# *Unraveling networked learning initiatives: an analytic framework*

*Ellen Rusman, Fleur Prinsen, Marjan Vermeulen*

*Welten Institute, Open Universiteit, ellen.rusman@ou.nl;fleur.prinsen@ou.nl; marjan.vermeulen@ou.nl*

## Abstract

Networked learning happens naturally within the social systems of which we are all part. However, in certain circumstances individuals may want to actively take initiative to initiate interaction with others they are not yet regularly in exchange with. This may be the case when external influences and societal changes require innovation of existing practices. This paper proposes a framework with relevant dimensions providing insight into precipitated characteristics of designed as well as 'fostered or grown' networked learning initiatives. Networked learning initiatives are characterized as "*goal-directed, interest-, or needs based activities of a group of (at least three) individuals that initiate interaction across the boundaries of their regular social systems*". The proposed framework is based on two existing research traditions, namely 'networked learning' and 'learning networks', comparing, integrating and building upon knowledge from both perspectives. We uncover some interesting differences between definitions, but also similarities in the way they describe what 'networked' means and how learning is conceptualized. We think it is productive to combine both research perspectives, since they both study the process of learning in networks extensively, albeit from different points of view, and their combination can provide valuable insights in networked learning initiatives. We uncover important features of networked learning initiatives, characterize actors and connections of which they are comprised and conditions which facilitate and support them. The resulting framework could be used both for analytic purposes and (partly) as a design framework. In this framework it is acknowledged that not all successful networks have the same characteristics: there is no standard 'constellation' of people, roles, rules, tools and artefacts, although there are indications that some network structures work better than others. Interactions of individuals can only be designed and fostered till a certain degree: the type of network and its 'growth' (e.g. in terms of the quantity of people involved, or the quality and relevance of co-created concepts, ideas, artefacts and solutions to its 'inhabitants') is in the hand of the people involved. Therefore, the framework consists of dimensions on a sliding scale. It introduces a structured and analytic way to look at the precipitation of networked learning initiatives: learning networks. Successive research on the application of this framework and feedback from the networked learning community is needed to further validate it's usability and value to both research as well as practice.

## Keywords

Social learning; collaborative learning; learning network; networked learning; co-creation; collaboration; innovation

## Introduction

Learning in social networks happens everywhere, is of all times and is in many cases a 'natural' phenomenon within the social systems of which we are all part (e.g. clubs, professions, families or an inhabitants of a town or city). The diffusion of knowledge and innovation, leading to change on an individual, organizational or societal level, occurs among individuals in a social system. The pattern of communication and interaction (called 'ties' or 'connections') among these individuals or organizations (called 'nodes') is called a social network (Valente, 1995). These connections can take multiple forms, like friendship, kinship, common interest, financial exchange, relationships, beliefs, knowledge or prestige (Ehlen, 2015).

However, there are situations in which individuals want to actively take a social network initiative, facilitating interaction with others they are not yet naturally and regularly in exchange with. These initiatives we here call 'networked learning initiatives'. Especially in cases where external influences and societal changes require re-organization or innovation of existing practices, individuals may learn from each other, within ánd across the boundaries of organizations. De Jong (2010) (in Ehlen, 2015, p.39) showed that 'linking' ties (connections outside the organization) are more innovative than 'bridging' ties (connections between teams) or 'bonding' ties (connections in a network). The type of network may also determine how quickly innovations diffuse, and the timing of each individual's adoption (Valente, 1995). There is a growing awareness that collaboration and co-operation in networks can be drivers of innovation and learning in society. Networks can be beneficial in boosting and harvesting the creativity of its participants, facilitating the co-creation of new artefacts, and increasing adoption of 'outcomes' of networked learning activities. New or significantly improved products, goods or services, processes, (organizational) structures or methods may be developed, in such a way that they are compatible, feasible and adoptable by (individuals within) various organizations. Learning in these networks happens in a non-formal manner, outside formal, structured, institutionalized educational settings (e.g. schools, universities).

Now that the benefits of learning and innovation in networks become more apparent for both professionals and organizations (Shilling & Phelps, 2007; Ehlen, 2015), there is a call towards more insight into what successful networked learning initiatives look like. To provide such insight we propose to integrate two existing research traditions that both extensively research learning in networks, namely 'networked learning' and 'learning networks'. We uncover important features of networked learning initiatives, characterize the actors and connections of which they are comprised, and the conditions which facilitate and support them. The resulting framework could be used both for analytic purposes and (partly) as a design framework of networked learning initiatives. However, it is important to acknowledge that networked activities and interactions of individuals can only be designed and fostered till a certain degree: the type of network and the 'growth' of such networked activities (e.g. in terms of the quantity of people involved, or the quality and relevance of co-created concepts, ideas, artefacts and solutions to its 'inhabitants') is in the hand of the people involved. Thus, there is no standard 'constellation' of people, roles, rules, tools and artefacts; not all successful networks will have the same characteristics (de Haan, Leander, Ünlüsoy & Prinsen, 2014). This constellation depends for example on the strived-for objectives, the (characteristics of) the participants and the social systems participants are already part of. Therefore, the key elements in the framework can be seen as dimensions and thus appear on a sliding scale.

To start, let's consider some definitions and descriptions, given over time, of networked learning and learning networks. The differences between the two (research) traditions will then be characterized, before discussing their similarities and how they can strengthen and built upon each other. This contemplation results in a proposal for a framework, which usability will be further tested within several networked learning practices. However, these analyses are beyond the scope of this paper and will be taken up in successive research.

## 'Networked learning', 'Learning networks': definitions

In the "***networked learning***" tradition, an often used definition is the one from Goodyear, Banks, Hodgson, & Steeples (2004), who define networked learning as "…*learning in which information and communications technology (ICT) is used to promote connections: between one learner and other learners, between learners and tutors; between a learning community and its learning resources*". In 2014, Goodyear and Carvalho conducted a survey of a variety of definitions and according to Sloep (in press) concluded that any satisfactory definition of networked learning should (p.42) :

1 allow one to individuate a learning network, i.e., discern instances from each other;

2 avoid the use of language that is customary in formal education;

3 emphasize technology as well as people; and

4 mention the individual as well as the collective.


ISBN 978-1-86220-324-2

An important difference between these propositions is that the 2004 definition used terminology with a formal educational connotation (e.g. tutor) while the 2014 one explicitly proposed to avoid this . Networked learning is therefore explicitly positioned as a non-formal (intentional learning outside formal educational institutes) or informal ('accidental', unintentional learning, happening in the course of employing other activities) learning process. Also in 2014, Dohn provided an amendment to the widespread 2004 definition, in order to put emphasis on the role of diverse contexts in which learners participate, adding [connections] "*between diverse contexts in which learners participate"*. This is an important addition, as it acknowledges the importance of the various social systems learners already participate in, and that in some cases this membership may mean that tensions arise, due to differences in practices and culture.

In above definitions focus is on the use of ICT to 'promote' a learning network, but in an indirect way; 'growing' the connections between individuals, not as something that is explicitly designed (for). The 'networked' seems to refer more to technical facilitation (by using ICT) here, and not social facilitation; shaping the ways to promote connections socially. Such an underlying, broader, social learning design would e.g. explicitly take into account the role of learner identity, awareness and trust in interaction, roles, or cultural/social norms around learning. Another striking issue in these definitions is exactly the requirement of the use of technology, in order to label a learning process happening in interaction with others as 'networked learning'. The definitions don't explicitly recognize and include situations where individuals, groups or organizations decide to step out of the 'comfort' of their immediate social systems and initiate new connections and interactions, crossing cultural, organizational or disciplinary boundaries (Espinosa et al., 2014) with the objective to learn or solve a problem together, without necessarily using technology (which is mostly used to cross spatial and temporal boundaries). This is also touched upon by Wenger, Trayner & de Laat (2011), which define a social network as '*a set of connections among people, whether or not these connections are mediated by technological networks.*'(p.9). They also state that individuals in a social network use their connections and relationships as a resource in order to quickly solve problems, share knowledge, and make further connections. We conclude our contemplation on 'networked learning' with the remark that above definitions are mainly focusing on the learning process and how this takes place in a (ICT-supported) social system.

In the *"**learning networks**"* tradition Sloep & Kester (2009, p.17) define a learning network as '*a particular kind of online, social network that is designed to support non-formal learning [outside the context of formal, institutionalized learning] in a particular domain*'. In this definition, learning is not happening in a formal or informal ('accidental') manner, but is intentional and goal-directed. A learning network is a collection of people who share an interest in a particular topic, domain or problem area about which they want to further educate themselves professionally or privately. Learning more about this area of interest is the explicit intention of all individuals that populate a learning network, although various reasons underlie this intention. A learning network is seen as an artefact that can be designed in order to foster interaction amongst and a learning process 'within' its participants. Goodyear et al. (2004) do use the terminology of 'learning networks' on occasion, as consisting of "heterogeneous assemblages of tasks, activities, people, roles, rules, places, tools, artefacts and other resources, distributed in complex configurations across time and space and involving digital, non-digital and hybrid entities", seemingly implying a designer of the network by the word 'assemblage'.

This is, at first sight, a difference compared to the learning process perspective adopted within the networked learning research tradition. As Rajagopal (2013) rightfully states, seeing "a social network as a designed object implies that there are people who are its creators, members and facilitators" (p.13)". However, learning networks can be created, maintained and activated at different levels, e.g. as an individual, a group or as an organization. In other words, it can be designed both as a bottom-up (individual or group of individuals) or as a top-down (management of an organization) initiative. And in order to design, an insight in how to best foster the (learning-, social-, and problem solving) processes is essential. So, at 'second' glance, insight in these key processes and how to facilitate these learning-, social-, and problem solving processes through connections with others in a social network is what unites both traditions.

Certain technology-enhanced online instruments and services can be considered components of learning networks, providing functionality to support necessary and desirable learning, problem solving and social processes (constituting affordances: instruments and services affording actors an opportunity

to take an action). These services may facilitate creation and management of participants' own presence and contributions in the network; enable participants to self-manage, self-organize, self-categorize and self-regulate their contributions; support knowledge co-construction or co-creation between them; help them to classify and evaluate their own contributions and those from others, and allow them to control the level of privacy of (their) contributions, as well as flag possibly offensive contributions (Berlanga, Rusman, Bitter-Rijpkema & Sloep, 2009, p.30). Examples of such services are dynamic profile services (e.g. affording identity, awareness, 'traces of history' and interpersonal trust) or recommender services (e.g. matching individuals with a question to individuals with relevant expertise, or a group assembly service). Services are used, combined and shaped, depending on the characteristics and needs of the network's learners. Thus, technology helps to shape a socially constructed unique 'place' or 'constellation', customized to needs of its inhabitants.

To conclude, looking at both research traditions, in both paradigms there is a clear role for technology, but as the learning networks tradition emphasizes designing learning environments, in the networked learning tradition the focus is on the understanding of the social, collective processes of learning in networks; whether learning technologies augment learning practices or not is a secondary consideration. Interestingly, a recent paper of Brouns et al. (2014) about networked learning in MOOC's illustrate this 'bridge' between a process (networked learning) and an artefact (learning network) view. Brouns et al. take networked learning as a central concept, but leading to (re)development of a technological learning environment. They describe how learning through interactions can take place at various levels and scales, but leading to tangible artefacts and structural change in the network. Individual learners can interact with materials and resources provided in the network, but also with resources contributed and produced by participants themselves (e.g. through content aggregation, writing and reflection). Participants can learn through their interactions with each other, for instance by providing each other with feedback, through interactions with community facilitators and by taking into consideration each other's different perspectives. All these interactions can result in newly created resources, can foster individual knowledge acquisition and can generate shared constructions of knowledge, which may in turn become incorporated more structurally in the social network. This again shows that at the heart of the two traditions a thorough understanding of learning-, problem-solving and social processes is key and thus that they are not so different after all.

Striking is that, as in both research traditions technology plays a role, they do not describe situations where individuals or organizations consciously choose to form new connections away from their regular social systems, *without* necessarily using of technology. Still, these type of initiatives could be described in terms of the same social, collective processes, and therefore can also be seen as networked learning. Another, unconsidered aspect in both research traditions is that networked learning can also take place within an existing social systems (e.g. an organization), as long as (a group of) individuals consciously take the initiative to connect with people outside their regular social system. For example, if different domain sections of a school start to interact and collaborate, instead of keeping interaction restricted to their own section, thereby starting a new practice, we also see this as a form of networked learning. ICT's do not mediate this interaction, but another type of infrastructure is present (e.g. meeting rooms can be booked at set times, or coffee corners or canteens can provide an interactive function). Individuals starting a network within an existing organization are already embedded in a broader social context with a similar set of values, rules and practices, and also to a certain degree have already established an identity within this organization, whereas in a learning network initiative across organization these values, norms, practices and identities might take more effort to grow and develop.

Clearly, both paradigms apply a broad understanding of learning, which is not positioned in formal educational settings, and both embrace self-directedness of learners, with consideration of interests and needs of individuals partaking in the activities and interactions. Still, the explicit aim to learn takes more center stage in the learning networks paradigm and learning from that perspective is more an intentional process, providing a reason for the networks' existence, compared to the networked learning paradigm, where learning can happen unintentionally, as a by-product of activities that are not always explicitly designated as learning.

Grounded in the reflection above, we now characterize a networked learning initiatives as:

> "***goal-directed, interest-or need based, collective activities of a group of (at least three) individuals, that initiate interaction across the boundaries of their regular social systems"***

The goal-directedness refers to different types of objectives individuals in the network can hold, but that merge into a collective goal. These collective goals can be explicitly focused on learning from each other in an area of shared interest (intentional learning) or be less focused on learning per se (unintentional, 'accidental' learning). An example of the latter case are initiatives that aim to collectively solve common problems individuals encounter in their private or professional life. Here, learning is not the explicit objective, it occurs while finding the best solution within the problem space shared between the networks participants. Our characterization of networked learning initiatives explicitly indicates the requirement of conscious action in contacting individuals outside a participants' regular social context, as this broadens the (type and number of) learning opportunities within the network. In networked learning initiatives people can take a variety of roles, use supportive technology, and behave according to (implicit) participatory rules within a social space. This space, or learning environment, may be arranged by an individual, (negotiated between the individuals in) a group or by an organization and may be physically localized or technology-supported. At the core of this environment is interaction (through communication, knowledge co-construction, co-creation and problem solving and with social capital, often captured in the form of learning artefacts or resources). The results of the interactions (in terms of formed connections, social agreements, rules, roles, resources, instruments and artefacts emerging between the networked actors) constitute the 'learning network'. In a sense a learning network is the precipitation of interaction processes between actors and resources in a network, looking at concrete results in terms of both grown or (partly) designed 'constellations' of network ties, structures and resources supporting interactions.

In the remaining of the paper we describe these highly variable constellations of precipitated networked learning initiatives, called 'learning networks'.

## Dimensions of a learning network

The dimensions determining the constellation of learning networks, emerging from networked learning initiatives, are dependent on the:

- **characteristics of individuals in the network**, encompassing both their *personal characteristics* (e.g. personal values, norms and expectancies, personality and expertise) and their social backgrounds; their *sense of belonging and embeddedness in their regular social systems* (e.g. an organization (unit), profession, or family, each with their own ways of doing/accepted 'practices') which are driven by common views on the kinds of appropriate and expected behavior.
- **characteristics of interpersonal relations and other interactions in the network**, in terms of their experienced communality, solidarity and involvement (e.g. in shared values, norms, beliefs, expertise, motivation), interpersonal trust, interdependency and reciprocity, appreciation of each other, and their shared practices ('mutually adopted ways of doing things'), including using certain types of (technology-enhanced) tools or instruments.

The *characteristics of individuals* are important for the constellation of a learning network, as they partly determine (and restrict) the possible relations between individuals, as well as the level of support (in terms of mental support as well as facilitation from a managerial perspective), autonomy and freedom (e.g. in terms of time and energy) an individual has to (en)act in a learning network, but also the type of practices and cultures a person is already used to reason from (e.g. in terms of connotations coming with concepts, contexts, skills and language used). E.g. an individual playing multiple roles (e.g. employee, parent, active citizen) in various social contexts can be very motivated for a networked learning initiative, but also has to consider time, energy and (geographical) location and proximity issues while interacting with others, restricting interaction possibilities. Also, learning with individuals from very different social systems (e.g. homeland culture), historically formed collective interests and commitments might be at play when interacting, and these may not be easily integrated or transferrable to the new learning network, in which other interests and commitments are present. An example is the study of Hannon, Riddle & Ryberg (2014) which describes that a change is often undermined by more dominant and persuasive existing networks.


ISBN 978-1-86220-324-2

The *characteristics of interpersonal relationships between individuals* are important as they determine the frequency, nature (emotional charge), direction, and type of interactions between individuals, thus expressing the type and strength of the relationship (within the boundaries of each individuals' experienced freedom) in the emerging pattern of interaction. For example, the type of interpersonal relationships affect the focus, endurance and type of practices adopted in the formed network, including artefacts, tools and stories (e.g. whether or not the network will include technology-enhanced elements). Looking at the precipitated (visible and concrete over time) elements of a learning network's constellation, we distinguish the dimensions in Figure 1:

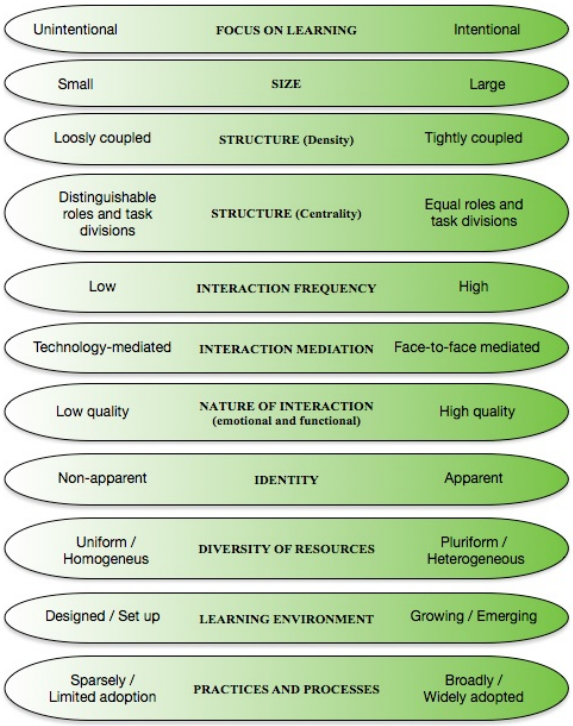


**Figure 1: Dimensions of a learning network**

The relevance of these dimensions for a networked learning initiative is explained as follows:

- **focus on learning:** achieving learning objectives in a more or less structured way is the explicit intention of individuals joining the learning network (non-formal, intentional learning) or individuals join for other reasons (e.g. jointly solving a societal problem, for fun) and learn accidentally in a not-for-learning designated, unintentional way (informal learning)
- **size:** size of a network is partly dependent on how individuals are approached to participate in networked learning, their geographical proximity and whether or not the network is technology-enhanced. It can fluctuate from 3 (small) to an (theoretically) indefinite number of people. The size partly determines the number of opportunities individuals have to learn from each other, and the amount of available resources.
- **density:** proportion of direct ties between individuals in a network relative to the total number possible. This tells something about the level of familiarity with each other in the network, whether or not the network thrives on equal or hierarchical relationships, and the amount of non-redundant information and knowledge consolidation taking place. It also illustrates the composition of the whole ecosystem: are there dedicated, specialized 'units' (clusters) of individuals providing (irregular) input to the rest of the network, or is everybody exchanging with everyone reciprocally.
- **centrality:** number and type of interactions that 'pass' (through) a certain individual tells something about their position and role in the network. It can be an indicator of the history of the network, when viewed upon in time, where the pattern will be different for an designed or 'grown' network;


ISBN 978-1-86220-324-2

it can tell something about strong versus weak or distributed leadership or whether or not clear task or role divisions are applicable in the network.

- **interaction frequency:** interaction frequency (over time) is the number of interactions individuals have in the network. It can indicate whether the network is active or dormant, whether interaction is regular or irregular, whether it is facilitated (e.g. in terms of available time to spent in the network) and it can tell something about the phase or process a network is in. Is it a temporal or structural network? Does it have a short or long shared history and practice? Did people just encounter? Are the individuals currently solving a specific problem (momentum), do they experience a peak (or flaw) in their work? It can also tell something about a special event or circumstance an individual experiences, e.g. illness.
- **interaction channels**: type of channels/facilities/mediation individuals use to interact. Is it online or face to face? Do they have a (physical/technology-enhanced)(owned) place to interact or not? (e.g. a project/ meeting room). The type of channels used is partly related to how individuals are located in time and space and whether or not it is a 'within' organization or 'between' organization network.
- **nature of interaction**: type of emotional and functional interactions in the network, individual's responsiveness to each other and the perceived quality of interactions can influence 'felt' strength and type of relationships (e.g. friendship- or expertise-based) individuals experience in the network. These relationships are not univocally derivable from the frequency of interaction. One perceived valuable interaction with an individual may influence a relationship more than ten worthless interactions.
- **identity:** apparition/visibility of individual and collective identity (e.g. by means of profiles, visible social traces/footprints, focus of resources in network, group identifier, like a logo) in a network can foster interpersonal trust (Rusman, 2011) by providing information on the personality, experience and motivation for participation in a network; awareness of each other and mutual engagement that binds the members of a network together in a social entity. It may influence the solidarity and connection an individual feels with the network and can provide a feeling of belonging.
- **resources:** variability of the nature, composition and type of resources (knowledge, used language/stories, discourses, skills, people/perspectives becoming part of a networks' 'social capital') influences the range of possible (valuable) interactions an individual may encounter in a network. The homogeneity or heterogeneity can tell something about how focused or dedicated a network is, but also about its learning opportunities. Complementarity (in terms of expertise as well as personality) of individuals can foster learning, whereas equality fosters reinforcement of what you already know or capable of (Rajagopal, 2013). The type of language used in the network influences the mutual understanding and grounding process individuals go through.
- **learning environment**: whether or not a learning environment (with tools, policies (rules, regulations, agreements) services, artefacts) is set-up from the start of interaction (designed) or not (grown into a social place through negotiation in interaction) can tell us something about the history of a network, e.g. by which actors it was initiated or determined (individuals, group(s)).
- **practices and processes:** whether or not there is a widely adopted and accepted way of working together within the network may tell something about the social capital (Ehlen, 2015) the network has succeeded to build.

## Conclusion and discussion

Our dimensional framework introduces an analytic way to look at and understand the precipitation of networked learning initiatives: learning networks. Learning networks are positioned as a visible and concrete 'product' of the processes characterizing networked learning initiatives over time. Successive research on the application of this analytic framework and feedback from the networked learning community is needed to further validate it's usability and value to both research as well as practice.


ISBN 978-1-86220-324-2

## References


Berlanga, A., Rusman, E., Bitter-Rijpkema, M. & Sloep, P. (2009). Guidelines to Foster Interaction in Online Communities. In R. Koper (Ed.), *Learning Network Services for Professional Development (*pp.27-43). Berlin, Germany: Springer-Verlag,

Brouns, F., Mota, J., Morgado, L., Jansen, D., Fano, S., Silva, A., & Teixeira, A. (2014). A networked learning framework for effective MOOC design: the ECO project approach. In A. M. Teixeira, & A. Szücs (Eds.), *8th EDEN Research Workshop. Challenges for Research into Open & Distance Learning: Doing Things Better: Doing Better Things* (pp. 161-171). Budapest, Hungary: EDEN. Oxford, United Kingdom.

Castelijns, J., Vermeulen, M., & Kools, Q. (2013). Collective learning in primary schools and teacher education institutes. *Journal of Educational Change, 14* (3), 373-402.

De Haan, M., Leander, K., Ünlüsoy, A. & Prinsen, F. (2014). Challenging ideals of connected learning: the networked configurations for learning of migrant youth in the Netherlands. *Learning, Media and Technology, 39* (*4), 507 - 535.* doi: 0.1080/17439884.2014.964256

Dohn, N. (2014). A practice-grounded approach to 'engagement' and 'motivation' in networked learning. In S. Bayne, C. Jones, M. de Laat, T. Ryberg & C. Sinclair (Eds.), *Proceedings of the 9th International Conference on Networked Learning* (pp.103-110). England, Lancaster: Lancaster University.

Ehlen, C.G.J.M. (2015). *Co-creation of Innovation: Investment with and in Social Capital. Studies on collaboration between education-industry-government*. Heerlen: Open Universiteit.

Espinosa, J. A., Lee, G., & DeLone, W. (2014). Global Team Boundary Complexity: A Social Network Perspective. In *Proceedings of the 47th Hawaii International Conference System Sciences (HICSS)* (pp. 321-330). USA, Waikoloa: IEEE.

Goodyear, P., Banks, S., Hodgson, V., & Steeples, C. (2004). *Advances in Research on Networked Learning.* Dordrecht: Kluwer.

Goodyear, P.M., & Carvalho, L. (2014). Framing the analysis of learning network architectures. In L. Carvalho & P.M. Goodyear (Eds.), *The architecture of productive learning networks* (pp.48-70). Routledge Falmer: New York.

Hannon, J., Riddle, M., & Ryberg, T. (2014). Assembling university learning technologies for an open world: connecting institutional and social networks. In S. Bayne, C. Jones, M. de Laat, T. Ryberg, & C. Sinclair (Eds.), *Proceedings of the 9th International Conference on Networked Learning* (pp. 443-452). England, Lancaster: Lancaster University.

Hodgson, V., de Laat, M., McConnell, D., & Ryberg, T. (2014). Researching design, experience and practice of networked learning: An overview. In *The design, experience and practice of networked learning* (pp. 1-26). Berlin: Springer International Publishing

Rajagopal, K., Van Bruggen, J., & Sloep, P.B.(2013). Chapter 5 - "I connect with people who think differently from me": People Recommenders that Match on Dissimilarity. In Rajagopal [thesis]. *Networking for learning. The Role of Networking in a Lifelong Learner's Professional Development* (pp. 77-101). Heerlen: Open Universiteit.

Rusman, E. (2011). Trustworthy in the eye of the beholder? A cognitive perspective on personal profile information in virtual project teams. In E.Rusman [thesis]. *The Mind's Eye on Personal Profiles. How to inform trustworthiness assessments in virtual project teams* (pp.101-113). Heerlen: Open Universiteit.

Shilling & Phelps (2007). Interfirm Collaboration Networks: The Impact of Large-Scale Network Structure on Firm Innovation. *Management Science, 53*(7), 1113-1126.

Sloep, P.B., & Kester, L. (2009). From Lurker to Active Participant. In R. Koper (Ed.), *Learning Network Services for Professional Development* (pp. 17-25). Berlin: Springer-Verlag.

Sloep, P. B. (in press). Design for Networked Learning. In B. Gros, Kinshuk, & M. Maina (Eds.), *The Future of Ubiquitous Learning Learning Designs for Emerging Pedagogies* (pp. 41–58). Berlin, Heidelberg: Springer. doi:10.1007/978-3-662-47724-3_3

Valente, T. (1995). *Network models of the diffusion of innovations.* Cresskill, New Jersey: Hampton Press.

Wenger, E., Trayner, B. & de Laat, M. (2011). *Promoting and assessing value creation in communities and networks: a conceptual framework*. Heerlen: Ruud de Moor Centrum, Open Universiteit.