NEW FORMS OF EXPANSIVE LEARNING AT WORK: THE LANDSCAPE OF CO-CONFIGURATION

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PURPOSE OF THE RESEARCH

A viable theory of work-related learning needs to be founded on an analysis of the historical development of work. A new landscape of learning emerges as work is transformed from mass production and mass customization toward co-configuration of customer-intelligent products and services with long life cycles. The purpose of this three-year project is threefold. First of all, the project aims at *creating a conceptual and methodological framework* for analyzing the learning demands and potentials of co-configuration work. Secondly, the project will *produce a set of tools* for the practical mastery and realization of these new learning demands and potentials in three different work settings. The theoretical foundation of the research is the theory of expansive learning (Engeström, 1987, in press). As the theory was created primarily to illuminate transformative learning in single activity systems, the inter-organizational and radically distributed nature of learning in co-configuration work generates the third aim of the project: serious *further development of the theory of expansive learning*.

CO-CONFIGURATION AS A NEW TYPE OF WORK AND PRODUCTION

Steve Barley and Gideon Kunda (2001) argue that prevailing theories of organizing are based primarily on detailed observations of bureaucratic work, but that the nature of work today is sufficiently different to bring the applicability of these theories into question. Barley and Kunda's primary conclusion is that detailed studies of work should be reintegrated into organizational science in order to provide a solid empirical basis for post-bureaucratic theories of organizing. This argument is applicable in the study of organizational learning. Without a substantive understanding of the historically changing character of the work done in a given organization, theories of organizational learning are likely to remain too general and abstract to capture the emerging possibilities and new forms of learning.

Bart Victor and Andrew Boynton (1998) provide a useful historical framework for such a reintegration of organization, work, and learning. They identify five types of work in the history of industrial production: craft, mass production, process enhancement, mass customization, and co-configuration (Figure 1). Each type of work generates and requires a certain type of knowledge and learning. At present, the most demanding and promising developments are associated with the emergence of *co-configuration work*. A critical prerequisite of co-configuration is the creation of customer-intelligent products or services which adapt to the changing needs of the user.

"The work of co-configuration involves building and sustaining a fully integrated system that can sense, respond, and adapt to the individual experience of the customer. When a firm does co-configuration work, it creates a product that can learn and adapt, but it also builds an ongoing relationship between each customer-product pair and the company. Doing mass customization requires designing a product at least once for each customer. This design process requires the company to sense and respond to the individual customer's needs. But co-configuration work takes this relationship up one level – it brings the value of an intelligent and 'adapting' product. The company then continues to work with this customer-product pair to make the product more responsive to each user. In this way, the customization work becomes continuous.

(…) Unlike previous work, co-configuration work never results in a 'finished' product. Instead, a living, growing network develops between customer, product, and company." (Victor & Boynton, 1998, p. 195)

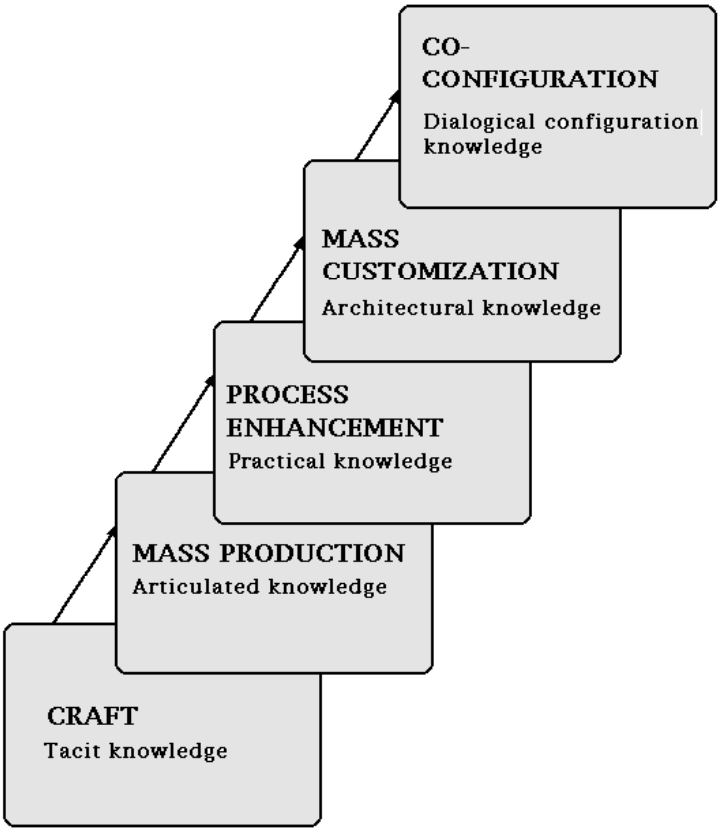

Figure 1. Historical forms of work (adapted from Victor & Boynton, 1998, p. 6 and p. 233)

We may provisionally define co-configuration as an emerging historically new type of work that has the following characteristics: (1) adaptive 'customer-intelligent' products or services, or more typically integrated product/service combinations, (2) continuous relationships of mutual exchange between customers, producers, and the product/service combinations, (3) ongoing configuration and customization of the product/service combination over lengthy periods of time, (4) active customer involvement and input into the configuration, (5) multiple collaborating producers that need to operate in networks within or between organizations, (6) mutual learning from interactions between the parties involved in the configuration actions.

In other words, co-configuration is more than just smart, adaptive products. "With the organization of work under co-configuration, the customer becomes, in a sense, a real partner with the producer." (Victor & Boynton, 1998, p. 199) Co-configuration typically also includes interdependency between multiple producers forming a strategic alliance, supplier network, or other such pattern of partnership which collaboratively puts together and maintains a complex package which integrates material products and services and has a long life cycle. Co-configuration requires flexible 'knotworking' in which no single actor has the sole, fixed authority – the center does not hold (Engeström, Engeström & Vähäaho, 1999).

Co-configuration is a very demanding mode of work and production. It offers radical strategic advantages when the objects of work demand it. Medical care is a case in point. An increasing percentage of patients have multiple chronic illnesses for which standardized, single-diagnosis care packages are inadequate. In Helsinki, 3.3% of the patients use 49.3% of all health care expenses, and 15.5% of patients use 78.2% of all resources. A significant portion of these patients are so expensive because they drift from one caregiver to another without anyone having an overview and overall responsibility for their care. Co-configuration work is a strategic priority because the different caregivers and the patients need to learn to produce together well coordinated and highly adaptable long-term care trajectories.

It is not unusual to see co-configuration attempts falter. An observer of one such attempt described her findings with the help of a game metaphor as follows.

"The actors are like blind players who come eagerly to the field in the middle of the game, attracted by shouting voices, not knowing who else are there and what the game is all about. There is no referee, so rules are made up in different parts of the field among those who happen to bump into one another. Some get tired and go home." (Kangasoja, 2002)

A precondition of successful co-configuration work is dialogue in which the parties rely on real-time feedback information on their activity. The interpretation, negotiation and synthesizing of such information between the parties requires new, dialogical and reflective knowledge tools as well as new, collaboratively constructed functional rules and infrastructures (Engeström & Ahonen, 2001).

THEORY OF EXPANSIVE LEARNING AS FRAMEWORK AND CHALLENGE

Processes of learning may be effectively differentiated along two key dimensions, one representing the given vs. newly emerging nature of the object and activity to be mastered, the other one representing the famous distinction between exploitation of existing knowledge vs. exploration for new knowledge put forward by James March (1996). Treated as dichotomies, these two dimensions yield a matrix of four basic types of learning at work (Figure 2).

Transferable exploitation (the lower right-hand field of the matrix) is transmission of existing knowledge in order to cope with a new object and a new activity. The stepwise appropriation of well-established Japanese quality management techniques by American companies facing new competitive pressures and market conditions is a good example (Cole, 1999). Don Norman's (1982) concept of accretion and the more recent concept of cross-appropriation (Spinosa, Flores & Dreyfus, 1997) illuminate different aspects of this type of learning.

Adjustable exploitation is gradual acquisition and internalization of the existing knowledge and skills embedded in the given activity. This type of learning is manifest in apprenticeship-type settings. Norman (1982) describes it as tuning, and Spinosa, Flores and Dreyfus (1997) as customary disclosing,

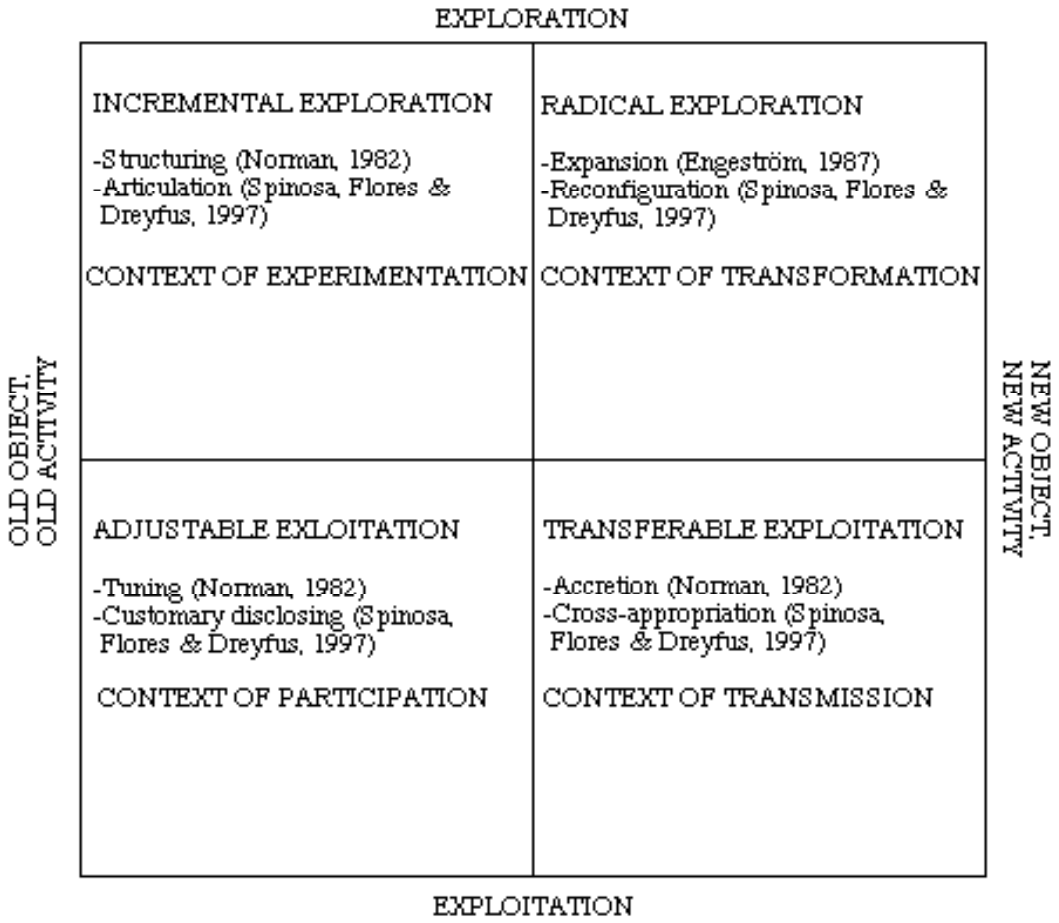

Figure 2. Four types of learning[1]

Incremental exploration is construction of new knowledge by experimentation within the given activity. Norman (1982) talks about this type of learning as structuring, while Spinosa, Flores and Dreyfus characterize it as articulation. This type of learning is often associated with the implementation of complex configurational technologies, such as the computer-aided production management systems analyzed by Fleck (1994).

"Each configuration is built up from a range of components to meet the very specific requirements of the particular user organization. Configurations therefore demand substantial user input and effort if they are to be at all successful, and such inputs can provide the raw material for significant innovation. (…) the specific implementation/innovation process with configurations is a matter of learning through the struggle to get the overall system to work, i.e., a process of 'learning by trying': improvements and modifications have to be made to the constituent components before the configuration can work as an integrated entity." (Fleck, 1994, p. 637-638)
"This is a more fundamental process of learning, much more like the trial and error nature of genuine experimentation than the secular accumulation of improvements in carrying out essentially the same activity." (Fleck, 1994, p. 648)

Fleck's case brings us into the transitional zone between incremental exploration and radical, expansive exploration. *Radical exploration*, or expansive learning (the upper right-hand field of the matrix), begins when experimentation is not anymore aimed only at making a well-bounded new technology work in the framework of a given, pre-existing activity. Radical exploration is learning what is not yet there. It is creation of new knowledge and new practices for a newly emerging activity,

[1] I am grateful to Professor Risto Tainio for ideas that led to the formulation of the matrix.

that is, learning embedded in and constitutive of qualitative transformation of the entire activity system. Such a transformation may be triggered by the introduction of a new technology, but it is not reducible to it. Radical exploration is the most poorly understood and historically most interesting type of learning. It is what the theory of expansive learning (Engeström, 1987) is focused on, and what Spinosa, Flores and Dreyfus (1997) call reconfiguration.

"In cases of reconfiguration, a greater sense of integrity (as experienced in articulation) is generally not experienced. Rather, one has the sense of gaining wider horizons." (Spinosa, Flores and Dreyfus, 1997, p. 26)

The four types of learning are not mutually exclusive. To the contrary, as shown already by Bateson (1972), expansive learning processes involve sub-processes or layers of the other types of learning, but these gain a different meaning, motive and perspective as parts of the expansive process.

The escalating cyclic character of expansive learning through a sequence of learning actions ascending from the initial abstract 'germ cell' to the concrete whole of the system to be mastered is reasonably well understood (Davydov, 1990, Engeström, 1987, 1999b, 2001a). In this respect, the theory of expansive learning will provide a central framework for the analysis and design of learning processes in co-configuration settings to be conducted in the research project presented here.

What is not so well understood is how such basically forward-oriented expansive learning actions are intertwined with horizontal or sideways movement across competing or complementary domains and activity systems, particularly characteristic to co-configuration. In a series of studies, we have identified patterns of such horizontal movement in expansive learning processes situated in organizational fields moving toward co-configuration work: boundary crossing (Engeström, Engeström & Kärkkäinen, 1995), multi-voiced dialogue (R. Engeström, 1995), negotiated knotworking (Engeström, Engeström & Vähäaho, 1999), and cognitive trail-blazing (Engeström, in press). While still provisional, these findings provide significant starting points for building a conceptually solid and empirically well-grounded *next-generation version of the theory of expansive learning that puts the horizontal and inter-organizational dimension of learning in the center*. This will be the theoretical task of the research project described in the present proposal.

THE LANDSCAPE OF LEARNING IN CO-CONFIGURATION

Learning in co-configuration settings is typically distributed over long, discontinuous periods of time. It is accomplished in and between multiple loosely interconnected activity systems and organizations operating in divided local and global terrains and representing different traditions, domains of expertise, and social languages. Learning is crucially dependent on the contribution of the clients or users. Learning is embedded in major transformations, upheavals, innovations, implementations and movements. It takes place is heterogeneous patchworks and textures of small and large, unnoticeable and spectacular actions, objectifications, trajectories and trails.

Co-configuration presents a twofold learning challenge to work organizations. First, co-configuration work itself needs to be learned (learning *for* co-configuration). In divided multi-activity terrains, expansive learning takes shape as renegotiation and reorganization of collaborative relations and practices, and as creation and implementation of corresponding concepts, tools, rules, and entire infrastructures.

Secondly, within co-configuration work, the organization and its members need to learn constantly from interactions between the user, the product/service, and the producers (learning *in* co-

configuration). Even after the infrastructure is in place, the very nature of ongoing co-configuration work is expansive; the product/service is never finished. These two aspects – learning *for* and learning *in* - merge in practice.

The *general working hypothesis* of this study is that the expansive learning required and generated by co-configuration work may be characterized with the help of three central features.

1. It is *transformative* learning that radically broadens the shared objects of work by means of explicitly objectified and articulated novel tools, models, and concepts (see Engeström, 2001a, in press, Engeström, Puonti & Seppänen, in press). This transformative aspect of learning in co-configuration puts a heavy emphasis on *actions of design, modeling, textualization, objectification, conceptualization and visibilization* (Engeström, 1999b). We might say that this is the visible superstructure of new forms of expansive learning at work.

2. It is *horizontal* and dialogical learning that creates knowledge and transforms the activity by crossing boundaries and tying knots between activity systems operating in divided multi-organizational terrains (see Engeström, Engeström & Vähäaho, 1999, Engeström, Engeström & Kerosuo, in press). This horizontal aspect of learning in co-configuration puts a heavy emphasis on *actions of bridging, boundary crossing, 'knotworking', negotiation, exchange and trading*. This is the structure of situationally constructed social spaces, arenas and encounters needed in new forms of expansive learning at work.

3. It is *subterranean* learning that blazes embodied and lived but unnoticeable cognitive trails that serve as anchors and stabilizing networks that secure the viability and sustainability of the new concepts, models and tools, thus making the divided multi-organizational terrains knowable and livable (see Cussins, 1992, Engeström, in press). This subterranean aspect of learning in co-cofiguration puts a heavy emphasis on *actions of spatial transition and movement, repetition, stabilization and destabilization, and embodiment*. This is the invisible, rhizomatic infrastructure of new forms of expansive learning at work.

This threefold working hypothesis points toward promising connections with innovative research and theorizing in related fields:

a. The transformative aspect of learning in co-configuration will be analyzed in discussion with new theories of concept formation which emphasize the polyvalent and heterogeneous nature of concepts. In particular, the rapidly developing research community around the theory of *conceptual blending* (Coulson, 2001, Fauconnier & Turner, 2002) offers an excellent arena for discussion and hybridization of ideas. The first steps in that direction will be taken in August 2002 with a presentation of key ideas of the present research project at the conference 'The Way We Think' in Denmark and in October 2002 at the Fifth International Conference of the Learning Sciences in Seattle.

b. The horizontal aspect of learning in co-configuration will be analyzed in discussion with theories of object-bound sociality (Knorr-Cetina, 1997), social capital (Woolcock, 1998), and hybridity, 'third spaces' and boundary interactions (Gutiérrez, Baquedano-López & Tejeda, 1999). Some of these discussions will feed into a special issue of the journal *Organization* on the topic of objects that will appear in 2004, guest-edited by Frank Blackler and Yrjö Engeström.

c. The subterranean aspect of learning in co-configuration will be analyzed in discussion with the theory of cognitive trails (Cussins, 1992) as well as with theories of embodied cognition (Lakoff &

Johnson, 1999) and theories of infrastructures (Bowker & Star, 1999). An invitational international workshop on 'Trails, infrastructures and embodiment in interorganizational learning' will be organized in 2003 in the Center for Activity Theory and Developmental Work Research.

RESEARCH QUESTIONS

This project seeks answers to the following research questions:

(1) What are the *learning challenges and potentials* brought about by the transition toward co-configuration in work organizations and how can they be incorporated into a *reworked theory of expansive learning?*

(2) What new *tools and infrastructures* may be developed and implemented to support expansive learning in co-configuration work; in particular, how is the instrumentality of the Change Laboratory to be developed to meet the challenge of learning for and in co-configuration?

(3) What are the features of a viable interventionist *methodology* for studying learning in and for co-configuration work?

Theories of situated and distributed learning (e.g., Bliss, Säljö & Light, 1999) and other attempts to reconceptualize learning are natural discussion partners for this research. On the other hand, the project will make a major contribution to the rapidly developing field of organizational learning (e.g., Dierkes & al., 2001)

RESEARCH SITES: HEALTH CARE, BANKING, AND TELECOMMUNICATIONS

The research will be conducted in three large organizations, each one moving toward co-configuration work in their strategic functions.

The first site is the *Western Health Center of the city of Helsinki* (contact person Riitta Simoila, Chief Health Officer). The Health Center is responsible for the primary health care of 100 700 inhabitants and it has 1158 employees. The practice of co-configuration in the care of chronic patients with multiple illnesses has been developed in Helsinki in recent years, centered around a new toolkit called care agreement (Engeström, Engeström & Vähäaho, 1999, Engeström, 2001b). The proposed project will follow and support the expansive learning processes embedded in the implementation of this new practice. In particular, the general practitioners working at the health stations of the Western Health Center have a central role and responsibility in the implementation. The proposed project will follow and document the co-configuration efforts of a selected set of 20 general practitioners over a period of two years. Patient cases which involve co-configuration efforts will be discussed in Change Laboratory meetings in the health stations on a monthly basis, with physicians and nurses of the health station and the respective patients themselves attending the sessions. The researchers will bring into the Change Laboratory sessions background data and documentation of the patient cases. The sessions will be aimed at identifying, conceptualizing and stabilizing new productive methods, tools and rules needed in co-configuration work in medical practice.

The second research site is the *Network Private Banking Finland of Nordea Group* (contact persons Auli Pasanen, NPB Finland, and Sirkka Oksanen, Project Manager, Human Resources Development). Nordea Group is the largest financial services group in the Nordic countries, with approximately EUR

253 billion in total assets, 9.7 million personal customers, 1 million corporate customers and 500 large corporate customers. Nordea is a leading asset manager in the Nordic financial market with EUR 108 billion (including private banking) under management. It has a comprehensive distribution network in the region, including 1,245 bank branch offices, 125 insurance service centres and leading telephone banking and Internet services. The customer's relationship with Nordea's Private Banking is based on an agreement which contains the framework for building a service package suited to the customer's needs. When one becomes a customer of Private Banking, one's assets will be managed according the one's personal long-term investment plan, worked out and updated with a personal banker whose task is to know the customer and his or her needs. The customer will receive extensive market and research information, regular report's on the investments, as well as advice and recommendations. The present project will focus on a pilot group of personal bankers, consisting of 10 to 15 members of a pilot unit, most likely the Helsinki Western unit. The daily co-configuration work of the bankers is observed and recorded. Data and interim findings are fed back to the pilot group and its manager in a series of Change Laboratory sessions. Representatives of the customers will also be invited to participate in some of the sessions. The sessions are aimed at developing and testing new procedures and tools for the mastery of long-term dialogical customer relationships. At the same time, this process serves as a pilot for a wider, advanced unit-based development program that will be conducted chiefly by Nordea's own internal consultants who are actively involved in the research project.

The third research site is the *Research Center of the Helsinki telecommunications company Elisa Communications* (contact persons Aimo Maanavilja, Vice President, Research, Annakaisa Häyrynen, Research Manager, and Liisa Varjokallio, Manager, Human Resource Development). With 7400 employees, Elisa Communications is both a network operator and a provider of telecommunication services. The Research Center has a record of successful R&D projects conducted in close collaboration with customers and actual end users, representing for instance small and mid-size enterprises. Elisa as a whole and the Research Center in particular have recently launched a strategic development effort aimed at strengthening the customer-focused approach of their operations. In the Research Center, research on usability and user needs is increasingly emphasized, a task force has been formed to enhance customer-centered research, and the idea of User Centered Product Concept Design (UCPCD) is being tested. The present project will focus on three types of pilot R&D projects. In type A pilot projects, the Research Center will engage in proactive collaboration with relevant business units of the mother company Elisa. In type B pilot projects, the Research Center will work together with actual end user customers. In type C pilot projects, all three parties will work closely together. Researchers will follow and document the progress of the pilot projects. Intermediate data and findings will be fed back to the project participants and Research Center management in specially arranged Change Laboratory sessions aimed at developing conceptual and practical tools for mastering the co-configuration process in R&D projects.

The three organizations represent very different, yet societally and economically crucially important settings of emerging co-configuration. The Western Health Center is a *public sector non-profit* organization in which co-configuration is needed in the development of *health care services for individual clients*. Nordea is a *private, for-profit* organization in which co-configuration is needed in the development of customer-focused *financial services for individual clients*. Elisa is a *private, for-profit* organization in which co-configuration is needed in new types of customer-focused R&D projects mainly aimed at the development of *new products and services for corporate or collective clients*. Comparing and contrasting the conditions and solutions of co-configuration in these three settings will provide a robust basis for theorizing across organizational differences (see Table 1). All three organizations already have a long-standing collaborative relationship with the Center for Activity Theory and Developmental Work Research.

Table 1. Organizational characteristics of the three research sites

Western Health Center	Public, non-profit	Individual services
Nordea Private Banking	Private, for-profit	Individual services
Elisa Research Center	Private, for-profit	Collective products and services

METHODOLOGY

The research project proposed here is an example of a broader interventionist methodology called developmental work research (Engeström, 1993). Developmental work research is an application of cultural-historical activity theory (Leont'ev, 1978, Engeström, Miettinen & Punamäki, 1999) in the study of work and organizations. Within cultural-historical activity theory, formative experiments and developmental interventions have been an integral aspect of the methodology from the beginning (Vygotsky, 1978; for a recent discussion on interventionist methodology in developmental work research, see Engeström, 2000a).

Our first major intervention studies in health care settings were conducted in the late 1980s (see Engeström, 1990, 1991). An overview of the 15-year lineage of this research is given in a forthcoming book titled *Collaborative Expertise: Expansive Learning in Medical Work* (Y. Engeström, in press). The laboratory method to be used and further developed in this project was developed in the mid-1990s in the Center for Activity Theory and Developmental Work Research at University of Helsinki under the generic name of *Change Laboratory* (Engeström & al., 1996). Variations of this method have been used in a large number of intervention studies in settings ranging from post offices and factories to schools and newsrooms.

Naturalistic social studies of science and technology (e.g., Latour & Woolgar, 1979) have been an influential model for ethnographic studies of professional work and discourse. Latour (1987) crystallized the quest of this research in his call: Follow the actors! Much of the recent ethnographic research in professional and industrial work has indeed focused on following the actors constructing their activities, social worlds and accepted truths by means of talk and text (e.g., Kunda, 1992, Darrah, 1996).

While this stance has surely been a healthy antidote to the tyranny of structures, there is a risk in focusing exclusively on actors. The professionals and their discursive interactions may appear as somewhat omnipotent constructors of their activities and social worlds. From the point of view of activity theory, this would mean that the material grounding and stubborn systemic dynamics of practical activities are lost or ignored, the resistance of objects is forgotten.

To an increasing degree, professional work and discourse are socio-spatially distributed among multiple organizational units and form long chains of interconnected practical and discursive actions. Actors become dispersed and replacable which renders the focus on actors increasingly vulnerable as a research strategy. What can keep radically distributed work and expertise together, coordinated and capable to act in concert when needed? I argue that the necessary glue is focus on the *objects* of professional work and discourse. As Knorr-Cetina (1997, p. 9) points out, "objects serve as centering

and integrating devices for regimes of expertise that transcend an expert's lifetime and create the collective conventions and the moral order communitarians are concerned about."

Objects should not be confused with goals. Goals are primarily conscious, relatively short-lived and finite aims of individual actions. The object is a heterogeneous and internally contradictory, yet enduring, constantly reproduced purpose of a collective activity system that motivates and defines the horizon of possible goals and actions (Leont'ev, 1978, Engeström, 1995).

Organizations may emerge through conversation, but they do not emerge for the sake of conversation. They emerge and continue to exist in order to produce goods, services, or less clearly definable outcomes for clients or users. If you take away patients and illnesses, you do not have hospitals. The object is not reducible to the raw material given or the product achieved. It is understandable as the trajectory from raw material to product in the emerging context of its eventual use by another activity system. Thus, the object of clinical work may be characterized as the trajectory from symptoms to treatment outcomes in the context of the patient's life activity. The object is projective and transitory, truly a moving horizon. But it is also specific and concrete, crystallized, embodied and re-problematized in every patient and illness entering the clinic.

All this indicates that we need to trace the objects of expert work as they move in space and time, across various situations and boundaries. History is not made by singular actors in singular situations but in the interlinking of multiple situations and actors accomplished by virtue of the durability and longevity of objects (see Engeström, Puonti & Seppänen, in press). This calls for a conscious expansion of attention beyond the subjects, to include and center on the objects of work and discourse. This is indeed the spirit of the more recent work of Latour (1996, 1999), as well as that of Knorr-Cetina (1997, 1999) and Daston (2000).

In cultural-historical activity theory, the object of activity is regarded as the key to understanding change and learning (Leont'ev, 1978). Expansive learning is above all stepwise expansion of the object. The potential for such expansion is best discovered by means of change experiments, interventions which open up the zone of proximal development of the activity system (Vygotsky, 1978). Thus, the study of expansive learning in co-configuration settings requires a longitudinal and interventionist approach.

The study will follow three methodological principles: (1) It will *follow the object*s of co-configuration work in their temporal and socio-spatial trajectories. (2) It will *give the objects a voice* by involving the clients or users in dialogues where the object is negotiated. (3) It will *expand the objects* by organizing intervention sessions where the producers and clients construct new shared models, concepts and tools to master their objects.

The Change Laboratory sessions to be used in this project are a *purposeful blend* between different types of meetings conducted in expert workplaces. First of all, the laboratory sessions focus on *concrete cases* that represent significant objects of work undergoing transformation. Secondly, the laboratory sessions *cross boundaries* by including practitioners from multiple organizational units and domains of expertise. Thirdly, the sessions use shared *conceptual tools of activity theory* to analyze the historical evolution of the work practice as well as its current contradictions, disturbances, and change potentials. Fourthly, the meetings are often *attended in person by clients* whose case is being discussed, backed up by *documents and videotaped excerpts* from previous interactions around the object. Fifthly, in laboratory sessions the participants envision and draft strongly *future-oriented new models of work and concrete changes* to be embarked upon. Thus, the laboratory sessions represent a blend of elements familiar from existing practices and new elements brought in by the researchers.

They are designed to serve as *microcosms* where potentials of co-configuration and knotworking can be experienced and experimented with.

"A microcosm is a social testbench and a spearhead of the coming culturally more advanced form of the activity system. ...the microcosm is supposed to reach within itself and propagate outwards reflective communication while at the same time expanding and therefore eventually dissolving into the whole community of the activity." (Engeström, 1987, p. 277-278)

Obviously there is a risk that the Change Laboratory sessions remain organizationally marginal in the sense that only a limited number of practitioners are involved in them and they will not become a permanent feature in the routine functioning of the organization. However, there are two kinds of marginality, centrifugal and centripetal. In one, the marginal practice is pushed out and tends to disappear. In the other, the marginal practice finds inroads and tends to spread into the central structures and interactional routines of the organization. The project proposed here will follow and assess the impact and sustainability of the Change Laboratory interventions, seeking to identify their centripetal potential.

In practice, the methodological principles sketched above mean that selected objects of work in the three research settings are first followed ethnographically. In the health care setting, the objects are the *care trajectories of patients with multiple chronic illnesses;* in the bank the objects are the *financial service packages selected clients;* in the research center of the telecommunications company the objects are *R&D projects*. Critical incidents and examples from the ethnographic material are brought into a series of Change Laboratory sessions to stimulate analysis and negotiation between the participants. The laboratory sessions themselves are videotaped for analysis. The participants of the sessions engage in constructing shared models and tools to enhance their collaborative mastery of the object. The objects are again followed as the new tools and models are being implemented. The length and frequency of such cycles will depend on the working rhythms of the three sites. Drawing on Vygotsky's (1978) method of dual stimulation, this methodology is an expansion of the design experiments described by Brown (1992). It allows for the collection of rich longitudinal data on the micro-interactions and cognitive processes involved in expansive learning as the participants make visible their work, moving between actions and activity, between the past, the present, and the envisioned future (see Engeström,1999a, 2000).

Naturalistic social studies of science and technology, even in their more recent forms developed 'after' actor network theory (Law & Hassard, 1999) have quite consistently shied away from intervening in the practices they have observed and analyzed. This stance is curiously conservative (see also Berg, 1996). The researcher tends to disappear as a speaking subject, or the researcher takes the position of a supreme narrator and commentator above the messy discourse of the practitioners and their clients. The three methodological rules presented above put the researcher-interventionist in a very different and much more vulnerable position.

One might ask what is the difference between the work proposed here and the 'action science' practiced by Chris Argyris and his colleagues (Argyris & al., 1985). Action science is aimed at making practitioners aware of the persistent and often harmful 'single-loop' mechanisms in their talk and interaction. However, in action science literature, we don't learn much about how the practitioners actually change their practices, or what new tools and organizational structures they develop and adopt. In contrast, the present research puts a heavy emphasis on the joint discursive design, testing and implementation of new mediating tools and models. It is important to distinguish this kind of intervention research from interventions which merely provide feedback to the practitioners or sensitize them to problematic aspects in their own discourse. In this regard, the 'consultative research

paradigm' put forward by Roberts and Sarangi (1999) is a very promising and relevant discussion partner.

The importance of new conceptual tools is directly related to the issue of the researchers' multiple roles in intervention research. Indeed, in our work the researchers are simultaneously and successively designers, participants, and analysts of interventions. The challenge is to make these roles and their implications visible, recordable and analyzable. At this point, we only draw attention to the importance of analyzing also the researchers' multiple contributions in intervention sessions. We regularly involve more than one researcher in such situations. This helps the researchers to get involved in the interaction in their own voices, none of them bearing alone the whole responsibility for observing and interpreting the events, or for trying to guide and channel them according to a pre-established script. Such involvement of the researchers is useful in extending the multi-voicedness and openness of the situation.

The specific methods of data analysis to be employed include (a) the analysis of the interactional modalities of coordination, cooperation and communication (Engeström & al., 1997), (b) the analysis of social languages and voices, developed by Ritva Engeström (1995), (c) the analysis of dilemmas, ruptures, disturbances, turning points and innovations (Engeström, 1992, Kärkkäinen, 1999), (d) the analysis of epistemic learning actions (Engeström, 1999b), (e) the analysis of initiatives (Haavisto, 2002), and (f) the analysis of expansive actions of boundary-crossing and cognitive trails (Engeström, in press). Technical details of these methods are explained and illustrated in the respective publications.

RESEARCH GROUP AND INTERNATIONAL COLLABORATION

The core research group of this project will consist of Professor Yrjö Engeström (principal investigator), two PhD-level senior researchers, and two doctoral students who will also be enrolled in the doctoral program of the Center for Activity Theory and Developmental Work Research. In the present application, we seek funding for one senior researcher and one doctoral student. Funding for the other senior researcher and the other doctoral student will be provided by the Center for Activity Theory and Developmental Work Research.

In each of the three sites, a project group will be formed to design and implement the interventions in collaboration with the research group. An important role in the research will be played by developer-practitioners inside the three organizations who will also be working on their PhD dissertations under the guidance and supervision of the core research group. In Nordea Private Banking, the developer-practitioners will be Auli Pasanen (NPB Finland) and Sirkka Oksanen (Human Resource Development). In Elisa, the developer-practitioners will be Annakaisa Häyrynen (Elisa Research Center) and Liisa Varjokallio (Human Resource Development). In the Western Health Center of Helsinki, the developer-practitioners involved in the research project will be named later. These developer-practitioners will participate in enlarged research group meetings (project seminars) as well as in data collection and analysis.

The project will be conducted in the Center for Activity Theory and Developmental Work Research. This is a National Center of Excellence with five strong interdisciplinary research groups which all deal with learning and work in their different ways. The Center provides an exceptionally fertile research environment and serves as an arena for lively interaction with numerous international scholars and Finnish research units.

The project will be carried out in close collaboration with three research groups abroad. One of them is the project 'Supported Learning for Social Inclusion', led by Professor Harry Daniels and Professor Anne Edwards in the *Centre for Sociocultural and Activity Theory Research at University of Birmingham, UK*. This research group shares the theoretical framework with the Finnish group but focuses its empirical work on new forms of co-configuration work and expansive learning among adults with learning disabilities and youth at risk. Daniels and Edwards are applying for research funding from the ESRC Teaching and Learning Research Programme in the UK. They collaborate closely with Professor Frank Blackler (Lancaster University), a leading expert in organizational learning. Yrjö Engeström is Honorary Professor in the School of Education at the University of Birmingham.

The second collaborating group is the *Research Unit on Organizational Cognition and Learning at University of Trento in Italy,* led by Professor Silvia Gherardi and Professor Gianni Jacucci. This group uses activity theory and actor-network theory as its frameworks and focuses on learning processes associated with the adoption of new technologies in inter-organizational settings. The group is launching a new project focused on co-configuration and interorganizational learning in medical settings using technologies of telemedicine in their collaboration. The project will run parallel with the project proposed here.

The third key collaboration partner will be the *Laboratory of Comparative Human Cognition (LCHC) at University of California, San Diego,* led by Professor Michael Cole. A leading center of cultural-historical activity theory, LCHC will focus on co-configuration and interorganizational learning in a globally distributed network of universities, schools and settings of after-school learning for children and adolescents, called the 5th Dimension Global Network. This large project is already running and will be conducted in parallel with the project proposed here. Yrjö Engeström is permanent faculty member and former Director of the LCHC.

Interaction between the project proposed here and its three international collaboration partners will take place in four main forms. First, there will be regular thematic videoconferences between the partners, a method from which we already have good experiences. Secondly, the partners will arrange joint sessions in relevant international conferences as well as invitational workshops over the three-year period of the project (the first one will be held in Helsinki in 2003, on the theme 'Trails, infrastructures and embodiment in interorganizational learning'). Thirdly, the partners will exchange and rotate graduate students and senior researchers. Fourthly, the partners will produce a series of joint publications, culminating in a book on new forms of learning in co-configuration settings, targeted for 2005.

TIMETABLE AND PRODUCTS

The project will proceed in three phases, each requiring approximately one year. The first phase consists of historical and ethnographic analysis of co-configuration work and expansive learning in the three organizations. The second phase will consist of the Change Laboratory interventions carried out in selected units of the two organizations. The third phase will consist of follow-up and evaluation of the new tools and practices generated by the interventions and of the writing up of results of the analyses.

The three phases will be conducted in the three organizations according to the timeline depicted in Table 2.

Table 2. Timeline of the research

	2003	2004	2005
Western Health Center	History & ethnography	Change Laboratories	Follow-up & analyses
Nordea Private Banking	History & ethnography	Change Laboratories	Follow-up & analyses
Elisa Research Center	History & ethnography	Change Laboratories	Follow-up & analyses

As Table 2 indicates, the intervention phase will begin already in the second half of 2003 in the Western Health Center, at the beginning of 2004 in Nordea Private Banking, and in the middle of 2004 in Elisa Research Center. The starting point of the follow-up and analysis phase is arranged similarly. This logic follows from the fact that we already have a strong background and understanding of the work conducted at the Western Health Center, whereas work conducted in the Elisa Research Center is technically complex and we have less background knowledge in it.

The project will generate five types of products. First, it will produce research articles in refereed journals (including a special issue of the journal *Organization* mentioned above, guest-edited by Frank Blackler and Yrjö Engeström). Secondly, the project will generate six PhD dissertations in Finland, two by members of the core research group and four by developer-practitioners in the participating organizations. Thirdly, as mentioned above, the international partners will organize joint sessions and present research papers at conferences such as EARLI, AERA, Academy of Management, EGOS, and ICLS. Fourthly, the partners will produce an edited book on new forms of learning in co-configuration work, with contributions from all the four research groups, with a targeted publication date in 2005. Finally, the Finnish project will produce practical reports and intervention materials for the three participating organizations.

The outcomes and impact of the research project will be theoretical, methodological and practical. Interest in new forms of work-related learning is growing in all parts of the world. The Finnish theory of expansive learning and the associated interventionist methodology of developmental work research have already gained wide international recognition for their originality and innovative potential. The proposed project will take this influence to a new level, opening up the landscape of co-configuration as a spearhead of future forms of work and expansive learning.

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