Bridging the Knowledge Gap: Using Social Network Methodology for Detecting, Connecting and Facilitating Informal Networked Learning in Organizations

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Abstract
This paper presents a social network analysis (SNA) based methodology for holding up a mirror within organizations to detect and visualise informal networked learning activities spontaneously undertaken by its workers. Practice driven informal workplace learning often goes undetected, but is increasingly seen as a powerful way of optimizing organizational learning and knowledge management practices based on meaningful day-to-day learning interactions. Empirical data from this study shows that using the Network mirror helps to bridge latent and weak ties between workers in organisations who are dealing with similar challenges and questions. The methodology combines SNA with group decision software not only to detect networks but also to make explicit what these networks are working on and what is meaningful to them. Triangulation of these data streams leads to new interventions driven by bottom-up networked activity as opposed to management directives.

1. Practice-based informal social learning

Professional development is effectively realized and organized by professionals through their own networks and communities. This is a perspective within organizational learning [1] that is gaining popularity and emphasizes informal learning processes in the workplace rather than planned interventions by management with its focus on explicit knowledge [2] [3]. There is a need not only to look beyond explanations that take knowledge as a well-defined substance, but also to look beyond explanations that take the cultural unity of an organization for granted [4]. Knowledge is developed in practice and shared among the workers involved in the communities they are members of [5], [6]. Learning, working and innovational change is therefore closely linked [7], [8]. Understanding work practices seems critical in understanding how learning takes place and how knowledge is shared and co-created through a web of social relations maintained throughout one’s working life. As professionals (i.e knowledge workers) are given more responsibility and space for collaboration and innovation, we must pay more attention to the sets of relationships that people rely on to accomplish their work and how these relationships help to solve problems and create new knowledge [9].

Understanding informal learning in such a social context is therefore becoming an important research agenda. A study by Vaast [10] for example stressed the importance of tacit knowledge for learning and organizational development and explores this further in context of networks of practice and communities [4]. Lewin and Cross [11] studied knowledge creation and sharing activities in social networks. Dixon et al explored network leadership roles and their impact on organization learning. Homan [12] found that successful organizational change and innovation is dependent of the support and actions of what he calls the - informal organization. This refers to the informal powerbases maintained by informal networks within the organization. Their resistance or support for organizational change is proven to be a good predictor for success in change management. Bringing together social networks and how they impact organizational change and learning is the research focus on if this paper. Being able to change and innovate is a product of learning and identity development [5]. Homan [13] has developed a SNA based research methodology to detect informal networks and to mirror to the organization their voices and opinions using a group discussion software. This methodology will be tested in the context of networked learning in organizations to see how this fits with our aim to detect informal learning relationships and study what they are about, what they produce and what support they need to foster collaboration and innovation. The underlying assumption is that if learning and innovation is
supported through peoples’ networks, as argued above, then we need a methodology that not only detects them, but we need to give them a voice as well, in order to hear what they are about and where they are taking their professional development.

2. Networked learning and learning ties

Networked learning is a term introduced around the mid-1990’s to refer to ways new communication technologies can influence teaching and learning [14], [15], [16], [17]. By networked learning we mean the use of (ICT supported) social relationships to promote collaborative or cooperative connections between learners and learning resources. As ICTs drive new forms of collaboration and contact, and also drive the need for more and varied presentations of learning, networked learning is well placed to address the way learning happens informally on and through the use of ICT with its focus on building and cultivating social networks and seeing technology as one part of this process rather than as an end in itself [18], [19]. Social network research has shown that having an extended network is crucial for personal and professional development. Both weak ties, held with acquaintances, and strong ties in long-lasting friendships and community memberships are important for learning. Weak ties (also called bridging ties, e.g. Putnam [20]) are important for gaining access to new knowledge [21]. Levin and Cross [11] found that for informal learning and professional development people rely on weak ties with competent people they can trust. Strong ties, with those who are close to you, are needed to deepen and embed knowledge closely related to day-to-day shared practice, as well as commitment to joint activities (bonding [22]). In the area of teacher professional development, some key studies show that teacher networks add value for implementation of innovations, teacher development, school leadership, and improved teaching practices [23], [24], [25], [26]. Studies by Burt [27] also show how positioning yourself appropriately in a network enhances your opportunity to be an entrepreneur. As schools and other social contexts begin to emphasize social entrepreneurship, network connections become an important consideration in implementation and successful building of alliances toward new professional practices.

Networked learning is an emerging perspective that aims to understand the network processes and properties – of ties, relations, roles and network formations – by asking how people develop and maintain a ‘web’ of social relations for their own and others’ learning. The underlying question is: What constitutes a learning tie in a network? [28]. In communities people develop tight, long-lasting social relationships related to their practice and domain. However, emergence and cultivation of communities is a difficult process, and even apparently successful ones may fail [29]. Successful communities may also turn their attention inward, preserving and deepening group knowledge, but failing to capture new information. A strong core may also dissuade participation by those outside the central core, or fail to provide an environment where newcomers can come to understand norms and practices through legitimate peripheral participation.

Communities of practice are often formed to place an emphasis on strong relationships engendering a certain closeness and unity of purpose [30]. This attention to strong, purposeful relationships is also evident in technology design to support particular tasks or working relationships, such as efforts in computer-supported cooperative work. A networked perspective encompasses more and different relations, looking at the diversity of social relationships people develop, the diversity of ties (weak to strong), and the diversity of relations (work, learning, social) – that make up communities and other forms of social structures. For example, in the area of professional development for teachers, what matters is the relative number of contacts one has to share work related experiences with. This can mean talking with one or more colleagues in the hallway or in the coffee corner; sending an email, Skype or phone with a few peers around the world; or sharing your experience with one or more communities. Networked learning puts the emphasis on the learner and tries to maximize the network in which this person navigates in support of his or her learning, whether this learning is personally driven, collaborative or collective.

In our research we look into informal learning networks in the workplace and how this influences professional development. We are working with 32 projects each year in the educational sector focusing on teacher professional development in the workplace. When interviewing school leaders [19] it seems that most of them have no or limited sight on what teachers learn from their day-to-day practice, let alone how to stimulate or reward this. Some even hold the opinion that teachers are not knowledge workers or professionals at all. We contest this perspective but due to a lack of sufficient empirical evidence it is hard to tackle this view. This is one of the main reasons to see if we can adapt the change mirror developed by Homan into a network mirror in order to visualize spontaneous informal networked learning by teachers and show a different picture of organizational learning in the ‘mirror’ used by school leaders and knowledge
managers. The question explored in this paper is to what extent can the network mirror be used as a methodology for detecting, connecting and facilitating networked learning in organizations?

In this study we will focus on networked learning activities around a particular school innovation, as research literature indicated that networked learning by teachers is mostly effective when it is aimed at changing teaching practice by bringing together teachers implementing a shared teaching innovation in their own schools [25].

3. Method

3.1. Method and procedure

In order to study the nature of networked learning in organisations we developed a multi-method approach triangulating quantitative and qualitative techniques to describe the complexity of networked learning from various perspectives and its development overtime [17]. The aim of this multi-method approach (see figure 1) is to paint a more complete picture of networked learning processes in a naturalistic setting [31]. We believe that this approach will contribute to the development of better pedagogical frameworks to effectively support (informal) learning in various social configurations.

This multi-method research framework combines social network analysis (SNA) to find out ‘who is talking to whom’, content analysis (CA) to find out ‘what they are talking about’, and contextual analysis (CxA) focusing on the context of the organisation the participants are working in to find out ‘why they are talking as they do’.

**Figure 1. Multi-method research framework for studying networked learning**

The network mirror is a research intervention methodology based on the change mirror developed by Homan [13]. It is a three-step approach combining SNA, group discussion and planned interventions based on data triangulation:

**Step 1 SNA:** Network analysis, aimed at finding out who is talking to whom with respect to a particular innovation. This step visualizes existing informal networks in which people talk about the innovation in question and shows the extent to which they are (or are not) connected throughout the entire organization. This is done using an online survey. In this survey the respondents are asked to fill out with whom they are talking informally about the innovation in question and how important these connections are for their own development as well as the development of the organization.

**Step 2 CA:** The next step is aimed at finding out what these networks are talking about, what are their ideas and thoughts on this innovation. This is done with a group discussion tool called Synthetron. All participants will take part in an anonymous synchronous online discussion, where they can share and talk about their opinions, feelings and actions they have taken in order to make this innovation work. Second all participants will have to rank the anonymous statements of the others. This way the discussion works as a group decision system finding areas of consensus and disagreement.

**Step 3 CxA:** This research methodology stresses the importance of working with a design team. The purpose of this design team is to form a representative ‘micro cosmos’ of the entire organization. This way the collected data can be interpreted and understood in its own naturalistic setting. An external researcher alone will not be able to interpret the impact particular networks may have on the organization let alone put a weight on the voices that resides in these networks. The researcher relies on this design team for understanding what is said in which networks and it is within this design team further actions and plans for follow up interventions are made and initiated.

3.2. Participants

A large conglomerate of 70 schools in the Netherlands cooperating together under the umbrella of a joint academy for professional development participated in this study. The academy is a fusion of four different groups schools each of a particular denomination. The innovation they are all concerned with is the implementation of societal internships for their students in their curriculum. This is a totally new task for the school, meaning they have to develop a vision of what these societal internships are, develop relationships with organizations in the region where the students can go for their internships, develop meaningful tasks and procedures to streamline these
activities. Besides developing procedures, tasks and materials there is another clear need to work collaboratively in order to distribute the students evenly over the placement organizations available in the region. Since there is no history on this innovation the teachers are faced with developing new knowledge and are encouraged to do this collaboratively with their colleagues supported by the joint academy for professional development.

Of each school at least one teacher who is working on this innovation, participated in this study.

4. Data

4.1. Step 1: detecting networks

The survey (returned by 52 participants) produced a network visualization of teachers talking with each other about societal internships. Figure 2 clearly shows the existence of several (isolated) networks talking about this innovation. The colors represent the four different school denominations. The pink color refers to external people who are involved in the networks but not working at one of the schools in question. It is clear from the links between the networks that the people are more or less connected to members of their own denomination. Little or no connections between the different colors are found. A second observation is that within the color groups there are also multiple networks with view connections between them. Further analysis by the design team learned that these small networks refer to specific school locations in which several people talk together about the innovation. From this we can conclude that the teachers mostly discuss this innovation with colleagues in their own schools and only limited with colleagues from within their own denomination. Some participants within the small networks seem to take a central position and/or act as bridges (connecting networks). Further analysis into the nature of this showed that in most cases these participants are school directors or otherwise teachers within the school who have a more flexible work agenda. This way they are not limited to teaching hours and can move more freely between schools for meetings.

4.2. Step 2: synthetron group discussion

Fifty teachers logged on to the synchronous Synthetron group discussion to talk and find consensus about what matters to them with respect to the innovation they are implementing. The main aim of this discussion was to find out where they are at with implementing this in their own schools, to what extent they would like to collaborate between schools within their joint academy, and what they would like these collaborations to be about. What do they need to learn most ‘urgently’ from each other and what materials can be shared amongst them to avoid reinventing the wheel several times within the organization, is the central focus of the Synthetron discussion.

The discussion proved to be very useful for gaining insight into the practice and needs of individual teachers concerned with this innovation (they explored issues like managerial support, time pressure, quality and experience). Never before has there been a collaborative conversation amongst the teachers at this scale about this innovation and being able to have a voice on this matter is valued by the participants. Recognizing shared concerns is of great value as well as identifying materials produced in order to make this innovation work. Particularly since there seems to be quite some overlap in the individual experiences with implementing this innovation. When the question was asked whether they would like to start working together aimed at producing and sharing resources, there was a high number of consensus amongst the teachers, agreeing that this would help them implementing this innovation. They explored concrete ideas (stories, good practices, procedures, standard forms, policy documents, excursions, etc.) that they would like to share or develop further. The main reason for working together according to them is to
learn from each other and to avoid reinventing the wheel and saving time and effort. There seemed to be a stronger incentive to work together and share practical oriented issues rather than develop new ideas and directions on how this innovation could reform educational practice. Yet at the same time they indicated a need for a clear vision and policy on the implications of implementing societal internships in their schools.

4.3. Triangulation: combining step 1 & step 2 of the network mirror

When combining the results of the online survey and the Synthetron discussion with the design team, we can build a clear picture of potential energy for networks to start working together or share information and resources. In figure 3 (see below) we have enlarged the nodes in the ‘isolated’ networks of the figure 2 who agreed to collaborate on topics mentioned during the Synthetron discussion. These people — referred to as key persons - agreed to the statements made during this discussion that it is important to share materials produced in order to help colleagues dealing with the same innovation in other schools that are part of their joint academy. When observing figure 3 it is particularly interesting to see that these key persons in the networks, seem to be relatively well spread across the isolated networks as well as across the different denominations that are part of this joint academy.

Figure 3. Key persons across networks found in the joint academy (based on empirical data)

This means that after detecting the informal networks (step 1), there is potential interest in connecting these networks (or at least participants of these networks). The key figures in these networks could be seen as latent ties [32] bridging the gap between currently unconnected networks within the organization. Being able to build connections amongst these spontaneous informal learning networks will boost the exchange of knowledge and productive learning within the entire organization.

Together with the design team we have been discussing ways in which networked learning could be facilitated, during the remainder of this project, in order to stimulate connections and flow of information and resources. Their initial reaction was to start by strengthening the connections within each denomination because this seems to group schools together more naturally (see also figure 2). The key figures could be used as central actors in the network bridging weak and strong ties in the network, by acting as knowledge brokers in and between their networks. Through their central position in the network new information or products developed in the periphery of the network of a particular denomination can be shared through them amongst the other denominations. A network structure that could arise from these planned interventions is illustrated in figure 4.

Figure 4. Suggestions for bridging the knowledge gap (planned intervention for facilitating networks)

5. Future system design ideas

5.1. Employ the advantage of social network statistics

The network mirror is a tool for research-based interventions. As such we envisage using it for visualizing current networked learning practices in organizations (step 1 and 2 – see paragraph 3) as well as planning ways for facilitating them in order to improve the flow of knowledge and productive learning in these organizations (step 3). Step 3 should be seen as planned interventions, planned together with
the design team, aimed at realizing a desired practice. In the methodology section we discussed a time-line approach (or more precise a cyclic approach) where we will measure the effects of step 3 by repeating step 1 (and 2 if necessary) time and again. By visualizing the networks again after an agreed period of time (time = X) we will be able to detect the changes that have occurred in the found network structures between moment X1 and X2. This allows us to assess the effects of the planned interventions (step 3). This way we can analyze for example if the networks have become more dense – in other words if there is a significant increase of the flow of knowledge and products between its members. Whether there are less isolated networks (groups and subgroups, like cliques), illustrating increased collaboration between previously isolated networks or members. We can also analyze if the key persons (see figure 3 and 4) have taken up their role (using centrality measures, such as degree and closeness) as knowledge brokers by reaching out to more peripheral members in the network (acting as a bridge to connect those further away from core activities). By conducting these measures repeatedly we can also follow the dynamics and growth of the entire network structure in the organization. This way we can see how members travel towards or away from the core activities as well as follow how new members start participating in the networked learning activities and how over time they might move from more peripheral activities to the core of the knowledge producing networks. These network statistics (SNA) combined with interviews (CA en CxA) will increase our understanding of networked learning research issues like: what constitutes a learning tie?

5.2. System design

We are still in an experimental stage with the use of the network mirror. However several ways of collecting network statistics can be automated through the use of electronic communication. If the participants for example would use group discussion forums as a basis for their communication, the data collection needed for visualizing the networks (step 1) at various moments in time can be carried out automatically. This would increase the power of the idea of a mirror acting as a self-reflection instrument for organizations on how it learns and how their members are engaged in professional development through social networks. A further step is to assign different attributes to the participants (like area’s of expertise) which will allow us to create different network visualizations allowing the organization to see how different network dynamics exists and change around particular networked learning activities. In other projects we are starting to experiment with these design ideas in schools to show how teachers are active in various expertise networks. Hanging up these visualizations in the schools seems to attract other teachers to start joining existing networks and they also seem to help network participants to become more aware of how social contacts help them to realize classroom change.

6. Conclusion and discussion

This research shows that the network mirror is a useful research driven intervention tool to detect, connect and facilitate informal networked learning in large organizations. With this methodology we can detect multiple (isolated) networks in the organization and connect ideas and foster collaboration beyond existing boundaries. Using the network mirror organizations can link in with existing informal networks of practice and unlock their potential for organizational learning by giving them a voice and make their results more explicit within the organization. This way we can overcome some of the traditional weaknesses of informal learning referred to in the introduction. Informal networked learning tends to deal with tacit knowledge, is embedded in day-to-day practice and are spontaneous learning activities that are off the radar of HR departments and management staff. These valuable informal networked learning outcomes remain therefore often located in the relative small networks or communities in which it is produced without getting the recognition it might deserve or having a stronger impact on organizational learning and development.

Networked learning as we have indicated is an emerging perspective that tries to understand this social learning process by asking the question how people develop and maintain a ‘web’ of social relations used for their own and reciprocal learning and professional development. What is the quality of these relations and what determines learning within this relationship? The way social connections impact how and what people learn is of great interest especially for learning in informal and non-formal settings. When focusing on workplace learning in the area of teacher professional development, the networked learning perspective can provide a torch to shed a different light on teacher professional development. School organizations, when thinking of teacher professional development, often rely on refreshment courses given by experts, in-service training, or personalised learning trajectories such as coaching. These formal training opportunities provided for teachers represent just the tip of the iceberg when imagining all learning that takes place triggered by the challenges teachers face in their daily
practice. These more spontaneous and informal ways of learning are largely overlooked on organisations and remain therefore implicit and are in most cases individual learning experiences. Yet at the same time there is a large body of literature that convincingly shows that these forms of spontaneous work related learning are important drivers for ongoing professional development [1], [2], [7], [8]. Within this work there is a tendency to move away from an emphasis on training towards a focus on learning; seeing working and learning as one and the same. In this light professional development is a continuing process of acting, reflecting, and changing day-to-day practices. This perspective gives rise to a more bottom-up – self governing - understanding of learning where workers with their colleagues interact about their work experiences through sharing their experiences, knowledge and contacts providing access to new or alternative resources.

Innovative teacher professional development should involve opportunities for teachers to share their expertise, learn from peers, and collaborate on real-world projects [33]. This approach to learning embraces the participation metaphor [34] where learning is seen as situated, embedded and maintained in the daily culture of (shared) practices and professional standards [35]. These practices not only concern the practice of your own classroom or school. Participation also means involving yourself with a larger perhaps even a global landscape of practices [5]. Learning in this context is distributed [36] over a network of people [37] active as teachers and sharing work related issues. This process of participation is best served through the ability of people to create and continually extend or maintain a meaningful social/professional network. People use their networks as a social infrastructure to gain access to what it is they are looking for whether it is products/materials, knowledge and new colleagues. At the same time there is a great need for empirical research and tools that can visualise how informal networks behave and make them surface the radar of organizational learning in order for these networks to become recognized, supported and legitimized as a powerful form of learning along side of formal learning initiatives. We argue that the network mirror presented in this paper serves this process.

7. References


