jaccard calculations do not show such a high degree of agreement across the users.
- 136 of the 139 users have the same worst Jaccard and tagset matches. These often come from the same set of 10 users.
- The second worst Jaccard and tagset similarities are also in agreement for most users in the database.

These results prompted us to draft the personalized set of 4 matches for each person:
T1: One common best tagset match
T2: One best Jaccard match
  T3: One common worst tagset match
T4: One optimal worst Jaccard match

We created personalized probes for every user in the database containing 4 anonymised Scoop.IT feeds with three randomly selected posts. The 139 users from our database were invited to evaluate their 4 recommended matched persons on the variables of “content relevance CR”, “experience of breakdown BD” and “desire to connect DC” through an online form.

We have the following variables associated with each matched pair of participants and associated with each participant (Table 5.4).

Table 5.4 Variables, their descriptions and the entities they belong to

<table>
<thead>
<tr>
<th>Associated with entity</th>
<th>Variable</th>
<th>Description of variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>For each matched pair:</td>
<td>number of matched tagsets</td>
<td>each matched pair of participants have a total number of matched tagsets, which is the product of both participants tagsets.</td>
</tr>
</tbody>
</table>
number of tagsets $x$ and participant B with number of tagsets $y$

number of tagsets per overlap type
- TypeA
- TypeB
- TypeC
- TypeD

Number of the total number of matched tagsets $k$ in each type of overlap
- TypeA - total overlap
- TypeB - subset of
- TypeC - partial overlap
- TypeD - no overlap

number of tags in overlap in TypeC

In each of the matched tagsets pairs of type C with partial overlap, we checked the number of shared tags. This variable is the maximum of these numbers.

Jaccard similarity score
Score for similarity for the matched pair

Tagset dissimilarity score
Score for dissimilarity for the matched pair

For each participant who responded to the survey

Evaluation Content Relevance for T1, T2, T3 and T4
Scores on a 5-point Likert scale, for each of the 4 recommended matches

Evaluation Experience of Breakdown for T1, T2, T3 and T4
Scores on a 5-point Likert scale, for each of the 4 recommended matches

Evaluation Desire to Connect for T1, T2, T3 and T4
Scores on a 5-point Likert scale, for each of the 4 recommended matches

Preference to follow a recommended match for T1, T2, T3 and T4
Yes/no answer to if they want to follow a recommended match

Results

Of the 139 surveys sent out to participants, we received 46 completed surveys. In the analyses, we adopt the common practice of treating Likert scales as interval scales.
To test our first hypothesis, we consider the correlation between the three variables: content relevance (CR), experience of breakdown (BD) and desire to connect (DC). We expect to see positive correlations between all three variables, as the more relevant a content is rated, the more it would increase the experience of breakdown, and subsequently, increase the desire to connect with the person behind the content. As described, we used two methodologies to select content that is relevant, namely similarity and dissimilarity. For both methodologies, the best matches aim to present highly relevant content, whereas the worst matches present not relevant content.

The first relation we look at is that between content relevance (CR) and experience of breakdown (BD). Table 5.5 shows the correlations between these two variables for the 4 groups of matches.

![Table 5.5 Correlations between content relevance (CR) and experience of breakdown (BD)]

<table>
<thead>
<tr>
<th>Types of matches</th>
<th>Correlation between CR and BD</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1: Best dissimilarity</td>
<td>0.546**</td>
</tr>
<tr>
<td>T2: Best similarity</td>
<td>0.354*</td>
</tr>
<tr>
<td>T3: Worst dissimilarity</td>
<td>0.514**</td>
</tr>
<tr>
<td>T4: Worst similarity</td>
<td>0.794**</td>
</tr>
</tbody>
</table>

** p<0.01, *p<0.05

The first thing we notice is that all the correlations are positive, and of a medium-to-high strength. This supports our expectations that content relevance is positively associated with the experience of breakdown. Furthermore, we also see that the correlation coefficients for best dissimilarity and worst dissimilarity are both around about the same number (0.5). This means that the variability of the data remains the same for both the best and worst matches. For the methodology of similarity, there is a much bigger variability, as CR and BD show a strong correlation for the worst matches (0.79) whereas this value is 0.35 for the best matches. In other words, the user evaluations of the best similarity matches for content relevance and experience of breakdown are much more diverse.

This difference between the two methodologies is also noticeable in the correlations between experience of breakdown (BD) and desire to connect (DC). Table 5.6 shows the Pearson correlations between BD and DC, and the partial correlation between these variables, controlling for content relevance (CR).

![Table 5.6 Correlations and partial correlations between experience of breakdown (BD) and desire to connect (DC) (controlling for content relevance CR)]

<table>
<thead>
<tr>
<th>Types of matches</th>
<th>Correlation between BD and DC</th>
<th>Partial correlation between BD and DC, controlling CR</th>
</tr>
</thead>
</table>

** p<0.01, *p<0.05
These correlation scores also show the difference in variability between best matches and worst matches for both methodologies. Regarding dissimilarity, the best matches show highly correlated evaluation scores for experience of breakdown (BD) and desire to connect (DC), controlling for content relevance (CR). This strong correlation is maintained in the worst dissimilarity matches with a partial correlation of 0.497. Regarding similarity, the worst matches again show a strong correlation between BD and DC, one that remains strong while controlling for content relevance. However, these variables are not as strongly correlated in the best matches, indicating that there is much more variability here.

These results seem to indicate that matching on dissimilarity gives us a much more stable methodology to predict a user’s experience of content and desire to connect with the recommended match. Matching on similarity performs well in the worst matches, where there is none to very little similarity. Evaluations of best similarity matches are however much more varied.

In the second hypothesis, we claim that there are differences in the evaluation between the two different methods of matching, namely tagset dissimilarity and Jaccard similarity. This has already been indicated by the correlation analysis. We are specifically interested in how the methods of matching perform in predicting the user evaluations of the best matches. We therefore conducted a within-subjects repeated measures ANOVAs for the 3 variables (content relevance, experience of breakdown and desire to connect) for the best matches (T1 and T2), considering two conditions: tagset dissimilarity matching and Jaccard similarity matching.

**Best Matches.** As we only compare the variables in two conditions, Mauchly’s test showed that the assumption of sphericity is not violated.

For content relevance, a within-subjects repeated measures ANOVA was conducted to compare the effect of matching method on content relevance in tagset dissimilarity and Jaccard similarity conditions. The analysis showed a main effect of the matching method, Wilks Lambda = 0.922, F(1, 45) = 3.784, p=0.058. The results are not significant at the 5%-level. However, note they would be if we were to use an only slightly more relaxed alpha. Post hoc comparisons between the two conditions showed a significant difference in the mean difference for tagset dissimilarity matching method (M=3.52, SD=1.13) and Jaccard similarity matching method (M=3.15, SD=0.965) conditions, p=0.017. This suggests that recommendations made on the basis of dissimilarity are evaluated higher on content relevance than recommendations made on the basis of similarity. The medium effect size (partial eta squared
For experience of breakdown, a within-subjects repeated measures ANOVA was conducted to compare the effect of matching method on experience of breakdown in tagset dissimilarity and Jaccard similarity conditions. The analysis showed a main significant effect of the match type, Wilks Lambda = 0.879, F(1,45) = 6.198, p=0.017. Post hoc comparisons between the two conditions showed a significant difference in the mean difference for tagset dissimilarity matching method (M=2.96, SD=1.30) and Jaccard similarity matching method (M=2.46, SD=1.03) conditions, p=0.017. This shows that for the best matches according to dissimilarity have been evaluated significantly higher than the best matches according to similarity. The large effect size (partial eta squared = 0.121) and the observed power 0.683 - 0.7 make it reasonable to conclude the significant difference observed.

For desire to connect, a within-subjects repeated measures ANOVA was conducted to compare the effect of matching method on desire to connect in tagset dissimilarity and Jaccard similarity conditions. There was a non-significant effect of the match type, Wilks Lambda = 0.948, F(1,45) = 2.477, p=0.123. There was a low-to-medium effect size (partial eta squared = 0.052) and the observed power of 0.338 – 0.34 indicate the need for further research to determine the relation between matching on dissimilarity and the desire to connect for best matches.

The results of the ANOVAs of the best matches indicate that the tagset dissimilarity matching method seems to predict the user evaluations for BD better than the Jaccard similarity matching method.

As both matching methods rank the calculated matches from best match to worst match, our next step was to look into the user evaluations of other matches on this ranking. Working with the data available, we conducted within-subjects repeated measures ANOVAs for the 3 variables (content relevance, experience of breakdown and desire to connect) for the worst matches (T3 and T4), again considering the two conditions: tagset dissimilarity matching and Jaccard similarity matching.

**Worst Matches.** As we only compared the variables in two conditions, Mauchly’s test showed that the assumption of sphericity is not violated.

For content relevance, a within-subjects repeated measures ANOVA was conducted to compare the effect of matching method on content relevance in tagset dissimilarity and Jaccard similarity conditions. There was a non-significant effect of the match type, Wilks Lambda = 0.997, F(1, 45) = 0.140, p=0.710. The low effect size (partial eta squared = 0.003) and the observed power 0.066 show inconclusive results, indicating the need for more research.

For experience of breakdown, a within-subjects repeated measures ANOVA was conducted to compare the effect of matching method on experience of breakdown in tagset dissimilarity-
ty and Jaccard similarity conditions. The analysis showed a significant main effect of the match type, Wilks Lambda = 0.860, F(1,45) = 7.341, p=0.010. Post-hoc comparisons between conditions showed a significant difference in the mean difference for tagset dissimilarity matching method (M=2.28, SD=1.26) and Jaccard similarity matching method (M=2.72, SD=1.22) conditions, p=0.010. This indicates that the recommendations of worst matches based on dissimilarity were evaluated significantly lower than the recommendations based on similarity. The large effect size (partial eta squared = 0.140) and observed power of 0.755 make it reasonable to infer a significant difference.

For desire to connect, a within-subjects repeated measures ANOVA was conducted to compare the effect of matching method on desire to connect in tagset dissimilarity and Jaccard similarity conditions. The analysis showed a significant effect of the match type, Wilks Lambda = 0.866, F(1,45) = 6.943, p=0.011. Post hoc comparisons between conditions showed a significant difference in the mean difference for tagset dissimilarity matching method (M=2.28, SD=1.11) and Jaccard similarity matching method (M=2.65, SD=1.25) conditions, p=0.011. This again shows that, for the worst matches, recommendations on the basis of dissimilarity are scored lower than recommendations on the basis of similarity. The medium-large effect size (partial eta squared = 0.134) and the observed power of 0.732 support this significant difference.

The results of the ANOVAs for the worst matches again show interesting results. Once more, the tagset dissimilarity matching method seems to predict the user evaluations of the variables BD and DC better. Further research is needed to assess if this performance of the matching methods can be captured in a measure for matching performance, to qualify the matching methods.

A byproduct of the calculation of tagset dissimilarity between two participants is the maximum number of tags they share. We call this variable “maximum intersection size”. To support the last hypothesis, we investigated whether the intersection size (i.e. the number of shared tags between two participants) is correlated with content relevance, experience of breakdown or the desire to connect. Our expectations for this were two-fold: (i) for content relevance, we expected a linear relationship, with the more tags shared, the higher the scored relevance of the recommended content; (ii) for experience of breakdown and desire to connect, we expected a non-linear relationship, as many shared tags indicate more similarity between the user and their recommended match. Although no significant results came out of the correlation analysis, plotting these variables does give us some insight into their relationship.

Figure 5.6 shows six heat maps, mapping the maximum intersection size of a match against the related evaluation scores of the match. To enhance the clarity of the plots, we grouped the two lowest scores of the Likert scale and the two highest scores of the Likert scale, effectively creating a 3-point scale. In Figure 5.6, the 5-point scales are on the left, whereas the reduced 3-point scales are on the right.
The content relevance heat maps show that a consistent positive evaluation of content relevance, as the maximum intersection size increases. So, users who share up to 9 tags with their recommended match still find the matched feed relevant for their purposes, as the top right of the corner of the maps appear more red. For the experience of breakdown, most answers are situated on the left side of the heat maps. In other words, a low maximum intersection size, seemingly with a cut-off point of 3 shared tags, seems to evoke both positive and negative reactions from the users for their perceived experiences of breakdown.

This would suggest that more shared tags in tagsets affect the perceived relevance of content. However, more shared tags in tagsets do not necessarily affect the perceived experience of breakdown or the desire to connect. Further investigation is needed to verify these initial findings.

**Discussion**

The model we proposed for the first hypothesis is supported by these results. The user evaluation of the probes shows that when a user perceives an experience of breakdown through the feed of a matched person, they also exhibit a desire to connect with that person. The correlation between these two variables is strong. The probes results also indicate that the
provision of relevant content contributes to the experience of breakdown. However, the correlation scores are generally lower here. This could be an indication that there are other factors that contribute to the experience of breakdown apart from content relevance. This requires an adjustment to our model, to include the existence of other factors that contribute to the experience of breakdown. The results strongly support that a user’s experience of breakdown with respect to one particular person, will contribute to a desire to connect with that person. Experience of breakdown can therefore be a good starting point to create new connections in a learner’s personal learning network. Content relevance is a variable that we can manipulate to trigger experience of breakdown. More research is needed to identify the other factors that contribute to a user’s experience of breakdown.

The correlation analysis indicates that matching on dissimilarity gives us a more stable methodology to predict a user’s evaluation of content relevance and their experience of breakdown, related to their desire to connect with the recommended match. Matching on similarity predicts the user evaluation of the worst matches well. However, the worst similarity matches are the matches where similarity is low to non-existent, which again supports the concept of dissimilarity matching. The user evaluations of best similarity matches show a greater variation.

For our second hypothesis, we notice some differences in the way matches based on tagset dissimilarity and Jaccard similarity are evaluated by the user. The difference is primarily noticeable for the variable of experience of breakdown: best matches that are made on the basis of tagset are rated higher on experience of breakdown than matches on the basis of Jaccard similarity. Similarly, worst matches based on tagset dissimilarity are rated lower than matches based on Jaccard similarity. A similar effect is noticeable for the desire to connect in the worst matches. Regarding content relevance, the data does not show significant differences between the tagset dissimilarity matches and the Jaccard similarity matches. These results together with the results of the correlation analysis show that the methodology of tagset dissimilarity is a more suitable methodology for finding content and people to create interactions where breakdown can occur for a particular user.

Additionally, there is a relation between the maximum number of tags a user shares with a match and how the user rates that match on content relevance, experience of breakdown and desire to connect. The plotted results seem to indicate a critical value of three shared tags to trigger a (strong or weak) experience of breakdown. Higher numbers of shared tags do not necessarily evoke more or higher scores in the experience of breakdown. However, the heat maps do show that higher numbers of shared tags do result in more higher ratings of content relevance. This result points to the need for different strategies than a common use of tags for creating the experience of breakdown and stimulating users to connect with each other. For example, combining tagset dissimilarity with qualitative filtering of the tags used by a recommended match could improve the performance of the tagset dissimilarity algorithm presented in this article.
Conclusions

The main conclusion of this article affects the recommendation strategies used by people recommenders for learning. Currently, existing people recommenders primarily aim to recommend others who are similar to the user. The results of this experiment, however, suggest that a user would connect with another person if that person has been responsible for triggering a situation of breakdown. In other words, the desire to connect with a certain person increases when the user re-assesses her held thoughts on a topic after an interaction with this person. Additionally, the results also indicate that such an experience of breakdown is not purely created through the provision of relevant content as deemed by the user. There are likely more factors that contribute to the experience of breakdown, something which needs to be researched further. Therefore, for promoting learning experiences between users, people recommenders would benefit from aiming to create interactions between users where they can experience breakdown. This conclusion follows certain previous research in educational technology design that focuses on creating interaction between learners (Fetter, Berlanga, Sloep, Van der Vegt, Rajagopal & Brouns, 2012; Sloep, 2013). A better understanding of which factors influence experiences of breakdown, and how these factors can be manipulated, will allow the design of better learner support tools.

Our second conclusion concerns the matching methodology used in people recommenders, namely based on similarity or dissimilarity. This study has shown that there is a difference between matching users on the basis of dissimilarity as opposed to similarity. Although the tagset dissimilarity scores and the Jaccard similarity scores are strongly correlated, the results suggest that using a dissimilarity matching methodology may be more successful in predicting user evaluation of perceived experience of breakdown than matching on similarity. Dissimilarity matching also seems to be a good strategy to predict user evaluations of perceived content relevance and the expressed desire to connect with a recommended user. Further research is needed to assess if this performance of the matching methods can be captured in a measure for matching performance.

This study has also shown some avenues for improving the tagset dissimilarity matching methodology. The initial observations show that a higher number of shared tags between a user and their recommended match may give more relevant content to that user. However, this increase in shared tags does not entail more opportunities of breakdown or higher likelihood to connect. There seems to be a cut-off point of up to three shared tags to evoke a positive or negative experience of breakdown. Monitoring which tags are shared and which are not shared between two users may allow for better matching. In particular, such monitoring can be implemented using linguistic principles. The underlying assumption is that the types of concepts that are shared between learners gives a better insight into their understanding of the domain, which in turn allows one to make a better representation of them in automated systems. For example, the use of domain-specific marker words could give some
insight into which subsection of the domain they might be situated in. Likewise, the use of a syntactically and semantically annotated lexicon and the use of a grammar might provide more elaborate descriptions of the user’s posts and consequently the user’s intended meanings. This in turn might create opportunities for calculating the dissimilarity between users in more detail, that could increase chances of triggering breakdown.

Our second conclusion is that matching on dissimilarity is an important matching methodology for educational people recommenders, deserving further investigation.

Limitations

There were a number of decisions limiting the scope of this experiment.

1. We selected the curation website Scoop.IT as the platform of our experiment. From the experiment, we learnt that the emphasis of this particular platform is very much on content, rather than on connecting with others. In the feedback we received from respondents, it was clear that many users use different platforms for different purposes. Scoop.IT is often used as a personal content management platform. Many respondents did not connect with others on Scoop.IT on principle. Therefore, by positioning the social matching system as a recommender system functioning within Scoop.IT, the survey may have brought in many extra considerations concerning the platform itself, rather than the recommended people. However, this is a general consideration regarding social networking sites: when does a user go beyond the content shared by a person to the person herself?

2. The comparison of the two methodologies in terms of correlation of the scores has its limits. A more qualitative approach to comparing these methods needs to be taken better to understand the differences between them. To do this, more sophisticated measuring instruments are necessary.

3. Although we started with a target group of 200 Scoop.It users, this number was naturally limited as explained in the Methods section. Additionally, the number of participants who chose to fill in the user-evaluation surveys was also limited, amounting to 46. There were many reasons for this:

- We reached the participants primarily through social media (i.e. Twitter and Scoop.IT), as this was the only direct contact information we had of many of the participants. This method of working had advantages (namely, immediacy of answers, triggering enthusiasm of participants) but also quite a few limitations (if we did not get a response, it was not always clear if this was because they ignored the invitation or if they had not seen it).
- Some participants showed initial interest, but did not follow through and complete the survey.

- The invitations were free: we depended purely on the goodwill of the participants to join in. We could offer no incentives apart from insight into which Scoop.IT feeds were recommended for them, after they had filled in the survey.

**Future Work**

There are several avenues for future work following this research.

First is a further exploration of the benefits of curation websites for profiling learners. There is high quality information in these websites that reveals the interests, opinions and understandings of a learner, which presumably could be used to create better learner support in networked learning contexts.

A second, more practical avenue is a further development of the tagset dissimilarity algorithm and methodology. Possible development can be in the form a language-specific lexicon awarding weights to the use of certain marker concepts, a domain-specific lexicon awarding weights to the use of certain topic concepts, or tying up to an ontology such as Wordnet.

A third avenue is to understand if the performance of the matching methods based on similarity and dissimilarity can be captured in a measure for matching performance. This measure would then qualify the matching method in terms of its performance.

A fourth avenue is the exploration of technological support for sensemaking and the experience of breakdown, not only from a collective perspective, but from the individual learners’ contribution as well. There has been extensive research on how technology can be used to support sensemaking processes for teams and groups of people. This technology has largely been concerned with facilitating the dialogue and conversations between group members (Conklin, 2006), and augmenting them with various types of related contextual information (Buckingham Shum, 2005). The emphasis of these technologies is on the collaborative space. However, sensemaking is now happening on a global scale through various current social networking technologies (e.g. LinkedIn Groups, Facebook pages, Twitter groups. MOOCs, etc.). Unlike the sensemaking technologies that focus on the collaborative space, these networking technologies focus on the role of the individual learner within the collective. There are a lot of opportunities to make previously learnt lessons concerning collaborative sensemaking fit into current circumstances.
Chapter 6: Conclusions

The chapter is organized as follows: first, a summary is given of the main conclusions of this thesis. Next, the contribution the thesis seeks to make to education in general and educational technology more specifically is discussed from three vantage points: (i) the thesis’ innovative contributions to educational research, in particular to educational technology design, (ii) its contributions to interdisciplinary research and (iii) its consequences for the organization of education for lifelong learners. Finally, I look beyond the immediate results and attempt to inventory promising lines of future work based on the result achieved here.

1. Summary

In the first part of this thesis, I looked into the social activity of networking, which plays a central role in an autonomous lifelong learner’s professional and personal continuous development.

In the introduction, interpersonal networking was introduced as a central social activity used by individuals to participate in designed social networks. I proposed that professionals use this social activity as a learning strategy to welcome experiences of breakdown through their networking activities and in particular, through their networking conversations. The learning value occurs in the subsequent common grounding as they engage with others to establish commonalities and collaborate in knowledge building. Conversation is the central activity in networking.

Chapter 2 showed that learners perceive various benefits from networking with their peers, ranging from gaining new knowledge to extending their personal networks. The model presented in this chapter indicates that there are three levels to networking, that stretch from simple activities and skills that encourage networking to the development of a mindset that views networking as an essential part of a lifelong learning experience. Various underlying drivers pertaining to one’s own priorities, to the peers’ qualities and to the situational context all contribute to the creation, maintenance and activation of a personal connection with someone. This chapter describes networking as a learning strategy in the lifelong learner’s continuous learning activities.

Chapter 3 zoomed in on the actual activities in networking, in particular the conversations learners hold with each other. We took a closer look at the learners’ perceptions of inter-
personal conversations with peers. These conversations are crucial for two reasons: (i) they offer a natural way for the learner to reflect on her own practice alone and in collaboration with others and (ii) the conversation itself triggers breakdown, i.e. confronts the learner with other plausible readings, perspectives and interpretations than their own of the same facts, because of which the process of sensemaking can start. The networking experience was shown to be a very complex occurrence in which the learner looks for momentary clarity. The process of seeking clarity causes the learner to re-assess previously hidden perceptions, which triggers a valuable experience for the learner. This aspect of the social activity of networking necessarily implies a re-interpretation of the functionalities of communication instruments. These tools should go beyond the facilitation of conversation to the creation of conversation. Technology here needs to allure the learner to learn actively.

The results of this first part support the hypothesis that networking is indeed a learning strategy for lifelong learners, in which conversations are key activities through which they engage in sensemaking. Part 2 of this thesis explored opportunities to implement the lessons learnt in part 1 into features of social networking technology that aim to give learners sensemaking, experiences online.

Chapter 4 looked at how the online activity of tagging and activities with tags can be used to trigger conversations between learners. In particular, it looked at user-created tag sets as a new component for user profiles in learner support systems. The results presented in this chapter show that tag sets can be used to represent a learner’s understanding of the topic: firstly, tags in tag sets are considered for their semantic value rather than for which resource they are connected to; secondly, tag sets hold some hidden semantic value, imparted by the learner, that is elaborated when learners are asked to explain. This chapter shows that tag sets could be a very useful component of learner support systems, and hold many potential applications for online networking and sensemaking.

In Chapter 5, the learner’s self-authored contextualizing texts were used to create a learner profile. By using natural language processing techniques, such learner-authored text snippets can be reduced to keywords and tag sets. In this chapter, the focus was on recommendation as a strategy to mutually compare and link learner profiles.

2. Contributions to disciplines

In this section, I discuss the potential contribution of this thesis to ongoing research, in particular: (i) its contributions to research in the field of education and educational technology, (ii) its contributions to interdisciplinary research and (iii) its contributions to organizing education for lifelong learners and learner support.
Firstly, this research started from the premise that designed learning support for networked learners needs to adapt to the learning habits and methods of these learners and to the ways they use social networking technology. With this premise, the focus was on understanding better what the current networking practices of networked lifelong learners are in non-formal learning contexts.

Secondly, although networking is such a prevalent method to implement non-formal learning and to facilitate personal network building in general, it is also one of the least studied and researched ones. Although the importance of networking has been acknowledged long since, there is a little academic research on how networking takes shape from an individual perspective, on how individuals learn to network and on why individuals perceive networking as valuable. However, this lack of academic research does not detract from the work of many educational practitioners who have recognized the importance of learning to network and help their students in this, often in non-curricular circumstances. To the best of my knowledge, this thesis is one among few academic studies that observed the dynamics of the social activity of networking and networking conversations, specifically with regard to its value for learning purposes. In this context, this thesis presents some pioneering work in understanding the dynamics of networking for learning from the individual’s perspective.

**Interdisciplinary research**

The research presented in this thesis was motivated by closely observing current learner practice. As a consequence, the design of appropriate learner support needed to tap into different domains of research to contribute to the best solutions possible for the learner. As such, this research is a truly interdisciplinary endeavor drawing from methodologies in several disciplines including educational sciences, linguistics and computer science.

Taking this interdisciplinary approach was appropriate and necessary for the central topic of this research, namely networking for learning, because of the following reasons:

- As networking focuses on a succession of conversations between learners, there were several possible routes to describe and research these dynamics. I wanted to understand the personal drivers that encourage an autonomous learner to participate in networking activities and conversations. First efforts went into mapping the environmental factors that cause or trigger a learner’s interest and networking activity. This met with limited success as it soon emerged that learners take the decisions to engage and connect with one another at the spur of a networking moment and base their decisions on a whole range of factors that stem from their personal context. Although this provided some interesting insight into the considerations networked learners entertain, it is insufficient to design learner support for them. We
therefore looked at other methodologies to investigate what happens in networking conversations, and decided on taking a linguistic approach.

- To support the autonomous learner, our focus in the second part of our research shifted from understanding the peer-to-peer conversation between learners to enabling this peer-to-peer conversation — or even, provoking it. Different strategies stemming from the field of linguistics were explored in an effort to understand as well as enable these conversations. This moves away from previous treatments of linguistic methodologies to offer learner support, such as through stylized and formalized language use to structure the interaction between teachers and students or between students (scripting).

- The aim to support the autonomous lifelong learner in networked learning also influenced the technology design in this research. The technologies developed as part of this research are not tools that ease a learner’s journey in finding information or peers, but they are instruments that draw the learner into engaging in a learning activity. This focus of technology design stems from a close observation of how social networking technology is currently used by autonomous learners to support their personal learning. Social networking tools such as Twitter, LinkedIn and Scoop.IT are well-established networking environments for lifelong learners, although they have not been designed specifically for learning. For many, the learning that occurs through these platforms is incidental rather than intentional. In this current context, learning is often perceived as a by-product of the use of the tool, and not as its primary purpose.

Organization of Education for Lifelong Learners

Finally, this research may have a number of consequences for the organization of education for lifelong learners.

Firstly, the role of networking as a method to support lifelong learning needs to be understood and recognized. For many professionals, a networking conversation is the most plausible and easiest way to create moments of reflection in their daily work. Reaching out to peers allows learners to test their previously held beliefs and interpretations, gain different perspectives and reassess their reading of events, activities etc. This sensemaking process has an additional, hidden and intangible consequence, namely, the creation of a renewed interest and motivation in the topic and the profession itself. The inconvenient part is that networking does not happen by itself, but needs to be instigated by the learner. At every moment in a networking experience, the learner chooses again and again to participate: from signing up to a networking event or platform, to accessing this networking event or platform, to engaging with others at this event, to sustaining a conversation for a longer period. In other words, a learner carries a lot of responsibility in making a networking experience relevant for herself. For many learners, this is uncomfortable, as it involves confrontation, insecurity and possibly, the acknowledgement of limited communication skills. It is easier for a learner ‘not to rock the boat’. There is a role for educationalists here to support learners in engaging in and understanding their networking behavior.
Secondly, learners need to be given networking experiences early on in their schooling career, to give them a head start in exploring their own networking behavior when the time has come. This perspective is already well-established with many circles of educational practitioners, who break the boundaries of their classrooms to enable their students to engage with the outside world. How networking for learning takes shape is highly personal, and as a result, every learner needs to explore the methods that work for him or her. Very often, as the study of networking experiences of young learners in Chapter 4 of this thesis showed, networking experiences confront learners with unexpected, unknown or unfamiliar perspectives, which is daunting for many inexperienced learners. However, this initial confrontation also teaches these learners to take a different perspective on their own situation, thereby contributing effectively to identity crafting. Again, with appropriate guidance, this has many positive effects, not in the least, higher levels of self-confidence of the learner. This aspect is exemplified by a quote from one of the teachers interviewed at the Caretakers conference, described in Chapter 4:

“You need to put yourself out there, to reap the rewards. For many, not putting yourself in that situation is the easier way out.”

Thirdly, the subversive effects of the Internet are also visible in the case of the social activity of networking. Online too, learners need to take a risk to step out there, and present themselves and engage with others. However, the modalities of communication online are as diverse as in face-to-face situations if not more so. There is a multitude of methods to communicate online, with varying extents of intensity, from page-long blogposts to micro blogs of 140 characters, from a word to image and video. Taking into account the content of the messages, the choice of method may be restricted but also may become more difficult. Learners who want to engage in networking online also need to explore these different communication methods, primarily, to understand their own preferences, strengths and weaknesses. Therefore, it is understandable that many professionals who network easily in face-to-face networking situations, do not understand the relevance of minimal interactions online, as they do not know (yet) how to network online. In other words, there is a need to give lifelong learners space to discover themselves online, just as young lifelong learners are given space to find their individual path in their career.

3. Vision

The past years have seen many instances where the thus far established educational system is seemingly failing. There are many statements issued by academia, industry and governments across the world that the established systems need to be overhauled to remain relevant in our current society (Redecker, Leis, Leendertse, Punie, Gijsbers, Kirschner, Stoyanov & Hoogveld, 2011; OECD, 2013, p291; Childress, 2012; Robinson, 2011). The central problem
is that the mainstream learning formats are focused on methods for the transfer of knowledge (from lectures in physical classrooms to online lectures in online classrooms). However, our society is less dependent on the ‘knowing’ of knowledge and more on the application of knowledge and the creation of knowledge for various purposes. This needs other strategies of teaching altogether (Benkler, 2009; European Commission, 2010; Kessels, 2004)

Many have claimed that networks offer the most suitable social structure for the support of lifelong learners (Koper, Sloep, Hummel, Vogten, Van Bruggen, & Specht, 2009). Much research has been conducted on the conditional factors that enable participation of individuals in networks, such as trust, identity building, coalition formation, etc. (Rusman, 2011; Berlanga & Sloep, 2011; Sie, Bitter-Rijpkema & Sloep, 2010). This thesis has complemented existing research with a focus on the communication that occurs between learners in networking interactions, in particular how these interactions contribute to individual sensemaking.

The focus on communication has opened some opportunities for further research on networking and networked learning, as well as on the design and development of learner support.

One, the prevalent form of communication in education is the conversation. However, this form of communication seems to have become restricted to the (formalized) interactions between teacher and student or peers with each other (Laurillard, 1999). More open forms of conversations happen all the time in educational contexts, but their role in supporting the lifelong learner is not understood. There is scope for much research in understanding learning conversations better, what they consist of, how they occur and how they can be supported.

Two, in the established educational system, conversation has been implemented typically as a one-to-many broadcast (lecturing), with its most typical form being the teacher lecturing to students. It can equally pertain to students presenting to each other or meetings of peers that are led by a few. This form of communication is well suited for the transfer of knowledge. On the other hand, networks are environments where communication is more distributed and diverse. In networked learning settings, conversation can occur in many forms, such as one-to-one, many-to-one, many-to-many, few-to-few, etc., including the one-to-many format of lectures. The form of conversation seems to determine in which way the learner is active (or fails to be active) in sensemaking. Especially, communicative formats in which the learner directly engages with another learner (such as in networking) seem to encourage the learner to start knowledge building and creating with the other learner in a direct way. For lifelong learners, it therefore becomes important to pay attention to the

Interesting in this regard are the visualizations of different conversations through Flashmeeting web conferencing system, which give an indication of how different groups interact with each other (Scott, Tomadaki & Quick, 2007).
forms of conversation that they are undertaking, and what kind of sensemaking they can achieve with these forms.

Three, lifelong learners have access to many more forms of communication through social networking technologies and multimedia. And yet, when looking at the phenomenon from a communicative point of view, we seem to be reaching a threshold as there are not many more different communicative modalities imaginable (e.g. short message; long message; very long message; essay; audio; image; video; multimedia). Importantly, this leveling off of the communicative possibilities can focus attention to the social activities at the heart of these technologies and their related communicative goals, thereby moving beyond the technologies themselves. This perspective creates some scope for much fundamental research, such as understanding the social activities at the foundation of communicating skills. Another research avenue relates to how communication strategies online are different from communicating strategies offline. It would also be valuable to investigate how the different communicative options online are implementing communication. For example, what message am I sending communicatively if I like a status on Facebook, rather than commenting on the status or sharing it? Understanding these basic aspects of communication online would allow more effective design of learner activities and learner support.

Four, the strength of a learning network lies in the strength of the autonomous learners who are part of the network. Or rather, it lies in the strength of the autonomous learners who design their network for their purposes to achieve their goals. If education needs to be reformed better to capture modern societies’ needs, the focus needs to be on the development of autonomous lifelong learners who are skilled networkers (see also Margaryan, Littlejohn & Milligan, in press). So, networking has been recognized by many educational practitioners as an important part of education. This is evidenced by the many ripples of individual initiatives of teachers to break the walls of their classrooms. Networking can happen through teacher–to-teacher collaborations (e.g. virtual mobility initiatives such as described in Boonen, Bijnen, Bijnen, Op De Beeck, Rajagopal, 2007), multilateral projects (e.g. the eTwinning network16), and the use of social networking technology in class (e.g. Personal Learning Network efforts in the classroom (Ash, 2013)). Therefore, lifelong learners would benefit from having these networking experiences from early-on in their learning careers.

Five, pursuing the two previously mentioned points - namely (i) acknowledging networking experiences as an inherent part of the lifelong learner’s learning and (ii) gaining a better understanding of the communication skills necessary in networking for sensemaking – would open up opportunities for more effective learner support. Lifelong learners could become more proficient and creative in designing their own learning experiences for sensemaking and for others. Likewise, designers of learner support technology could create technologies that allure their users into learning, crossing the online/offline boundary. Examples such as the enhancement of face-to-face conversations through mobile applications,

16 eTwinning Network http://www.etwinning.net
the capture of distributed knowledge creation at networking events and playing with blended synchronous and asynchronous collaborative sensemaking activities are all exciting and realistic opportunities for the near future.

As a final note: at present you do not need to be a computer scientist anymore, to use technology, to program, to make a website, to have a blog or to connect to other people online. But you still need to be creative to do these things. You still need to see the purpose of doing these activities and you still need to gain something personally from engaging in these activities. Technology allows us to be very creative in the ways we can communicate with each other, but to gain substantially from the opportunities it offers, we need to acknowledge the importance of our communication and we need to understand the why’s behind our communicative choices and decisions. We need education to discover ourselves.
Summary

This dissertation discusses the role the social activity of networking plays in lifelong learners’ professional and personal continuous development. For most people, networking is the natural way of communicating with acquaintances and strangers, as it helps them establish common ground and understand differences. With the rise of the Internet, networking is increasingly also taking place online through dedicated social networking sites, which, although very popular, have shown to support the social practice of networking only in a limited way. In particular, networking (offline and online) allows people to achieve three things: (i) to expand and strengthen their personal network, (ii) to discover and create aspects of their own identity, and (iii) to engage in knowledge building and learning. Although networking plays such an important role in a learner’s professional and personal learning, this social activity remains one of the least researched. The motivation for the research presented in this dissertation stems from this paradox, with the aim to raise the veil off this all-pervading activity and to gain lessons for designing better learner support for online networking.

The main hypothesis of this thesis is that networking is a learning strategy for lifelong learners, in which conversations are key activities through which they re-assess their held thoughts and make sense of their experiences together with others. This hypothesis is elaborated in two studies in this thesis. The results described in Chapter 2 show that there are three levels to networking, that stretch from simple activities that encourage networking to the development of a mindset that views networking as an essential part of a lifelong learning experience. Various underlying drivers pertaining to the learner’s own priorities, to their peers’ qualities and to the situational context all contribute to the creation, maintenance and activation of a personal connection with someone. In Chapter 3, we look at the learners’ perceptions of interpersonal conversations with their peers, through a linguistic analysis. These conversations are crucial for two reasons: (i) they offer a natural way for the learner to reflect on her own practice, gathered alone and in collaboration with others and (ii) the conversation itself triggers breakdown, i.e. it confronts the learner with other plausible readings, perspectives and interpretations of the same facts, because of which the learner starts to re-assess her held thoughts. The networking experience was shown to be a very complex occurrence in which the learner seeks momentary clarity. The process of seeking clarity causes the learner to re-assess previously hidden perceptions and this in turn triggers a valuable experience for the learner.
Understanding the social activity of networking better has many consequences for the design of social networking technology that aims to support learning, in particular communication instruments. These tools need to go beyond the mere facilitation of conversation to the creation of conversation. Technology here needs to allure the learner to active learning.

Part 2 of this thesis explored possibilities to implement features of social networking technology so as to give learners real networking, i.e. sensemaking, experiences online. In particular, it was considered how learners are technically represented on these platforms and which strategies are used to match learners with each other in social networking sites. The results presented in Chapter 4 show that user-created tag sets can be a useful method to represent a learner’s understanding of the topic and, as such, can be a very useful component of learner support systems for the design of applications for online networking and sensemaking. Chapter 5 considered the benefits of two matching strategies to recommend learners to each other: a strategy based on similarity between learners and a strategy based on dissimilarity between learners. Dissimilarity proved to be the more useful matching strategy.

The work presented in this dissertation contributes to the field of education and educational technology. With regard to education, firstly, it expands the limited existing research on the role networking plays in lifelong learning. Secondly, the linguistic-analytical methods used for understanding networking and networking conversations reveal the complexity of communication in learning networks. The educational field stands to benefit from more interdisciplinary research from a communication-based perspective on interaction in online learning networks. There is a lot of scope to understand fundamental learning processes better as well as create better learner support by using linguistic methodologies that have been unexplored so far in educational applications. Also, the results of this thesis are relevant for the design and development of educational technology. Firstly, designed learning support for networked learners needs to adapt to the learning habits and methods of these learners and the ways they use social networking technology. With this premise, the focus was on understanding better what are the current networking practices for lifelong learners in nonformal learning contexts. Secondly, the technology designs presented in this thesis show that technology can do more than just making a learner’s life easier in finding people or finding information. If designed intelligently, technology can engage learners in understanding their thought processes and create situations in which they are triggered to re-assess their preconceived ideas and thoughts.
Deze dissertatie handelt over de rol van de sociale activiteit van het “netwerken” in professionele en persoonlijke permanente vorming in het levenslang leren. Voor de meeste mensen is het netwerken een natuurlijke manier van communiceren met kennis en vreemden, aangezien het hen helpt in het vastleggen van wat ze in gemeen hebben, en het begrijpen van verschillen. Met de opkomst van het Internet neemt het netwerken ook meer en meer online plaats door het gebruik van speciale sociale netwerk sites. Hoewel deze online netwerkplatforms heel populair zijn, ondersteunen ze het netwerken maar op een beperkte manier. Meer specifiek stelt het (offline en online) netwerken mensen in staat drie taken te vervullen: (i) hun persoonlijk netwerk uit te breiden en te versterken, (ii) aspecten van hun eigen identiteit te ontdekken en te creëren, en (iii) in kenniscreatie en leren te delven.

Hoewel het netwerken een belangrijke rol speelt in het professionele en persoonlijke leren, is er weinig onderzoek gedaan naar deze sociale activiteit. Het onderzoek dat in deze dissertatie wordt voorgesteld is gegroeid uit deze paradox, met het doel om de sluier te lichten van deze allesdoordringende activiteit en om lessen te leren voor het ontwerpen van betere ondersteuning voor het online netwerken.

De voornaamste hypothese van deze thesis is dat het netwerken een leerstrategie is in het levenslang leren, in dewelke gesprekken kernactiviteiten zijn die door leerders gebruikt worden om hun begrijpen terug onder de loep te nemen en samen met anderen zin te geven (sensemaking) aan hun ervaringen. Deze hypothese wordt door twee studies uitgewerkt in deze thesis. The resultaten beschreven in Hoofdstuk 2 tonen dat er drie niveaus zijn in het netwerken, die strekken van eenvoudige activiteiten die het netwerken aanmoedigen tot het ontwikkelen van een mindset dat netwerken als een essentieel onderdeel van een levenslange leerervaring beschouwt. Verscheidende onderliggende drivers met betrekking tot de leerder’s eigen prioriteiten, tot de kwaliteiten van hun peers en tot de situationele context dragen allemaal bij tot de creatie, het onderhoud en de activering van een persoonlijk contact met iemand. In Hoofdstuk 3 kijken we naar de leerders’ perceptie van interpersoonlijke gesprekken met hun peers met een linguïstische analyse. Deze gesprekken zijn belangrijk omwille van twee redenen: (i) ze creëren een natuurlijke manier voor leerders om over hun eigen praktijk te refleteren, alleen of in samenwerking met anderen en (ii) het gesprek zelf leidt tot breakdown, i.e. het confronteert de leerder met andere mogelijke lezingen, perspectieven en interpretaties van dezelfde feiten, waardoor de leerder de gehouden gedachten herbekijken. Het is aangetoond dat de netwerkervaring een zeer complex gebeuren is waarin de leerder kortstondige duidelijkheid zoekt. Het zoekproces naar duidelijkheid zorgt ervoor dat de leerder voorheen ongearticuleerde percepties onder de loep nemen en dit creëert een waardevolle leerervaring voor de leerder.
Een verbeterd begrijpen van de sociale activiteit van het netwerken heft veel gevolgen voor het ontwerp van sociale netwerktechnologie dat het leren wil faciliteren, en voornamelijk communicatie-instrumenten. Technologie hier moet de leerder aantrekken tot het actief leren.

Deel 2 van deze thesis onderzocht mogelijkheden om eigenschappen van sociale netwerktechnologie te implementeren om leerders echte netwerkervaringen, i.e. *sensemaking* ervaringen te bieden. Specifiek werd er gekeken naar hoe leerders technisch worden voorgeplaatst op sociale netwerkplatformen en welke strategieën worden gebruikt om leerders met elkaar te matchen op sociale netwerksites. De resultaten in Hoofdstuk 4 tonen dat door gebruikers gecreëerde tag sets een bruikbare methode zijn om voorstellen hoe een leerder een onderwerp begrijpt. Daarom kan het een zeer bruikbaar component worden van leerondersteuningsystemen in het ontwerp van toepassingen voor het online netwerken en *sensemaking*. Hoofdstuk 5 bekeek de voordelen van twee matching strategieën om leerders aan elkaar aan te bevelen: een strategie gebaseerd op de gelijkenissen tussen leerders en een strategie gebaseerd op het verschil tussen leerders. Verschil bleek een meer bruikbare matching strategie te zijn.

Het werk dat in deze dissertatie voorgesteld wordt draagt bij tot de vakgebieden van onderwijs en onderwijstechnologie. Wat betreft onderwijs, breidt het ten eerste het beperkte bestaande onderzoek over de rol van het netwerken in levenslang leren uit. Ten tweede tonen de linguïstisch-analytische methodes die gebruikt worden om het netwerken en netwerkgesprekken te begrijpen tonen de complexiteit van communicatie in leernetwerken. Het onderwijs vakgebied zal voordeel halen uit meer interdisciplinair onderzoek van een communicatie-gebaseerd perspectief op interacties in online leernetwerken. Er is ook veel potentieel om fundamentele leerprocessen beter te begrijpen alsook om betere leerondersteuning te creëren door het gebruik van linguïstische methodologieën die in onderwijskundige toepassingen alsnog ongebruikt zijn. De resultaten van deze thesis zijn ook relevant voor het ontwerpen en ontwikkelen van onderwijstechnologie. Ten eerste moet ontworpen leerondersteuning voor genetwerkte leerders aangepast zijn aan de leergerwonten en methodes van deze leerders en de manieren waarop ze sociaal netwerktechnologie gebruiken. Met deze premisse was de focus gezet op het beter begrijpen van de huidige netwerkpraktijken van levenslange leerders in niet-formele leercontexten. Ten tweede tonen de technologische ontwerpen in deze thesis dat technologie meer kan doen dan het leven van de leerder gemakkelijker maken door mensen of informatie te vinden. Als het op een slimme manier ontworpen is, kan technologie leerders engageren in het begrijpen van hun denkprocessen en situaties creëren in dwelke ze aangespoord worden hun voorgehouden ideeën en gedachten opnieuw te beoordelen.
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