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RELATIONAL AGENCY AND THE DEVELOPMENT OF TOOLS IN SERVICE NETWORKS

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ABSTRACT

Material and symbolic tools of collaboration are necessary for sustaining the networked activities of services. This chapter explores the tool-mediated basis of relational agency and relational work. We examine how service practitioners create, use, and modify collaborative tools, such as concepts, documents, annual clocks, action cards and virtual systems, to support their joint work. The chapter narrates tool-related events that the participants discussed in developmental interventions in five different service networks. Drawing on the cultural-historical activity theory the events are analysed in the conceptual framework highlighting the integration of the object of collaboration and the materialisation of the network script. We use the framework to elaborate on the potential of the tools created by the professionals. The findings indicate developmental dialectics between relational agency and the tools of collaboration meaning that relational agency contributes to the emergence and transformation of collaborative tools, and developed tools, in turn, shape possibilities for relational agency to occur and grow in service networks. The notion of relational agency enriches our understanding of the complex dynamics of cross-sectoral tool development, and highlights how professionals use tools to maintain and transform their service networks.

Keywords: instrumental genesis, network script, object of collaboration, service networks, tools of collaboration

INTRODUCTION

The “gardening tools” (Edwards, 2012) discussed in this volume, relational expertise, common knowledge and relational agency, are concepts that are mediating efforts to understand how the collaborative production of services occur in dispersed multi-organisational and multi-professional networks. We have found that relational expertise is not self-evident in current networks. Yet one might expect that the exercise of relational agency, “a capacity to work with others to expand the object that one is working on and trying to transform by recognising, examining, and working with the resources that others bring to bear as they interpret and respond to the object” (Edwards, 2009, p. 209) would be one of the reasons for such networks. Particularly, as Edwards notes, relational agency differs from versions of networked support in which one single actor asks others for resources to support her interpretation of the object of activity (Edwards, 2010, p. 14).

In this chapter we document the emergence of, and need for relational agency, by reinterpreting our recent empirical research in five service networks, examining how they collaborate and work with clients (Seppänen et al., 2014; Seppänen, Cerf & Toiviainen, 2013). Seeing relational agency as a site of struggle, development and learning, and reflecting on these notions in the service networks has prompted the question: how do new tools and means of collaboration shape possibilities for mobilising relational agency on joint problems in service networks? How does relational agency contribute to instrumental genesis and better tools for collaborating on complex problems? The services addressed cover social welfare (divorce families, prisoners), public transportation (rail traffic control) and global corporations (in-house welfare services, technology consulting). We investigate tools which have aimed at collaboration including concepts, meeting scripts, documents, annual clocks, action cards and virtual systems. Developed and implemented in the networks, these artefacts

assumedly tell us something essential about the developmental phases and learning potential of the networks. Analyses examining the development of the tools for encouraging collaboration intertwined with the network's development are rare, and we know of no studies that have investigated relational agency in this context.

RELATIONAL AGENCY AND INSTRUMENTAL GENESIS

The relationship between an individual subject and collective activities is central in activity theoretical approaches to agency (Engeström, 2009). Stetsenko (2005) similarly suggests that human subjectivity, together with material production and intersubjective exchanges form a uniform dialectical system in which the three parts co-evolve. Edwards' approach is compatible with these views, arguing (Edwards, 2009) that relational expertise and relational agency attempt to conceptualise what happens in joint action within and between systems by focusing on the analytic stratum between the individual and the system. In this paper we augment this focus by providing empirical evidence of Stetsenko's co-evolution, employing the idea of relational agency as an analytic resource.

Cultural historical activity theory (CHAT) offers a methodology for examining the dynamic relationships between tools and other elements of activity, giving access to the co-evolution of tools. Miettinen (1998) explains tool formation in the following way: "When it is an object of cognition and transformation, it is an object of activity. Once stabilized, it is transformed into a means of activity" (Miettinen, 1998, 431). Consequently, the development of tools (that is, means or instrumentalities, recently discussed by Engeström et al, 2015) is a window on the transformation of a network, its ongoing object construction and collaborative relationships.

One example of such an approach used activity theory and the theory of expansive learning (Engeström, 1987) to analyse the development of the Network for Ethnological Monitoring and Early Warning (EAWARN) in the post-Soviet sphere (Foot, 2001). Careful analysis of the cycles of expansive learning over time revealed that the introduction of a specific tool, the indicator model, precipitated a new mode of joint activity between the network participants by contributing to the resolution of the systemic contradictions of the network's activity.

Béguin and Rabardel speak of instrumental genesis when discussing the transformation of tools and activities over time. Instrumental genesis refers to how people contribute to the development and use of an artefact, constructing their instruments and how they are used to complete their action. They describe instrumental genesis as a process of dialectical transformation: "Instruments come out of the specific form of activity that we call instrumental genesis. This is a process of dialectical transformation of artifacts and social schema, during which the individual and his resources will develop." (Béguin & Rabardel, 2000, p.186)

By replacing "social schema" in this quotation by a concept of "network scripts" we extend the idea of instrumental genesis to our analysis of service networks. Following the idea of instrumental genesis, we find that relational agency and its related concepts help us understand how tools are created, tested, validated or modified. To analyse this dialectical relationship in historically evolving service networks we need a developmental frame of reference.

SCRIPTS AND OBJECTS OF NETWORKED ACTIVITY

We have identified two interrelated conceptual dimensions to depict the development of service networks (Figure 9.1). The horizontal axis represents the formation of the script for the network's activity, whereas the vertical axis outlines the integration of the object of service activity.

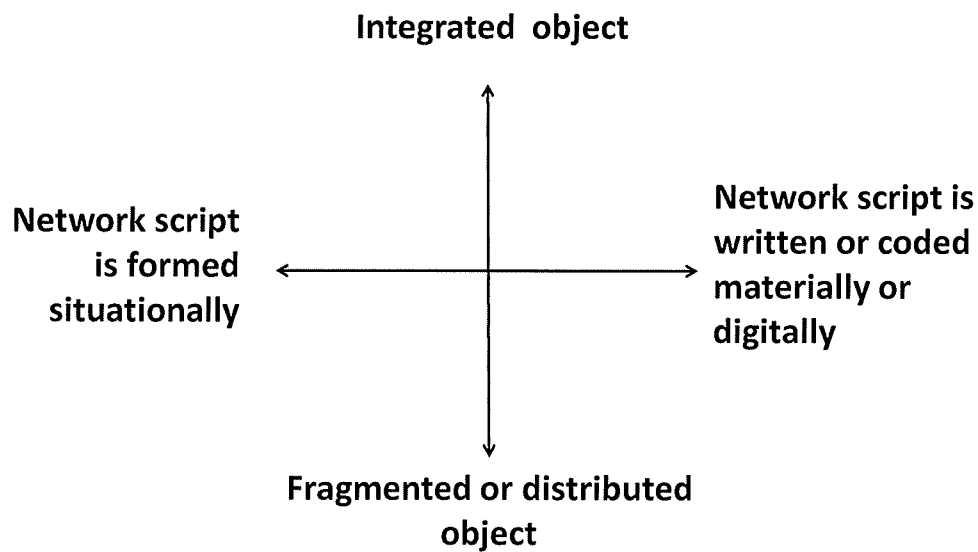


Figure 9.1 Analytical framework of network development (modified from Seppänen et al., 2014)

A script refers to an event schema, which “specifies the people who appropriately participate in an event, the social roles they play, the objects they use, and the sequence of actions and causal relations that applies.” (Cole, 1996, p.126). A script is therefore based on both the explicit rules and “tacitly assumed traditions” (Nummijoki & Engeström, 2010, p. 57) that co-ordinate the participants’ and professionals’ actions according to the roles and tasks assigned to them. A script, however, is an intermediate concept that cannot explain human agency: “Scripts alone leave unanswered the crucial question of motivation. If the essence of work boils down to collections of scripted action strings, what drives the practitioners in their actions?” (Engeström, 2000, p. 964).

Here Engeström emphasises that the object of work gives rise to continuity and coherence in both the actions and the scripts. This dimension is captured in the vertical axis in Figure 9.1. The horizontal axis arises from our observation that, in some networks, the script was transformed from situational scripts, based on social relations, to scripts inscribed in material or codified tools (horizontal axis in Figure 9.1). These shifts occurred while networks tried to overcome the fragmentation of their activities.

Script formation, crucial for the functioning of the networks, seems to be tightly embedded in the development of network instruments. Moreover, the quality of the tools evolving through instrumental genesis reflects the quality of the network. We believe that this feature of instrumental genesis, when dealing collectively with complex problems, benefits from, or is built on, relational agency.

DATA AND METHODS

We will first briefly describe each service and the context of tool development. We have selected a tool-related event from each network for analysis. The method combines the narratives of the tool-related events and their interpretative analysis using the framework in Figure 9.1.

Social Services for Divorced Families (SSDF) The SSDF network works with clients in divorce situations, some of whom may have long-term relationships with multiple social and legal services. A divorce process may be prolonged, for example, if parents argue about child custody, taking their disputes to the magistrate’s court. The central partners in the SSDF network are Family Counselling

(FC), Family Law Issues (FLI) and Child Protection (CP). The strategy of these services is to develop preventive and anticipatory service practices.

Although the separate functional units of SSDF are institutionalised and administratively located in the same municipal department, their means of collaboration are mostly occasional. The functions follow the scripts based on professionally specialised practices. In one development workshop, the practitioners discussed common client cases (Seppänen, Cerf & Toiviainen, 2013). One critical event in a prolonged client case was based on the mother's story about her child running back to her during a visit to the father's home. The practitioners used their own professional concepts as a means of discussing the event, which brought to light the multiplicity of concepts across the different professional functions (Seppänen & Kloetzer, 2014).

Critical Transition from Prison to Society Supervised probationary freedom (SPF) is the option of a prisoner being released up to six months early. During SPF, prisoners are required to engage in working, studying or rehabilitation. The design and implementation of SPF is based on an institutionalised and articulated script that requires networking between the professionals. The central actors within the Criminal Sanctions Agency (CSA) are senior officials of prisons, assessment centres and the community service offices. Actors outside the CSA, such as schools, workplaces, and rehabilitation are indispensable for putting SPF into practice. Municipalities grant financial aid. Prisons and mobile CSA patrols carry out the surveillance work during SPF.

The preparation and implementation tools of SPF are the information systems of the CSA, meetings and agreements between prison authorities and the organisers of SPF activities, and the 'enforcement plan' stating the prisoner's activities, duties, and contacts during SPF. These tools are not available to all actors of the network. Information systems are used by the CSA. Agreements and plans are made at an organisational level, but, as our research has revealed, the information about their existence and content may not reach everybody who works with the prisoner (Uusitalo & Seppänen, 2015).

Wellbeing Services in a Global Corporation This network represents the provision of wellbeing services within a Finnish industrial corporation, including human resources, occupational safety, and occupational health functions. In this case, the users of the services were the front-line supervisors of the corporation's production unit. Due to the changing needs of the supervisors, the separate service functions discussed how to intensify collaboration in order to better serve supervisors; in particular their work with enhancing employee wellbeing.

The case to be discussed is an event in the development of a shared tool, the annual clock, which emerged from the practitioners' initiative to synchronize their overlapping and inconsistent wellbeing services. The idea evolved in a series of development workshops; first as a conceptual object, then as a tool of collaboration, and eventually as a script for cross-functional practice (Ruotsala, 2014). The event was the turning point in the developmental discussion, in which the novel tool took shape [as a conceptual object] and radically reorganised the professionals' view of the object and of their relationships.

Rail Traffic Control in Southern Finland A new kind of network was born when the rail traffic market was opened to international competition and the public tasks of rail control and maintenance were separated from the private tasks of managing trains, stock and their personnel (Seppänen, Ala-Laurinaho & Piispanen, 2015). We observed a long-term transition from one or two units to separate functions in new units or organisations. The object of the network's activity remained to ensure fluent traffic for trains and passengers, while the new division of labour created a new object of managing the network collaboration across the units.

The long common history of rail traffic control, with its tacit knowledge and a largely tacit script, was at first helpful in designing the new division of labour for the network, but had limitations when coping with their new objects of activity. In order to facilitate technological and organisational transformation, the partnering organisations collaboratively designed a system of action cards – guidelines - as a script for handling local disturbances such as, a damaged piece of railroad, handling a broken wagon or locomotive, or acting in an accident situation.

Technology Consulting Service in a Global Company An international technology consulting and engineering company delivers management consulting and engineering services worldwide. Our research examined the production of engineering design services in one of the business sectors, which was undergoing change, being distributed in a global network. We studied the design engineering activity occurring in the intra-firm network under the project management team's supervision. In the team, the co-ordinators of separate design areas work in intensive interaction with the design engineers who take on the design tasks, comment on the outcomes, give advice and update and distribute documents. We followed a project where the team worked in the headquarters in Finland, but the design engineering work was, for the first time, distributed between Finland and China. The situated script of local activity had to be changed and digitally coded to guide distributed work.

The system of design tools and a virtual design environment represents advanced ICT. However, it is not designed to support mutual learning in a multi-cultural network, creating a for design tools to enable such collaboration. During the project, the participants attempted to expand the means of collaboration by, for example, creating a co-ordination interface between the Finnish and the Chinese offices (Toiviainen et al., 2012).

Table 9.1. Five service networks

<i>Service network</i>	<i>Service and customer</i>	<i>Participants of network</i>	<i>Network tools and their developmental challenges</i>
Social services for divorced families	Divorced families with children who have long-term relations with various social and legal services	Municipal functions of Family Legal Issues, Child Protection and Family Counselling. Many actors outside municipal social affairs.	Tools are situated; search for co-ordination tools
Critical transition from prison to society	Activities of supervised probationary freedom (SPF) for selected prisoners	Various actors both inside and outside Criminal Sanctions Agency	Documents and meetings exist but some relevant actors are not included
Well-being services in a global corporation	Support for production supervisors in enhancing employee well-being	Organisational service providers of human resources, occupational safety and occupational health	Existing tools are situated. Supervisors' Annual Clock – service providers innovate a shared tool of collaboration
Rail traffic control in Southern Finland	Securing fluent and safe traffic of trains.	Public actors managing and maintaining railroads and private train service providers	Transition to standardised tools such as action cards
Technology consulting service in a global company	Industrial design and project management for global customers	Project co-ordinators and design engineers in Finland and China	A systemic digital design tool and creation of a co-ordination interface to expand its collaboration and learning features.

In order to explore the role of relational agency in the development processes of tools we have identified relevant collaborative events from the analyses carried out by our research team. This study is a meta-analysis of the reported findings of the events and Table 9.1 presents a summary of the networks. Relational work may be observed at two levels. The first level is the service work activities and client cases, which formed the content of the professionals' discussions. The second level is the recognitions, reinterpretations, novel responses and other development efforts created during the workshops through the dialogue between different professionals. The data allows analysis on both these levels.

INTERPRETING RELATIONAL AGENCY IN SERVICE NETWORKS

Professional Concepts as Collaborative Tools The event is from a developmental workshop where practitioners offering social services for divorced families discussed a trajectory of divorced parents with children, who had used many services for several years. A mother's story about her child running back to her from the father's home was used as a trigger to elicit practitioners' different perspectives. The tools in this event were the professional concepts with which practitioners made sense of the mother's story such as 'interaction problem', 'weak signal', or 'worry'. Researchers have addressed this case to analyse whether the use of these concepts helped or hindered practitioners' crossing the functional boundaries between the service units (Seppänen & Kloetzer, 2014).

Analyses demonstrated that the concepts helped professionals do relational work with clients, and thus they shaped the professionals' conceptions of "what matters" (Edwards, 2012) for the clients and the conditions in which they were acting. Edwards suggests that becoming familiar with others' professional concepts and the meanings carried in them may help create common knowledge which can then mediate collaboration. However, the concepts *per se* did not enable inter-professional integration of what mattered for the clients as the object of work (see the vertical axis in Figure 9.1). This means that individual professionals' successful relational agency with clients does not automatically enhance relational agency in inter-professional collaboration.

For example, the concept of 'worry' mediated the relations of FC with their clients by observing the child's confusion, and supporting the father in spending time with his child. But the 'worry' did not match FLI's framework for action, because FLI saw the event from the point of the legal *contract* made between the parents. Only a parent's request can make FLI act and the concept of worry was therefore not meaningful for them. The practitioners anchored (Marková 2000) the story in their existing functional frameworks.

With this event we highlight the power of the specific professional concepts either as mediators or inhibitors of relational agency. When concepts have evolved within one function or unit, they may hinder relational agency between service functions. The concepts may label the functional intentions and motives in such a way that their opening for common, cross-professional reflection becomes difficult. Moving towards an integrated object (Figure 9.1) through relational agency and building of common knowledge with other professionals often requires new concepts to emerge.

Discovering Ruptures and Creating New Narratives The second event is from a developmental workshop with SPF practitioners discussing plans for Steve, a prisoner. The practitioners discovered ruptures between the actions of a school teacher and the rest of Steve's service network. The teacher was an external actor and a professional involved in the prisoner's rehabilitation as Steve was aiming at completing his basic education. The teacher had not been invited to the earlier meeting where Steve's SPF was designed. In the workshop, three practitioners from the CSA and the teacher discussed the different SPF activities designed for Steve, and their observations regarding the realization and implications of these.

The participants shared interpretations of what they saw as central to shaping Steve's trajectory towards a crime-free, competent life. During this conversation, the three actors from the CSA discovered that the teacher was having difficulties getting Steve to learn. The teacher had not received information about Steve's SPF activities and she did not know how important school was for Steve's rehabilitation. Most importantly, Steve's other SPF activities, such as courses organised by

Community Sanctions, often took him away from her class and disturbed the teacher's object motive, the 'what matters' in her teacher's work.

The participants listened to, interpreted, and responded to each other, which we interpret as exercising relational expertise and building common knowledge as a pre-cursor to using relational agency to create a new narrative in relation to Steve. Their discussion continued by their pondering on Steve's many SPF activities designed to keep him active and away from crime. But now the participants asked if Steve's mobility, required by the many activities, in fact allowed him to escape control and, at worst, turn to criminal activity. Their discussion thus relationally created a new narrative about the quantity of SPF activities.

This event shows how the rupture, in the form of a lack of document-sharing or any communication between the teacher and the other networking partners, inhibited the possibilities for exercising relational agency and the expansion of the object between the teacher and the other practitioners in Steve's network. It also shows how the relational expertise that was exhibited in the dialogue helped the professionals understand the rupture of communication and its implications and consequently what mattered for each of them in their work with Steve, enabling them to jointly create a new way forward in their work with the client. A new narrative is a part of instrumental genesis entailing the implementation of the SPF through stages of transformation.

Starting to See from the Client's Perspective The third event took place amidst a series of development workshops, in which wellbeing professionals discussed their services for supervisors (Ruotsala, 2014). During the workshop discussion, the idea of an annual clock emerged as the service providers' attempted to synchronize the overlapping, inconsistent wellbeing services for supervisors. (An annual clock is an organizational tool for planning, scheduling and managing recurring operations within a period of one year.) Up until this point the professionals had shown that the tools used by the various professionals were different so that each function provided the supervisors with separate, multiple instruments and task assignments. A turning point in the discussion towards a more collaborative mode took place when the service providers articulated and questioned this multiplicity by taking the supervisor's perspective. The health, safety and environment (HSE) manager argued:

Well, I'll try looking at it from the supervisor's perspective. Now, if I as a supervisor am told that there is a kind of annual clock, and if then there's an HR annual clock, and then a quality and occupational health annual clock. And then other annual clocks come from business and... And project-based annual clocks and others, so everybody introduces an annual clock that the supervisor should understand. It's hopeless. [...] The supervisor must be left blissfully unaware of the existence of the annual clock. Because this is a service organisation that serves the supervisors [--]."

(HSE manager, Ruotsala, 2014)

This speaker pointed out that supervisors need support and should not have to deal with multiple, annual clocks. However, in the discussion that followed, the HR manager put forth the idea of a supervisor's annual clock, one wellbeing services annual clock instead of many, would be a supervisors' tool.

This shift in perspective had many implications, not only for the design of the tool, but also for the way in which the professionals started to relate to each other's services and conceptualise the object of the wellbeing service activity. Ruotsala (2014) calls the process "reflective exchange," by means of which the service providers outlined the general idea of the annual clock to help the supervisors master their tasks during the year and give the service functions a holistic picture of the supervisors' complex operational environment. Moreover, the use of the annual clock might bring the service producers and users together to regularly evaluate the promotion of wellbeing at work. "As a result of the reflective exchange, the conceptualization of the annual clock turned into a *cross-functional practice* script, defining how collaboration could be developed in the future" (Ruotsala, 2014, p. 46; italics in original).

Questioning Standardisation The fourth event is embedded in the transitional situation of the rail traffic control network. A workshop was organised to jointly analyse rail traffic disturbances and to discuss a new potential collaborative tool, conjoined action cards, for handling disturbances (Seppänen, Ala-Laurinaho & Piispanen, 2015).

There was a great deal of uncertainty in this transitional phase. Although action cards would help diminish this uncertainty, the rail traffic controllers questioned their standardisation. They considered that planned solutions would not always work in chaotic traffic situations such as after heavy snowfall. For strategic managers and designers of the network, the rationale for the action cards was to reduce the variation of actions in the network and make rail traffic control more foreseeable to others. Their logic was to manage disturbances by diminishing “personal handwriting”. This logic, and the controllers’ questioning, is seen here.

Senior inspector: I suppose we should simply say that this train just will not move. We don’t look into the details, whether [the broken wagon] is at this or that end or in the middle, whether it’ll move or not. The train just won’t move. This has consequences.
Rail traffic controller: Or, would it be worth describing different alternatives here, as if the first wagon is defective...
Senior inspector: It gets too complicated. We don’t have time. There’s no time for adjustments, we’re talking about minutes here.

The preferred degree of standardization or flexibility of the future action cards was discussed at length. As the actual, tacitly undertaken procedures varied considerably, the participants produced the idea of experimenting with several alternative blueprints for the action cards. By discussing action cards as promising artefacts, and by aiming to articulate multiple tacitly held professional practices in their design the workshop contributed to their instrumental genesis in the rail traffic control network.

This event revealed how the old experience-based way of working produced a critique of standardisation, which seemed to reduce the autonomy of professionals. It turns our attention to hierarchical relations where relational agency and the creation of common knowledge are needed, a topic discussed by Edwards (2010) in terms of the upstream mobilisation of knowledge. In the example discussed here, strategic managers and designers crucially needed the tacit knowledge of traffic controllers for designing the action cards.

Asymmetric Learning Practices in Digitalised Work The fifth event describes professionals’ expansive learning efforts to master globally distributed work by creating and implementing new tools and practices. An example was the co-ordination interface created between one of the engineering design supervisors in Finland and the expatriate project manager in China (Toiviainen et al., 2012). Based on an individual initiative, the co-ordination interface actually became a general working model between the offices. The interface was a channel of daily communication between the offices to crosscheck how the design work was proceeding and to agree on urgent actions. The advanced virtual design environment was not flexible enough to facilitate online communication. The co-ordination interface was a local innovation for the project managers and supervisors who compared it with the inter-firm peer-to-peer links they had heard of from other companies (Paasivaara & Lassenius, 2003).

For the new designers in China, however, the narrow co-ordination interface did not allow direct access to all systems or to the other designers in the global network. As the network remained invisible for the newcomers in China, they could not see how their updating of the design depended on the changes performed by other designers in different locations: “We keep doing similar updating work many times, which is very boring and kind of a waste of time”. Furthermore, the network interface did not allow the newcomers to see the final outcome of the design: “doing the work without knowledge of why we are doing it”. They were asked to suggest solutions to these problems. They recommended improving coordination work and communication, and organising visits to the construction sites or factories in use (Toiviainen et al., 2012).

Despite the limitations of the co-ordination interface, it was considered useful in distributed design activity and was sustained in the project that followed. The interface role in China

was assigned to a Chinese engineer who replaced the Finnish expatriate project co-ordinator. That move signalled an expansion of agency among the participants in China and a step towards solving the newcomers' problems.

Participants in networks seem generally to problematise the use of digitalised design tools and systems when entering global work. The creation of the co-ordination interface exemplified instrumental genesis by extending an existing virtual operational environment. The initiators of the co-ordination interface put an end to the separated, culturally-split practice between Finland and China (Toiviainen, 2015). But it did not allow the Chinese to exercise relational expertise, build common knowledge and ultimately engage in relational agency by jointly solving problem with other network members, as the Chinese engineers' comments indicate. The initiative of the two co-ordinators helped their colleagues in Finland relate to the distant, new and unknown designers and their work. For the newcomers in China, relating to others in the network was not facilitated. Thus, when comparing the old and the new workers we see asymmetries in the development of relational work. Building new learning practices in digitalised work is an example of the dialectic co-evolution of agency, material means of production and intersubjective exchange in a global network (Stetsenko, 2005).

DISCUSSION

The aim of this chapter was to illuminate the tool-mediated basis of relational agency by reinterpreting some of our recent research. We discuss the reinterpretations in order to answer the questions: How do new tools and means of collaboration shape the opportunities to mobilise relational agency in service networks' joint problems? How does relational agency contribute to instrumental genesis and better tools for collaborating in complex problems? For this purpose, Figure 9.2 locates the tools discussed in each network event in the analytical framework (see Figure 9.1).

The assumption is that these tool innovations will enable relational agency in networks, and relational agency is an attribute of a network that should enable tool development. The concepts of co-evolution (Stetsenko, 2005) and instrumental genesis (Béguin & Rabardel, 2000) were introduced to support the developmental approach in our framework. How tools are designed, existing tools expanded and new ones invented in multi-professional collaboration tells us something essential about the developmental conditions of a given service network.

While the development of tools and the development of networks are interconnected, we note one reservation. The two-dimensional framework was originally created to illustrate the developmental directions of service networks. Here, however, we refrain from drawing conclusions for network-level development, and instead use the framework to elaborate on the potential of the tools created by the professionals in network projects. The potential of a tool is assessed with reference to relational agency and relational work, but a tool of high developmental potential does not automatically predict a high level of the future development of a service network. This is because the success of collaboration depends on a set of multi-level activities rather than on the implementation of tools alone (Toiviainen, 2007). In brief, our interest is the dynamic relationship between tool development and relational agency.

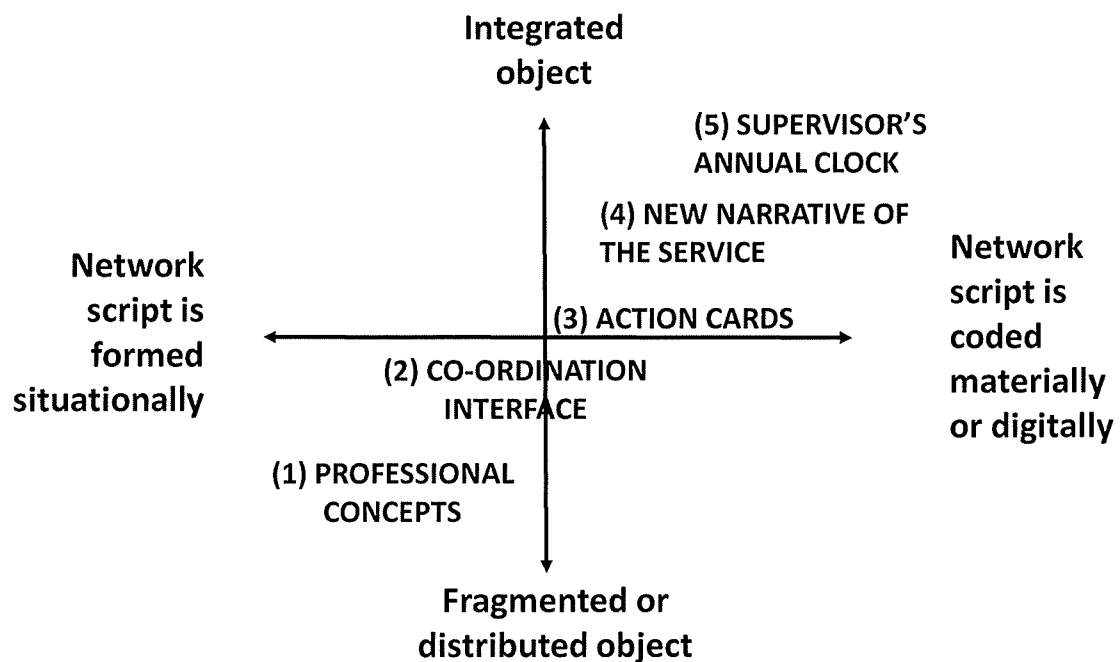


Figure 9.2. Tools as material representations of relational agency in service networks

The potential of relational agency is relevant in many ways to the collaborative development of tools, with which participants expand the object of service provision and renew the service network scripts (Figure 9.2). A formal comparison of the qualitatively different tools would make no sense; however, what can be compared are the interpretations of the quality and the meaning of relational agency and relational work in each case.

The first kind of tool we discuss is professional concepts, used by experts in the SSDF network. The professional schema, terms and definitions helped practitioners make sense of the client-object (divorcing families), showing that concepts are powerful tools in professional use. Sectoral differentiation of these concepts, however, was an obstacle to interlinking the concepts and creating relational agency across service functions. Relational agency requires people to be explicit about what matters to them, as well as to exhibit sensitivity to the motives of others (Edwards, 2010, 2012). We suggest that the strength of sectoral concepts, and the lack of new cross-sectoral concepts and their material representations, were connected to weak signs of relational agency. Under these circumstances, specialist professional concepts mediated a limited network script and a fragmented object of service activity.

The second tool, the co-ordination interface in the globally distributed engineering design activity, represents instrumental genesis, suggesting that professionals do modify existing digital tools to enable relational agency and to enhance relational work in new situations. Attempts to mediate relational work through a co-ordination interface remained partial, as the object and the network partners stayed invisible to newcomers in the global network. This led to asymmetric learning, preventing relational work. Later, assigning the interface role to a newcomer signalled an expansion of relational agency. In sum, the co-ordination interface supported a situational script and orientation towards a split and partly invisible object of activity. But the tool was to some extent stabilised, representing a micro-episode towards relational work in the company's global network.

Thirdly, the development of the action cards was marked by tension between the strategic aim of standardisation and the operational actors' concern regarding transferring tacit knowledge to a new network. Professionals questioned the idea that standardised tools would affect their way of working with the object, i.e. rail traffic control. Their questioning demonstrated a resource of relational agency that seemed to enhance relational work in the hierarchical linkage between strategic management and traffic control. Rail traffic controllers' criticism was not an

expression of diffuse opposition to change, but a strategically relevant act. The recognition of relevance is necessary for negotiation and for affiliation to a certain outcome (Edwards, 2010, p.130). Questioning and negotiation showed the managers that it is important to let the discrepancies of motives surface when tackling complex problems (Edwards, 2010, 2012). Action cards, when interpreted in the analytical framework as a disputed field of standardisation, are an intermediate example of an effort to pursue a coded script and integrated object of the safety-critical public service, rail traffic control.

The fourth tool was identified by the researchers and named a new narrative, which transformed the understanding of how probationary freedom would guide the prisoner towards crimefree life. We found that professional client-oriented discussion promoted new understandings of both clients and the networked services (Seppänen, Cerf & Toiviainen, 2013). Discussion is needed to discover ruptures in service production and to create new narratives that stabilise the situation, while still allowing for the diversity of professional actions (Edwards, 2012, p.30). This type of discussion and renewal is possible in networks that can accommodate relational agency; in this case, the statutory practice for providing prisoners with the service of supervised probationary freedom. Narratives of a client's situation are a part of instrumental genesis to enhance the "enriched understanding of the problem space" (Edwards, 2010, p. 208) and, thus, a central element of relational work. The common object of the network (prisoner's supervised probationary freedom), which was regulated by the materially coded script, enabled professionals to relationally observe ruptures and recognise the lack of tools in the collaboration.

The fifth tool, the annual clock, powerfully illustrates how a shift in perspective was possible through professionals' relational agency, which was oriented, first, towards the needs of the customer, and later, towards each other's work. This shift in perspective through instrumental genesis (Béguin & Rabardel, 2000), led to a significant innovation in the form of "the supervisor's annual clock" and to the reconceptualisation of the object of service activity. Furthermore, assuming the supervisor's perspective and thus expanding the object of activity triggered the redesign of the script of the service network collaboration. As Ruotsala (2014, p. 42) summarises, "the emergence of the annual clock was a significant shift that changed the script, generated a new object, and eventually affected the whole progress of the intervention."

In reviewing the five studies, we found that the creation and implementation of "lower level" tools describes early efforts to create and strengthen relational agency and relational work, whereas the emergence of the "higher level" tools clearly benefits from the relational resources accumulated in the service networks. In this respect, we may compare two "discursive" tools: the professional concepts and the new narrative. Professional concepts did not, as such, involve cross-functional relational agency and were assessed to be a weak tool for developing relational work in the SSDF; whereas the new narrative seemed to benefit from relational agency and relational work, having evolved in the scripted practice of supervised probationary freedom. This suggests that codified or even institutionalised network scripts may support relational work.

Another comparison between the most "artefactual" tools, the action cards and annual clock, shows differences in their relationships with the object of service. We interpreted that relational agency was involved in the traffic controllers' act of questioning, which led to productive tool development. However, standardisation as a leading motive of tool design still left the object of service, i.e. rail traffic control and the users of the service, in the background. The annual clock, in contrast, was an innovation based on an explicit reconceptualisation of the object of service. Relational agency and the creation of the object were mutually supportive in the tool development. Table 9.2 summarises our findings.

Table 9.2. Development of tools in service networks

<i>Network event</i>	<i>Tool development</i>	<i>Relational agency in tool development</i>
1. Professional concepts as collaborative tools	Powerful professional concepts and need for new network concepts	Sectorial professional concepts restrain cross-functional relational agency to evolve
2. Asymmetric learning practices in digitalised work	Digital design tools are insufficient to support learning in network	Expanding digital tools by creating the co-ordination interface enables relational agency in global work
3. Questioning standardisation	Design of Action cards to mediate standardised practices in a new service network	Criticism to standardisation represents relational agency that mobilises tacit knowledge in the design of a new network tool
4. Discovering ruptures and creating new narratives	Documents and meetings created for a new service	Relational agency helps reveal ruptures in the service network and supports the creation of a new narrative of a client/service
5. Starting to see from the clients' perspective	Creation of a new tool, Annual clock	Relational agency initiates instrumental genesis for expanding the object and developing a new network script

CONCLUSION

We have documented some of the dynamic linkages between network tools and relational agency. On the one hand, the findings reveal how tools and means of collaboration shape possibilities for relational agency in events in service networks. Tools both exclude and include actors, or enable and restrict the creation of common knowledge in relation to service activities. On the other hand, through instrumental genesis, relational agency may significantly contribute to the emergence and shaping of collaborative tools. In both cases, relational work in connection with tool development offers insight into the developmental phase and learning potential of service networks. To conclude, the notion of relational agency enriched our understanding of the complex dynamics of cross-sectoral tool development, and highlighted how professionals use these tools to maintain and transform their service networks.

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