LANCASTER UNIVERSITY

Organizational Learning and Knowledge

5th International Conference

Friday, 30th May – Monday, 2nd June, 2003

BOUNDARY CROSSING AND LEARNING IN CREATION OF NEW WORK PRACTICE: CREATION AND RE-CREATION OF ROUTINES DURING TOOL IMPLEMENTATION

Theme: Learning Across Boundaries

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Abstract

The following theoretical challenges concerning organizational learning are examined in the study. Firstly, organizational learning is not only formation of collective routines, it is also tool-creation and implementation. Secondly, tools evolve as they are implemented. Thirdly, tools become powerful when they become interconnected instrumentality and constellations. Tool-creation and implementation are examined when a new set of tools is being appropriated for collaboration between primary and secondary health care. Boundary crossings in the interaction of the multiple providers are focused as an essential context of use during implementation. Findings of the study concern the productivity of the resistance, the importance of turning points, the formation of the new instrumentality, discovery of the gaps, and the necessity of stabilization in organizational learning.

1. Introduction

One of the questions often posed in the literature of organizational learning is: what is learnt, or what is the content of organizational learning. However, it is generally agreed among the practitioners in the field that one of the outcomes in organizational learning is based on collectively assumed *routines* defined in Cyert and March (1963), Levitt and March (1999/1988), and Nelson and Winter (1982). According to Levitt and March (1999/1988: 76):

"The generic term of routine includes the forms, rules, procedures, conventions, strategies, around which organizations are constructed. It also includes the structure of beliefs, frameworks, paradigms, codes, cultures, and knowledge that buttress, elaborate, and contradict the formal routines."

Routines are usually transmitted through socialization and education. They act as carriers of organizational memory, and they change as a result of interpretations of history in relation to organizational targets. However, in the present study, the creation, re-creation and stabilization of routines are examined as 'going beyond' the prevailing routines. This is intended in the implementation of a set of new tools in interorganizational context of health care. In the previous studies of implementation, it is suggested that "implementation is not only about perceiving the immediate and individual object of the implementation. Instead, people need to understand and re-invent (expand) the entire patterns of work that often emerges with the new tool" (Hasu, 2001: 60). Implementation of court reform can also be perceived as a learning process, "in which the new rules are interpreted, shaped and enriched when applied in practice" (Haavisto, 2002:302). These approaches of implementation are assumed here as a starting point when a new set of tools is being implemented for collaboration between primary and secondary care in health care. While the focus of implementation is the collaboration in the interorganizational context, the learning process inevidently consists of boundary crossings between the organizations under study.

The project, 'Developing a Negotiated Way of Working between Primary Care and Specialized Hospital Care in Helsinki'[i], provides a fertile ground for examining the formation of collective routines. In the project, new 'care calendar', 'care map' and 'care agreement' tools and a new practice called 'negotiated knotworking' were implemented for the case management of chronically ill patients with multiple diseases. The practice and tools were

tentatively formulated in an earlier project undertaken at children's health care (see Engeström, Engeström, Vähäaho, 1999; see also Engeström, Engeström, Kerosuo, 2003). The need for developing the new practice for local health-care provision derives from the challenge to increase collaboration between different levels of the health care organization, as well as between the general practice and various specialties. The care of the patients suffering from multiple illnesses is presently dispersed over different parts of the health care system, and the current system for provision appears fragmented, causing overlaps, gaps, and disturbances in the overall care processes of these patients.

At first the theory of expansive learning will be presented as a framework for the study, and the theoretical challenges of the present study will be set. Then the research setting, data, and the method will be described leading to the subsequent findings concerning the implementation process. Finally, the conclusions of the learning in the creation of work practice will be proposed.

2. Theory of Expansive Learning as Framework

The theory of expansive learning is rooted in cultural-historical activity theory and developmental work research (Engeström, Miettinen, Punamäki, 1999; Chaiklin, Hedegard, Jensen,1999). These approaches represent a participatory approach for developing and changing work practices in historically specific local contexts. Activity is collective, oriented towards an object, and mediated by tools and signs. The idea of mediation as an elementary part of object-oriented human action was introduced in the classical writings of Vygotsky (1978). Vygotsky stated that the elements of human action are subject, object and the mediating artifacts. Leont'ev's (1978) extention to conceptualization of collective human activity was that it is directed by articulations of rules and division of labor in a community. Previous studies of implementation suggest that these elements are important in implementation. In Engeström's (1987) theory of expansive learning, activity is represented as an activity system. Presently, activity systems are often approached in a network of activity systems that are linked with each other (see Engeström, 2001).

The theory of expansive learning (Engeström, 1987) captures the recreation of work practice as learning. Learning emerges through transformations in the activity system while the internal contradictions of an activity system act as a motive force of the activity. The transformation of activity proceeds from the need state through double bind situations to creation of new instruments, and their implementation toward a new, expanded object as a multidimensional process. The process of transformation emerges through individual, but still collective actions at *the zone of proximal development* of the activity. It is being defined as "the distance between the present everyday actions of the individuals and the historically new form of societal activity that can be collectively generated as a solution to the double bind potentially embedded in the everyday actions". (Engeström 1987: 174).

According to Engeström (2001), the horizontal and interorganizational relationships, presently under study in activity theory, call for a reconsptualization of expansive learning. Engeström maintains that besides the learning of routine-type skills of the prevailing practices directed by the vertical direction, there is a need for a new type of learning appearing horizontally in networks of activity systems. The new type of learning is required

in situations when it is not always known what has to be learnt. In the intervention under study, the horizontal learning shall be focused on the middle-ground existing between activity systems of health care. The focus emphasizes the importance of boundary crossings between providers from different organizations. Learning and development in the implementation appear intertwined in the interaction of the health care providers. There are simultaneously two objects of learning, one of them being the new tools, while the other one is medical patient care in a multi-organizational care provision.

Learning in tool implementation seems elementary. When the mediating artifacts, signs and tools, are used jointly in producing an object and motive at work, they are called *instrumentality*. Hasu (2001: 60) asserts in her study of the implementation of a technical device in medicine that transformations of the artifact needs to be analyzed as an expansive integration process instead of introductory type of adaptation. Engeström, Engeström, Vähäaho (1999: 361) consider a new instrumentality such as a care agreement as a powerful new tool for expanding the object. They stated: "This instrumentality, when shared by practitioners across institutional boundaries, is supposed to expand the object of their work by opening up the dimension of horizontal, socio-spatial interactions in the patient's evolving network of care, making the parties conceptually aware of and practically responsible for the coordination of multiple parallel medical needs and services in many patients' lives."

We shall examine here the following theoretical challenges concerning organizational learning in creation of new work practice from the perspective of the theory of expansive learning:

* Organizational learning is not only the formation of collective routines, it is also tool-creation and implementation.
* Tools evolve as they are implemented.
* Tools become powerful when they become interconnected instrumentality and constellations.

3. Research Setting, Data and Method

Here we examine the formation of collective routines in tool creation and implementation in care provision of ten patients for whom data were gathered during 2001-2002. The care given to twenty patients was followed up in the project during 2000-2002. The 'change laboratory' method was applied in the implementation project (Engeström, Virkkunen, Helle et al., 1996). 'Change laboratory' is an interventionist methodology for work-based learning and development of the activity (Engeström, 2000). The researchers gather data in the real-life situations occurring at work. The data are then analyzed, discussed, and worked on jointly during laboratory meetings with the practitioners. The participants are able to use learning tools of the laboratory setting as resources that can be used to solve work-related problems.

In the presently analyzed data, ten medical doctors and nurses in the pilot group applied the new care calendar, care map and care agreement tools in the care of one of their patients. The tools are potentially conceptualized as integrated instrumentality. As instruments they are like templates that can be modified according to different contexts of use. In the following analysis, we shall use tools and instruments as synonyms. *The care calendar* tool captures the

history of the patient's diseases, using a list of symptoms. It includes the patient's description of her symptoms and illnesses, as well as the diagnosed illnesses and their treatment reported on the health records. *The care map* tool depicts the prevalent care relationships, information exchange between the providers, as well as the division of care responsibility. The locations of care are marked in empty boxes, one box representing one location of care. The care map is particularly useful for the analysis of problems in the care provision. *The care agreement* is meant to be appropriated as a joint tool in negotiations between a patient and her providers. The care agreement includes the knowledge about the patient's main illnesses or symptoms, as well as the patient's concerns of those illnesses, or other important matters in her life context. The information exchange, and the division of the care responsibility are documented, as well as the names and the contact information of the providers. After the negotiation, and agreement on the central matters, the patient and the providers sign the agreement.

Table one, the accumulation of tool-use is depicted in nine pilot group meetings. Patients, health care providers, as well as the medical doctors and nurses, attended these meetings. In the first, the process of implementation was described and the directions for making a patient case were given to members of the pilot group. In the following six meetings the members presented the cases they had prepared while experimenting with the new tools. Usually, two cases were discussed in one meeting, but there were two cases (5 and 8) that were handled as the only cases. During the last two meetings, the applications of the tools were discussed. The suggestion for their use was put forward by the management of primary as well as secondary care, and is has now taken place in the autumn 2002.

Table 1. Accumulation of Tool-Use in Pilot Group Meetings

Patient Case, Main Ailment	**Care Calendar**	**Care Map**	**Care Agreement**	**"Own Tools"**
Case 1 Rheumatoid Arthritis	X	X	-	Patient's care map: - Problems in the flow of information
Case 2 Heart Ailment	X	-	-	-
Case 3 Heart Ailment	X	X	-	Care calendar a list of epicrisis
Case 4 Diabetes	X	-	-	-
Case 5 Diabetes	X	X	(X)[ii]	Combined care calendar and care map. Care agreement proposal on a hospital referral.
Case 6 Nephropathy	X	X	X	-
Case 7 Diabetes	X	X	X	Depiction of a model client at the health center as an amoeba.
Case 8 Heart and Pulmonary Ailment	X	X	X	Care map as a flowchart.
Case 9 Nephropathy	X	X	X	-
Case 10 Pulmonary Ailment	X	X	-	-

The method used for the analyses of learning in tool implementation is based on qualitative methods outlined in developmental work research and has been widely reported (see for instance Engeström, 2000). The data under analysis consist of video-taped interactions given to ten patients (Table 1). In general, the data for each patient include an interview with the patient and a conversation at the pilot group meeting. All the data were transcribed by a research assistant and include total of 524 pages.

Observations of learning during creation of new work practices are made in the interaction representing a boundary crossing, or an attempt of boundary crossing in the data. Boundary crossing represents the interaction appearing on the middle-ground between the activity systems of health care. Katz and Shotter (1996: 929) describe boundary crossing as 'situated actions'. They define boundary crossing actions as means to navigate through different languages, registers and cultural issues, as well as local worlds of meaning. For us a boundary crossing is a two-way interaction. If only one party crosses the boundary without the participation of the other party, the boundary crossing is one-way and not expansive.

The historically evolved boundaries of health care in boundary crossings seem unresolved. Boundaries in everyday actions occur when a person encounters a problem or dilemma as an expression of those boundaries (Kerosuo, 2001). Two types of boundary occur in inter-organizational healthcare interaction: the institutional boundary between primary and secondary care, and the boundary created by the 'sovereignty' of the medical profession (Kerosuo, 2003). The institutional boundary refers to collaborative relationships between hierarchical levels of health care, while the second boundary describes the practice based on the solitude inherent in the medical profession. In addition to these two mentioned boundaries, we also focus on interaction at the boundary created by the medical profession when professionals interact with patients.

Here we shall report the findings of the learning process analysis. At first, we deal with the *resistance* toward the new tools in the pilot member's explorations. Secondly, we take up the importance of the *turning points*. Later we focus on the formation of *instrumentality*, and then explore the importance of discovering the *gaps* in care provision. The necessity for *stabilization* is then discussed. In the final section we present our conclusions of learning in creation of new work practice. In our report, we present only those cases where the above mentioned qualities appear most distinctively.

4. Productivity of Resistance

A close examination of Table 1 shows that not all the new tools were adopted in examining patient cases 1 - 4. The care calendar and care map were appropriated, but the care agreement was not used until case 5; in other words, the members of the pilot group resisted the use of the care agreement. In the following, we approach the implementation process from the issue of resistance in learning with the aim of enriching the conceptualization of resistance by pointing to its productive properties.

In addition to open objections, Kindred (1999) stated that resistance may also be silent in workplace behavior. In the project under study, rejection of the care agreement during

discussions of *cases 1, and 2* may be interpreted as an expression of silent resistance. Adoption of the care agreement was not openly objected to but neither were the agreements completed. The elaborated 'given' tools and the pilot doctor's 'own tool' for mapping problems in the flow of information served as the basis of discussion at the meeting and assisted the participants in piecing together the disruptions occurring in the care processes. The leader of the research group suggested a 'draft agreement' for improving the communication between the care providers. The agreement would include the contact information of the care providers, and the suggested improvements in the patient's care provision. In *the first patient case,* the professionals neither disagreed nor accepted the proposal. *In the second patient case,* the proposal did not strike a chord among the professionals, but it was also not rejected. In fact, the pilot doctor made it clear that it is not difficult to contact the other providers, but as in the first patient case the care agreement was not fulfilled.

More open ways of objecting, as well as a dilemma in the use of tools emerged during negotiation with *the third patient case*. Pilot doctor 3, a personal physician, depicted the complex network of a heart patient's care providers with the aid of the care calendar and care map. The researchers presented a video clip taken of a care negotiation with the patient, personal doctor, and consulting internist prior to the pilot group meeting. The clip showed how the professionals resisted against appropriating the care agreement during configuration of the patient's care that the researcher was proposing. In the pilot group meeting, the video-clip acted as a basis for the reflection leading to open resistance against appropriation of the care agreement. In excerpt 1, we provide one clip as an example from the video presented at the pilot group meeting. The personal doctor is the pilot doctor presenting the case, while the internist is a specialist from the health center hospital at which the doctor consulted.

Excerpt 1
Researcher: *Do you really have a feeling that one does not need a kind of written anything here? That this goes well enough [without the documented agreement]*.
Internist: *Yes, in a way now, it is that at the moment the medication as a whole, the treatment of the coronary disease is undertaken at the health care center, Marevan medication is at the health care center, it is at the moment. So, if we want to document it, yes, but there is nothing to negotiate about. The patient herself agrees that it is like this and we all agree. But right now the examinations of her stomach troubles are under way over here, and that - but that is something we cannot make an agreement, because it is not finished.* (Pilot group meeting, May 10,2001, part I).

However, the patient did not totally agree with what was presented in the video clip, because there were symptoms that were not treated. For instance, she was still concerned about the pain in her leg that constantly troubled her. It was not treated anywhere, and she wanted to find out about it.

The members of the pilot group perceived the care calendar and care map as useful for the overall depiction of the care provided in several locations, while on the other hand, they maintained that they lacked the culture, as well as time to listen the patient's ailments and worries. Some members were also considering the care agreements as a possibility of improving the care, but others, among them the pilot doctor, did not see them as necessary because the patient's care provision followed the officially accepted division of care responsibility between providers, and there were also unfinished examinations that were difficult to agree upon. However, one member continued to elaborate on the idea of care

agreement. She asked the researchers whether they sought a care agreement that could be written in a document, while the internist admitted that they ended up in the oral agreement with the personal doctor and the patient. Anyhow, in excerpt 2, the pilot doctor still returns to the refusal of the care agreement.

Excerpt 2
Personal doctor: I feel that perhaps our approach was a little different. So, because of that it appeared that when the researcher asked that should we make that document, do we need the paper for this. And we felt that I don't know whether we need a document over here. (Pilot group meeting, May 10, 2001, part I. pp. 21-22).

In addition the pilot doctor hesitated using the care agreement based on his earlier experience with care agreements as applied in the care of the pediatric patients in previous projects. He thought that the agreements are 'dead documents' that are signed, sent ahead, put into archives, and have no value for practical use. At this point, another member of the pilot group took up the missing treatment of the patient's leg as well as a follow-up visit not completed with lung specialists that the patient had continued to mention during the pilot group meeting. She proposed a care agreement that included information on the treatments, as well as the visits, where they were provided, and when. Despite this lengthy, multi-voiced discussion, the care agreement was not done.

Resistance is often interpreted as preventing change in development and learning. However, Kindred (1999) asserts that resistance in learning is not only an opposing force, but also an exploratory path that generates learning. The 'foreign' or 'unknown' must become mine to be appropriated, and this means 'biting the new'. In our findings, the tool that resembled the old tools, namely the care calendar, was adopted more easily than the 'foreign tool', the care agreement. The care map is an interesting tool falling between 'the old' and 'the foreign' but with the properties of easy adoption into use. Anyhow, the easy adoption did not mean the 'real use', but deviating use, i.e. doing as little as possible. In the subsequent section, the implementation of the care agreement is followed further when we focus on the importance of turning points.

5. Importance of Turning Points

The essential turning point in the implementation of the new tools and work practice emerged when the members of the pilot group adapted the care agreement. As shown in Table 1, the care agreement became widely used from patient case six onward. However, before case six, in *case five*, a spontaneously conducted care agreement was made when a personal doctor, a member of the pilot group, sent a proposal for care agreement to the hospital, inquiring about the patient's diabetes follow-ups. She did not use the template of the care agreement suggested by the researchers, but instead a copy from the patient's health record. We will now focus more closely on the occasion.

The patient suffered from polyneuropathy and infections on his feet as a consequence of diabetes. These ailments brought about frequent visits at the specialist hospital, where he was referred from one specialty division to another. During the occasion described here, the flow of information between the hospital and personal doctor became disrupted. The doctor began

to wonder whether the specialist hospital was running the tests needed in the diabetes follow-ups, because she had not seen the patient for some time. To determine the results of the tests, she sent a copy of the patient's health record with a question inquiring about the division of care responsibility in following up the diabetes. The hospital endocrinologist gave a formal reply confirming the prevailing rules about the division of care responsibility between primary and secondary care. However, the personal doctor was not after the formal rule, because she knew them well; she was an experienced physician. She wanted a specific reply and negotiation about conducting the follow-ups.

At the pilot group meeting, the problem of diabetes follow-ups was taken up at the video-clips that the researchers showed from the interview with the personal doctor and patient. After seeing the video-clips, the patient himself, the endocrinologist, as well as the personal doctor and the visiting nurse were active in the discussion. At first, the endocrinologist offered the rules regarding the levels of care between primary and secondary care, as well as the clinical practice guidelines for a solution instead of negotiation on the division of care responsibility. However, the personal doctor, visiting nurse, and patient insisted that there had been problems in information exchange that could not be solved in formally. Finally, the endocrinologist admitted the necessity for negotiation and even suggested that it might be worthwhile to sign an agreement the patient could bring along when entering the different care locations, as illustrated in his own words in excerpt 3.

Excerpt 3
Endocrinologist: *This [the information exchange] is, as I said, a never-ending question. And it has been recognized, and also admitted the same thing that we should inform, the information should flow, but it becomes continuously disrupted on and on. So, I think that until we all have computers, a kind of, what could it be, an agreement, a paper that the patient could carry with him, where…*
Researcher[speaking over]: *One page.*
Endocrinologist: *one has documented what is being treated, and where, I consider it to be quite a good thing*. (Pilot group meeting, June, 20, 2001, part II, p.4).

After the comment by the endocrinologist, the atmosphere at the meeting changed. Members of the pilot group started to innovate new, practical ideas about entering the agreement.

Gersick (1988, 1989) has showed in her field and laboratory studies that group development is dependent on time and pacing in progress through creative projects. Group progress follows an alteration of inertial movement and radical change, a 'punctuated equilibrium', instead of succession of stages. Gersick (1989: 277) describes a transition as "the moment when group members made fundamental changes in their conceptualization of their own work. They pulled in new ideas and reframed their accrued experience in ways that enabled them to jump forward". She recognizes the temporal milestones as important as the midpoint transitions that emerge in group progress as the deadlines of the group tasks are approached. Temporal midpoints may be consequential for group effectiveness, and improving through learning.

While Gersick's definition of temporal midpoints sheds light on the group progress, Kärkkäinen (1999: 109) emphasizes the formulation of a joint object in the group process as a crucial element of the turning points. In her study of the teacher teams, she defines a turning point as follows: “By turning point I mean an event in team discourse during which the team

began to outline their object in a new way" (Kärkkäinen, 1999: 109). An indication of a turning point are the disturbance clusters, questioning, and interaction of different voices in team behavior. Virkkunen (1995: 283) for his part focused on turning points in the study of labor inspectors' work. He defines a turning point in terms of changes in inspectors' relationships towards plans they use in their inspections. Turning points indicate a new viewpoint in the discussion during inspection, or changes in practice of an activity. In his study, Virkkunen recognized 'narrowing' and 'widening' turning points in relation to the plan the labor inspectors used.

In the data of the implementation project described above, the comment by the endocrinologist can be described as a turning point outlined by Kärkkäinen. In excerpt 3, the group appears to reach a shared understanding of the necessity for the care agreement. After the comment in excerpt 3, group behavior changed when the group began to work together and elaborated a joint tool for their future cooperation. Excerpt 3 is also a good example of a 'widening turn', since the discussion changes dramatically after the turning point.

The appropriation for tool use in case five appeared in the fourth pilot group meeting, almost at the midpoint of the group process. Presumably, it is necessary to recognize the turning points in group progress in order to better manage the learning and development at work. It is also worth noting that excerpt 3 clarifies the relationship between learning and boundary crossing. The excerpt depicts the reciprocity of the boundary crossing. Without reciprocity between the representatives on each side of the boundary, learning and boundary crossing would remain unfulfilled.

6. Formation of Instrumentality

Instrumentality, as defined in section two, consists of jointly used instruments in a community. Also talk and cognition in action are part of a 'contextual instrumentality' that emerges in collective cognitive repertoires that "are historically changing and internally conflicting culture-specific rationalities" (R. Engeström, 1999: 37). When individual actors appropriate these collective instruments or tools, they enrich them. New instrumentality opens new objects, and collective motives for activity expanding the boundaries of present conditions of life (Engeström, Engeström,Vähäaho,1999:361). The formation of instrumentality as an embodiment of activity is a primary means of learning and transmitting human achievements (Miettinen, Virkkunen, 2003). Engeström (2001: 150) suggests that the projected care agreement adopted at children's health care is supposed to become a germ cell for a new kind of collaborative care, 'knotworking'.

The elaboration of new tools that is focused in the present study is an example of such instrumentality. The adoption of the care agreement also became a transition during the implementation. In this section, we follow the process of implementation further by examining how the formation of instrumentality proceeded after the transition in the process. *The sixth patient case* offers an opportunity to study the formation of instrumentality. It was the only case in which all the instruments were appropriated, all the relevant care providers contacted for negotiation, and the patient herself was very insightful in articulating her experiences as a patient. The case also shows how difficult the formation of instrumentality actually is.

Starting from the pilot group meeting, *the sixth patient* convinced the members of the pilot group of the need for recording the main worry of the patient in the care agreement. Patient's worries may seem unimportant from the standpoint of practicing medicine, but the patient may also describe important things related to her illnesses. For instance the sixth patient suffered from renal insufficiency caused by diabetes. She was a single parent, a widow, and her main concern was to preserve the function of her kidneys to enable her to bring up her daughter. Her fear was that the wrong medication could damage her kidneys. At the meeting, she concluded that information exchange between care providers is not reliable; it is dependent on what medication the patient takes, and it worried her because there are situations when the patient may not be able to inform the providers about her kidney insufficiency. For instance she may have high temperature, or as in the case of diabetes, she may loose consciousness. In fact, she had experienced such a situation in acute care, when she received medication not fit for renal patients.

The patient's concern was dealt with among other things in her care provision at the meeting. The pilot doctor, an internist from the health center hospital, had met the patient prior to the group meeting, and had prepared the care calendar, care map, and a sketch of the care agreement based on the meeting with the patient. Presently, the consultation clinic at the health center hospital is in charge of the diabetes follow-ups, as well as following up renal conditions. The patient was earlier treated at the specialist hospital, and the present treatment was scheduled at specialized care. The providers accepted the sketch for the care agreement including addition of the patient's concern and contact information of the relevant care providers. The meeting was concluded with the acknowledgement that the patient's personal doctor and personal nurse from the health center were missing from the negotiation. After the meeting, one of the researchers contacted the senior physician at the health center where the personal doctor was located. The senior physician was a member of the pilot group and decided to arrange a care negotiation with the patient, personal doctor, personal nurse, as well as the internist, and a specialist nurse from the health center hospital.

The care negotiation is an example of the challenges encountered in formation of instrumentality. When the new instrumentality is in the making, as in the care negotiation under study, the situation of appropriation appears to emerge at first as an empty space before the professionals start to 'fulfill' it, or script it. According to Nelson, (1985: 40) "the script is basically an ordered sequence of actions appropriate to a particular spatial-temporal context, organized around a goal. The script is made of slots and requirements of what can fill these slots".

In the care negotiation, the internist mainly took over the responsibility for scripting. She directed the discussion in such a way that after defining the present care responsibilities, they went on to information exchange and to some practical matters. However, pauses appear during the conversation, giving the impression that taking up a new topic was not self-evident. In particular, one pause lasting for 17 seconds stands out. It occurred, after the participants had ended a lengthy discussion concerning the present care arrangements and a symptom observed by the internist. During the pause the researcher intervened, and as we can see below in excerpt 4, inconsiderately changed scripting of the negotiation. She had made a conscious effort to remain silent behind the video camera during the conversation to see how the professionals carried out the care negotiation. During the pause the researcher stepped behind the video camera, bent over the care agreement on the table, and asked about

including information on the patient's concerns. The change of the script is presented in excerpt 4.

Excerpt 4
Internist: [Speaking over] *It was that that buzzing in the head - ¤ [short pause, reading a medical record] - Yes. This is enough for the time being. Ahah, yes, so it is, that is how it was that it was there at the other health center hospital, where they examined the head. But they don't speak anything about the blood veins on the neck, but it was that buzzing in the head what was the symptom.*
Patient: *Yes.*
Internist: *I was just looking that did they accomplish the examination of the blood veins on the neck. But it has not been done, and it could well be done. So, that, let's arrange for it, but we let you know about it [looks at the personal doctor while speaking]*.
[Pause ¤ 17 seconds]
Researcher: *How about when we sketched this care agreement, your worry may have remained unrecorded then. It could be entered now.*
Internist [speaking over]: *Yes, do you remember, your worry, it is this thing at the acute care.*
Patient: *Yes.* (Care negotiation, December 19, 2001, pp. 8-9).

From that on the participants began to script the situation in a new way as directed by the contents of the care agreement. The change of the script is an example of the integrated adaptation of the new instrumentality. At the end of the meeting, the contact information on the providers was added to the agreement, and then everyone signed the document, including the patient. After signing the agreement, all the participants received a copy of their own.

In *the seventh patient case,* the use of the care calendar was appropriated with new insight indicating an enrichment of the instrument. It was not used only as a means of describing the patient's care provision to others as in the previous cases, but as a tool for managing the patient's care in the care practice. The patient was a lady who had lived most of her adult life abroad in developing countries. When she returned to her home country, she simultaneously had several symptoms, and diseases needing treatment. At the pilot group meeting, the personal doctor recalled how the new tools met her needs when she started to outline the overall picture of the patient's ailments (excerpt 5).

Excerpt 5
Personal doctor: *(...) I then performed on request, and discovered that it is really good, really good, and helpful with the overall figuration [of patient's illnesses], this care calendar (...) this kind of overall figuration makes it much easier when you are able to see the whole history, and in a way you take it intellectually without going into a diagnosis following the first sight.* (Pilot group meeting, October 9, 2001, part I, pp. 5-6)

In addition to the care calendar and care map, the doctor also sketched a model client at the community health center as an amoeba. The depiction is a good example of the enrichment of instrumentality. The several legs of the amoeba mark the various illnesses of the patient in the model. Moreover, the doctor also sketched a care agreement in which she had all the patient's diagnoses, worries, need for information exchange, as well as the present division of care responsibility documented.

In *the ninth case,* the pilot doctor, a nephrologist, experimented with the care agreement during a patient reception at the outpatient clinic. The patient visited the clinic for follow-up of a renal transplant. The nephrologist took up the care agreement after going through the laboratory test results and medication. The contents of the care agreement document directed the conversation during the completion of the document. Members of the pilot group stressed the importance of contacting the patient's personal doctor. When the agreement is being fulfilled during a visit, it is important to discuss the information recorded at the agreement with the patient's other providers and include their share of the care provision in the agreement later.

The formation of instrumentality, as analyzed in the section, appears difficult because the instrumentality is deeply embedded in concepts and language use. Although all the new instruments were appropriated in the cases presented, there was only one case, (patient case 6) that depicted the overall integration. In this particular case, especially, a new way of scripting the care negotiation gave insight into the formation of the instrumentality. However, the enrichment of the instrumentality was more easily witnessed in professionals own tools and their use. For instance, the way in which the pilot doctor in the seventh case depicted the overall care of a patient as an amoeba and the way she used the care calendar in the care of her patient sheds light on the phenomenon of the enrichment of instrumentality.

The activity theoretical conceptualization of instrumentality is similar to 'equipmental complex' defined by Lynch (1995), and the 'tool constellation' described by Keller & Keller (1996). In his analysis of the scientific work, Lynch (1995: 230) asserts that an 'equipmental complex' embodies systems of common usage, built environments, and the activities consonant with those environments. Whereas a 'tool constellation' according to Keller & Keller (1996:90) is a configuration of ideas, implements, and materials in the production of an artifact. When describing the work of a blacksmith they maintain that mental and material elements "are mutually constitutive of the constellation as a whole and are held together by a logic constructed from the goal orientation and principles of the smith. Production of a particular item entails the selection of tools and material on the basis of this plan in anticipation of enacting envisioned procedural steps."

7. Discovery of Gaps

Gaps are types of ruptures emerging in inter-subjective interaction (Engeström, 1992: 68). *The tenth patient case* shows how the gaps in the interaction effect the appropriation of the new tools. The patient is an aged lady with a long history of illnesses, and the pilot doctor, a lung specialist, had plans to transfer her asthma follow-ups to the health center from secondary care. However, discussion with the patient at reception made her uncertain of the proceeding with the transfer. The relationship between the patient and her personal doctor was apparently not functioning, and the network of care providers appeared to be acting without knowledge of what the other parties were doing. For intance, the patient describes her situation in excerpt 6.

Excerpt 8
Patient: *If I go to specialized care, there is always a different doctor, prescribes different medicine. Then I return here, so this doctor gives, she says that there is a pause now, you*

cannot take that medicine, she does not prescribe that medicine. My life is full of such contradictions that I do not know whom to believe, what to believe and what is the matter with me. (Patient interview, December 10, 2001)

The pilot doctor called the personal doctor to negotiate about the patient's care, but the personal doctor did not receive her due to her busy schedule, neither was she able to participate in the pilot group meeting at such short notice. During the discussion in the pilot group, it became evident that there were many problems involved in care provision. The group innovated solutions to the problems but they could not be taken into use because a relevant party, the personal doctor, was missing.

Gaps are often observed in the patients care provision as a consequence of the lack of cooperation between providers, and they express the learning challenges of the health care system. For instance, in the care of the third pilot patient, the gap involved a missing treatment of her hurting leg. In case 5, there was a gap in the flow of information that caused a rupture in diabetes follow-ups. In the analysis of the new instrumentality gaps are less obvious and even more structurally, and functionally embedded. The adoption of the new instruments becomes difficult if there are gaps in the network of providers, the tenth patient case is good example of this. The lesson to be learned for the appropriation of new instrumentality cannot be used as such. The need to expand the appropriation of new instrumentality creates the necessity for stabilization.

8. Necessity for Stabilization

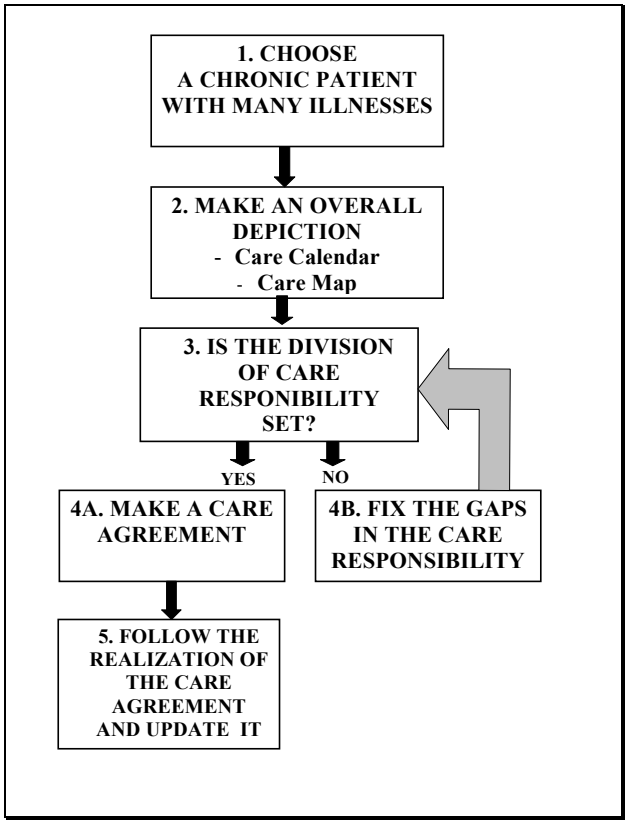
The stabilization of new instrumentality is created through the integration of learning, or more specifically through integration of those aspects of learning that become adopted, enriched, and integrated into the new instrumentality during explorative use of the new instruments in the project. For this special purpose, the researchers arranged 2 additional pilot group meetings. At the meetings the experiences gained from the explorations were shared through delivery of the material the pilot doctors had produced during the implementation. The researchers also showed video clips of the tool-use during the first meeting. The instrumentality became further enriched in the discussions when the pilot group members commented on the experimentation and worked out directions for use of the new instruments. A seminar for the management of primary, as well as secondary care was arranged, and another 2 seminars were prepared for the professionals of the organizations. The directions for tool-use and the seminars were intended as attempts at stabilization of the new instrumentality.

In 'the theory of cognitive trails' (Cussins,1992), the learning of new practice is gained through practicing, and through these processes of doing the cognitive trails emerge in the environment. For instance, organizational routines are appropriated by performing the routines. Stabilization of trails is according to Cussins (1992: 677) "a process which takes some phenomenon that is in flux, and draws a line (or builds a box) around the phenomenon, so that the phenomenon can enter cognition (and the world) in a single act of reference rather than as a dynamic and extended trajectory through the flux of feature space". However, the stabilization is not only conceptual, it is also cultural and material. Tomasello (1999: 39-40) depicts the accumulation of cultural evolution as a 'ratchet effect'. He says: "The metaphor of

ratchet is meant to capture the fact that imitative learning (with or without active instruction) enables the kind of faithful transmission that is necessary to hold the novel variant in place in the group so as to provide a platform for further innovations".

The algorithm depicted in Figure 1, expressing the idea of new work practice, was a conceptual modeling of stabilization that can be used in institutionalizing the new instrumentality. As a model, the algorithm depicts the process of 'negotiated knotworking', a new work practice that is intended to aid the professionals in improving the care of chronically ill patients.

Figure 1. The model of 'negotiated knotworking' (Engeström, Engeström & Kerosuo, 2002).



9. Conclusions

The challenge of the study was to examine organizational learning as tool-creation and implementation in the multiorganizational field of health care provision. Implementation was approached as an activity where not only the implemented instruments but also the processes and the contexts of their use are under study (Hasu, 2001). The implementation was captured as a learning process (Haavisto, 2002) that can lead to recreation of work practices through expansive learning (Engeström, 1987). The observations of learning in the data were made in the interaction representing a boundary crossing. Boundary crossings between the providers from different organizations were the precondition for the study of learning and development. They were a precondition because, as expressed in activity theoretical terms, development of

an activity should be undertaken in the conditions of appropriation. Findings of the organizational learning in the implementation of instruments concern the productivity of the resistance, the importance of turning points, the formation of the new instrumentality, discovery of the gaps, and the necessity of stabilization. In the following, we summarize the main findings.

Resistance during the process of the implementation related to the adoption of new instruments. As presented in section 4, the use of the new instruments was resisted either in a passive, or active way. The adoption of the new instruments was passively resisted when the instruments were not used or when they were adopted in deviating manner that was not real use. The active resistance in the interaction between the professionals, patients and reserchers appeared to be more productive leading to consideration of experimenting the tools. Resistance in learning is not only an opposing force, but a process of exploring 'the un-known'.

The analysis of the turning points is important, because turning points 'mark' the points of instrument appropriation for discovering the joint object of the agents. The turning point in the process of implementation appeared when the members of the pilot group reached a shared understanding of the necessity of the care agreement for patient care. After the turning point, the group behavior changed and the pilot group started to elaborate a joint tool for their future cooperation.

The formation of instrumentality is difficult. Although, all the new instruments were appropriated in the presented cases, there was only one case (case 6) where all the instruments were being used. In the particular case, a new way of scripting the care negotiation gave insight about the formation of new instrumentality. Therefore scripts and scripting are an important part of the appropriation of new tools. The enrichment of the instrumentality became witnessed in variety of the professionals own tools. For instance, the amoeba as a depiction of the care provision in case 7.

The observation of the gaps gives information about the interorganizational learning challenges. If there are gaps in the network of providers, the implementation of new tools becomes even more difficult. The new instruments cannot be used as such.

The need to expand the appropriation of new instrumentality creates a need for stabilization. Learning a new practice is not completed in the formation of new instrumentality, also stabilization of the created practice is needed. In the final section, we presented the model of the elaborated new work practice, 'negotiated knotworking'. The model is an important tool in the stabilization of the new practice in the interorganizational context because it represents the sequence of actions needed in the conduct of the new practice. Now we return to the research challenges suggested in section 2 and discuss them from the perspective of expansive learning.

As a first theoretical research challenge, it was suggested that organizational learning is not only a formation of collective routines; it is also tool-creation and implementation. On the basis of the findings, it possible to accept the challenge with the supplements that specify the contents of learning routines. The supplemented assertion is now: Organizational learning is not only a formation of collective routines; it is also tool-creation and implementation that

expand the prevailing routines. Tool-creation and implementation include disolving, creation, re-creation and stabilization of routines.

Secondly, it was proposed that tools evolve as they are implemented. The findings make it possible to specify the process of evolvement, and its effect on tools. It is assereted now: Tools evolve during the process of implementation that includes productive resistance, important turning points, formation of instrumentality, discovering the gaps and stabilization. The tools become enriched when they are used during implementation.

Thirdly, it was supposed that tools become powerful when they become interconnected instrumentality and constellations. The power of the tools applies to the care of the patients with many illnesses. In other words, with the new tools as interconnected instrumentality and constellations is is possible to treat the patients in a more reliable way in the network of multiple providers. As interconnected instrumentality and constellations, the powerful tools make 'the center to hold'.

Acknowledgement

The first author has received a grant, a fund number 101436 , from the Finnish Work Environment Fund for the study.

Bibliography

Chaiklin S, Hedegaard M, Jensen U. J. (eds). (1999) *Activity Theory and Social Practices*. Aarhus: Aarhus University Press.

Cussins, A. (1992) Content, Embodiment and Objectivity: The Theory of Cognitive Trails. *Mind*. Vol. 101. No. 404, pp. 654-688. Oxford University Press.

Cyert R. M, March J. G. (1963) *A Behavioral Theory of the Firm.* Englewood Cliffs, NJ: Prentice-Hall.

Engeström, R (1999) Imagine the World You Want to Live in: A Study on Developmental Change in Doctor-Patient Interaction. *Outlines, Critical Social Studies.* Vol. 1, pp.33-50.

Engeström, Y. (1987) *Learning by Expanding. An Activity - Theoretical Approach to Developmental Research.* Helsinki: Orienta konsultit.

Engeström, Y. (1992) Interactive Expertise. Studies in Distributed Working Intelligence. *Department of Education, University of Helsinki, Research Bulletin 83.* Helsinki: Yliopistopaino.

Engeström, Y. (2000) From Individual Action to Collective Activity and Back: Developmental Work Research as an Interventionist Methodology. In P. Luff, J. Hindmarsh, C. Heath. (eds.) *Workplace Studies.* Cambridge, UK: Cambridge University Press.

Engeström, Y. (2001) Expansive Learning at Work: Toward an Activity Theoretical Reconceptualization. *Journal of Education and Work,* 14(1), 133-156.

Engeström Y, Virkkunen J, Helle M, Pihlaja J, Poikela R. (1996) The Change Laboratory as a Tool For Transforming Work. *Life Long Learning in Europe* 2: 10-17.

Engeström Y, Miettinen R, Punamäki R-L (eds). (1999) *Perspectives on Activity Theory.* Cambridge, U.K: Cambridge University Press.

Engeström Y, Engeström R, Vähäaho T. (1999) When the Center Does not Hold: The Importance of Knotworking. In S. Chaiklin, M. Hedegaard & U. J. Jensen (Eds.), *Activity Theory and Social Practice: Cultural-Historical Approaches.* Pp. 345-374 Aarhus: Aarhus University Press.

Engeström Y, Engeström R, Kerosuo H. (2002) Neuvotteleva työtapa monisairaiden potilaiden hoidossa. Loppuraportti. Julkaisematon käsikirjoitus. [Negotiated way of working in the care of patients with many illnesses. Final report. Unpublished Report. In Finnish.]

Engeström, Y, Engeström R, Kerosuo H. (2003) The Discursive Construction of Collaborative Care. *Applied Linguistics* 24/3, *Special Issue* (in print).

Gersick, C. J. G. (1988) Time and Transition in Work Teams: Toward a New Model of Group Development. *Academy of Management Journal,* Vol. 31, No. 1, 9-41.

Gersick, C. J. G. (1989) Marking Time: Predictable Transitions in Task Groups. *Academy of Management Journal,* Vol. 32. No. 2, 274-309.

Haavisto, V. (2002) *Court Work in Transition. An Activity-Theoretical Study of Changing Work Practices in a Finnish District Court.* Helsinki: Helsinki University Press.

Katz, A, M. & Shotter, J. (1996). Hearing the Patient's 'Voice': Toward a Social Poetics in Diagnostic Interviews. *Social Science & Medicine.* Vol. 43. No. 6, pp. 919-931.

Keller C. M, Dixon Keller J. (1996) *Cognition and Tool Use. The Blacksmith at Work.* Cambridge: Cambridge University Press.

Kerosuo, H (2001) Boundary Encounters as a Place for Learning and Development at Work. *Outlines.* Vol. 3. No. 1, pp. 53-65.

Kerosuo, H. (2003) Boundaries in Health Care Discussions: An Activity Theoretical Approach to the Analysis of Boundaries. In N. Paulsen & T. Hernes (eds.) *Managing Boundaries in Organizations. Multiple Perspectives.* Basingstoke: Palgrave.

Kindred, J. B. (1999) "8/1897 Bite Me": Resistance in Learning and Work. *Mind, Culture, and Activity*, Vol. 6. No.3, pp.196-221.

Kärkkäinen, M. (1999) Teams as Breakers of Traditional Work Practices. A Longitudinal Study of Planning and Implementing Curriculum Units in Elementary School Teaching

Teams. *Department of Education, University of Helsinki, Research Bulletin 100*. Helsinki: Hakapaino Oy.

Leont'ev, A. N. (1978) *Activity, Consciousness and Personality*. Englewood Cliffs, New Jersey: Prentice-Hall, Inc.

Levitt B, March J. M. (1999) Organizational Learning. In J. G. March *The Pursuit of Organizational Intelligence.* Massachusetts USA, Oxford UK: Blackwell Business. Pp.75-99. Originally appeared in *Annual Review of Sociology,* Vol.14 (1988), pp. 319-40.

Lynch, M. (1995) Laboratory Space and the Technological Complex: An Investigation of Topical Contextures. In S. L. Star *Ecologies of Knowledge. Work and Politics in Science and Technology.* Pp. 226-256.Albany: State University of New York Press.

Miettinen R, Virkkunen J. (2003) Learning in Working Life and the Joined Construction of Mediational Artifacts. (Manuscript)

Nelson, K. (1985) *Making Sense: The Acquisition of Shared Meaning.* Orlando: Academic Press.

Nelson R. R, Winter S. G. (1982) *An Evolutionary Theory of Economic Change.* Cambridge, MA: Harvard University Press.

Tomasello, M. (1999) *The Cultural Origins of Human Cognition.* Cambridge MA, London England: Harvard University Press.

Virkkunen, J. (1995) *Työpaikkatarkastuksen ristiriidat ja niiden ylittämisen mahdollisuudet. Tutkimus keskusteluun perustuvan työn välineistä ja tuloksellisuudesta*. [Contradictions of Labor Protection and Opportunities to Overcome Them. Research on Tools and Results of Conversation-based Work.] Työpoliittinen tutkimus. Helsinki: Hakapaino. [In Finnish with a summary in English]

Vygotsky, L. S. (1978) *Mind in Society. The Development of Higher Psychological Processes.* Cambridge, Massachusetts, and London, England: Harvard University Press.

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[ii] The use of the care agreement is reported in the brackets, because the pilot doctor did not use the template of the care agreement suggested by the researchers, but a copy from the patient's health record