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LEARNING, KNOWLEDGE TRANSFER AND COMPETENCE DEVELOPMENT IN FORESTRY OPERATIONS SMALL AND MEDIUM SIZED ENTERPRISES (SMEs)

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Abstract

The topic of this report (part of the project COMFOR) is the field of competence development and knowledge transfer in the forestry operations sector, especially with regard to occupational safety and health in small and medium enterprises (forestry contractors). After discussing various approaches on learning, education and knowledge transfer, focusing on different modes of learning (formal, non-formal, informal), the state of education and training for forestry contractors in three different regions (Northern Europe, West Central Europe, East Central Europe) is analyzed. Six main barriers reducing training attendance by forestry contractors and their employees are identified, and different strategies to overcome these barriers are discussed. The report comes to the conclusion, that the “channels” for successful “knowledge transfer” should be compatible with the contractors’ learning culture and the situational context, e.g. focusing on the actual benefits and employing “hands-on” modes of exchange of knowledge. These conclusions are then discussed in regard to the “tools” developed in the COMFOR project.

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competence development
in forestry operations small and medium
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1 Introduction: Background and key questions

“The change to out-sourcing of forest operations, mechanised harvesting and poor financial returns are having a major effect on forestry SMEs throughout Europe. As a result of these structural changes, the occupational health problems in forestry work and economic pressure on SMEs are increasing. Current ergonomic research provides answers for healthier working practices which also improve performance. However, putting science into practice is difficult for these SMEs who face practical and financial barriers to change their way of working and are not in a position to undertake research and development themselves” (COMFOR 2004, p.3).

1.1 Background

The EU project COMFOR will carry out research to develop an innovative competence development concept with regard to forest operations SMEs. This will enable the adoption of ergonomically effective work practices and mitigate the problems of poor occupational health and economic performance. However, research on competence development and qualification in the forestry contracting sector is limited and only little information exists from previous research. Work package WP2.2 will contribute to reduce this gap of information. This WP2.2 report will present the current state of understanding and practice in the field of competence development and knowledge transfer in the forestry operations sector, particularly regarding occupational safety and health education.

Based on a review of theoretical knowledge (cf. Chap. 3), this WP2.2 report will synthesise the relevant information and the state-of-practice in the fields mentioned above, in order to identify appropriate means and channels for knowledge dissemination (“*educative model*” according to the COMFOR work description), which may encourage and help forestry contractors to improve their learning capabilities, and thus, change their working practices, upgrade competence and improve occupational health. The results will be elaborated looking into the three different European regions being represented in the COMFOR project. These regions are Northern Europe, West Central Europe and East Central Europe.

1.2 Description of work of WP2.2

This WP2.2 report is based on the work description of work package 2.2 stated in annex ii, “description of work”, of the EU project COMFOR and will proceed with the following steps:

1. Review and analyse the current knowledge, understanding and practices in the field of occupational safety and health education, competence development and learning in the forestry operations SME sector, to form the basis to improve ergo-

nomically efficient work practices and competences. The analysis will be carried out to:

- a. Describe the current state of the art of formal education in forestry and the possibility to match forestry contractors' needs.
 - b. Identify factors that appear to influence the knowledge transfer and the performance of educative offers.
 - c. Identify forces that influence the way how forestry contractors acquire relevant knowledge for their work, e.g. regulatory frameworks but also ways of learning in rural areas.
 - d. Define the main gaps and challenges in current knowledge dissemination in forestry SMEs;
2. Analyse main findings of WP1.1-1.3 with focus on the framework for knowledge dissemination and learning in different regional contexts (WP1.1), identified appropriate ways of learning within the case studies (WP1.2) as well as condensed results from WP1.3. Clarify how appropriate learning approaches can be developed and established with special regard to the three different country groups.
 3. Link results from WP2.1 and WP2.3 to propose means and channels which can be used to pilot the knowledge dissemination of ergonomic good practice with the 10 core SMEs (WP3).

The objectives of WP2.2 and starting points of work have been formulating as follows:

- » Analysing the learning patterns of forestry operation contractors and their employees in the field of occupational safety and health education, competence development and lifelong learning.
- » Development of a draft educative model which will encourage forestry contractors to change working practices, upgrade competence and improve their occupational health.
- » Assess the differences in the three European regions

Starting points of work:

- » Development of draft educative model
- » Assess the differences in the three European regions
- » Data analysis and preparation of draft final report

1.3 Key questions

With this description of WP2.2 in mind, after the review of current knowledge, the following key questions will guide through the research process:

1. What qualifications and competences do forestry contractors have?
2. How do contractors define their qualification demands?
3. How do forestry contractors get the information they assume being relevant for their business? What are knowledge transfer channels?
4. Which factors do influence “successful” knowledge transfer?
5. How can existing knowledge transfer channels be shaped in order to meet forestry contractors demands best possible? Is there a need to develop new knowledge transfer methods?

2 Structure and contents of WP2.2 report

2.1 Existing working papers and presentations

Several working papers were presented at different COMFOR project meetings:

1. Kutzschenbach et al. (2006): Report on knowledge dissemination and learning in the field of occupational training and competence development in forestry contracting SMEs. Discussion Paper. Ecomusée, France.
2. Brogt and Lewark (2007) Preliminary findings from WP 1.2 and WP 1.1 on knowledge dissemination and learning in the field of occupational training and competence development in forestry contracting SMEs. Discussion Paper. Busteni, Romania.
3. Lewark (2007) Discussion paper on Basic assumptions about learning in forestry contracting enterprises. Busteni, Romania.
4. Brogt and Lewark (2008): Learning cultures and knowledge dissemination in occupational training and competence development in forestry contracting SMEs: findings and conclusions. Background Paper. Vuokatti, Finland.
5. Lewark (2008): “Educational models” for the COMFOR project. Discussion Paper. Vuokatti, Finland.
6. Lewark, Brogt and Steinert (2008): Loose-leaf-collection: Concepts and terminology of learning in SMEs. Discussion Paper. Vuokatti, Finland.

Presentations:

1. Brogt, Lewark and Kastenholz (2007): Learning Cultures in Small Enterprises in Forest Operations. 3rd Forest Engineering Conference. October 1-4, 2007 in Mont Tremblant, Quebec (Canada). Session 9 – Who will log in the future? Paper. Proceedings.
2. Kastenholz, Brogt, Lewark (2008): Berücksichtigung der Lernkulturen in kleinen Unternehmen als Grundlage für erfolgreichen Wissenstransfer. Paper at Forstwiss. Tagung (FT) 2008

The educational approach as developed by WP 2.2, as a result of reviewing and analysing concepts and models, will be presented, commented and valuated in regard to the use for the COMFOR project.

3 Learning, knowledge, knowledge transfer: theoretical framework based on literature review

3.1 Learning theories

Theories of individual learning are crucial to understanding organisational learning. Although individual learning has been the subject of research of psychologists, linguists, educators, and others for a long time, they are still far from fully understanding the workings of the human mind. Therefore, to better understand also organisational learning, the following paragraphs will present the basic individual learning theories and highlight the role of experiences for learning.

3.1.1 Behaviourism

Behaviourism is an approach to psychology which purports that learning is the result of operant conditioning. Operant conditioning is a process both named and investigated by B. F. Skinner. The word “operant” refers to the way in which behaviour “operates on the environment”. Briefly, a behaviour may result either in reinforcement, which increases the likelihood of that behaviour occurring again; or punishment, which decreases the likelihood of the same behaviour recurring in the future.

3.1.2 Cognitivism

Cognitivism became the dominant force in psychology in the late 20th century, replacing behaviourism as the most popular paradigm for understanding mental function. Cognitive psychology is not a wholesale refutation of behaviourism, but rather an expansion that accepts that mental states are appropriate to analyse and subject to examination.

3.1.3 Constructivism

By contrast, constructivism views learning as a process in which the learner actively constructs or builds new ideas or concepts based upon current and past knowledge. In other words, “learning involves constructing one's own knowledge from one's own experiences”. Constructivist learning, therefore, is a very personal endeavour, whereby internalised concepts, rules, and general principles may consequently be applied in a practical real-world context.

3.1.4 Experiential learning theory

Kolb (1984) provides one of the most useful descriptive models of the adult learning process available, inspired by the work of Kurt Lewin. He suggests that there are four stages which follow from each other: “*concrete experience*” is followed by “*reflection*” on that experience on a personal basis. This may then be followed by the derivation of general rules describing the experience, or the application of known theories to it (“*ab-*

stract conceptualisation”), and hence to the construction of ways of modifying the next occurrence of the experience, leading in turn to the next concrete experience. All this may happen in a flash, or over days, weeks or months, depending on the topic, and there may be a "wheels within wheels" process at the same time.

3.1.5 *Situated learning*

Lave argues that learning as it normally occurs is a function of the activity, context and culture in which it occurs (i.e., it is situated). This contrasts with most classroom learning activities which involve knowledge which is abstract and out of context. Social interaction is a critical component of situated learning – learners become involved in a “*community of practice*” which embodies certain beliefs and behaviours to be acquired. As the beginner or newcomer moves from the periphery of this community to its centre, he or she becomes more active and engaged within the culture and hence assumes the role of expert or old-timer. Furthermore, situated learning is usually unintentional rather than deliberate. These ideas are what Lave & Wenger (1991) call the process of “*legitimate peripheral participation*.”

* * *

Kim (1993) defines individual learning “*as increasing one’s capacity to take effective action*” (Kim 1993, p. 38). For Piaget (1970), the key to learning lies in the mutual interaction of the process of accommodation (adapting our mental concepts based on experience in the world) and the process of assimilation (integrating our experience into existing mental concepts). As Kolb (1984) puts it,

“Learning is the process whereby knowledge is created through the transformation of experience. This definition emphasizes several critical aspects of the learning process as viewed from the experiential perspective. First is the emphasis on the process of adaptation and learning as opposed to content or outcomes. Second is that knowledge is a transformation process, being continuously created and recreated, not an independent entity to be acquired or transmitted. Third, learning transforms experience in both its objective and subjective forms. Finally, to understand learning, we must understand the nature of knowledge, and vice versa” (Kolb 1984, p.38).

Thus, both parts of the definition are important: what people learn and how they understand and apply that learning.

3.2 **Knowing and knowledge**

Discussion of knowledge management often begins with the definition of the terms data, information, and knowledge. Here we emphasise a different starting point. Building on situated learning and experiential learning theory, knowledge always involves a person. To know a topic or a discipline is not just to possess information about it. It is

the very human ability to use that information, compare it, and apply it. In order to solve a specific problem in their organisation, employees in the forest sector piece information together, reflect on their experiences, generate insights, and use those insights to solve that problem.

Furthermore, knowledge belongs to communities. We typically think of a community's knowledge as the stuff in textbooks, articles, written procedures and people's minds. But many other "objects" contain a community's knowledge, unwritten work routines, the layout of a workplace, stories, specialised languages and common wisdom about cause-effect relationships. These knowledge artefacts circulate through the community in many ways.

The central tenet is that our experience of the universe is subjective, and consequently, we are faced with a difficulty in extending that experience into the larger whole of our society without rendering our experiences into a somewhat more objective form. Under such a construct, a mental model is a personal (subjective) understanding of how reality is organised.

It is in our human efforts at connecting our personally-held and inherently-subjective mental models that we find ourselves using metaphors as a means of exploring and establishing common ground. It is when those metaphors become universally entrenched across many individual mental models that we develop means of establishing a so-called "shared understanding" of a reality. Mental models remain substantially individually: sharing of understanding occurs purely as a consequence of mutual agreements as to the possible implications of those models, those agreements taking the form of metaphors. The implication is that mental models do have meaning, but that meaning is constructed solely in the mind of the beholder.

3.3 Learning and knowledge dissemination

One way to think about the dissemination of knowledge and its role in competence development comes from the distinction between tacit knowledge and explicit knowledge (Nonaka 1998). *Tacit knowledge* pertains to personal insights, intuitions, and abilities; explicit knowledge pertains to knowledge that can be shared and communicated. Building on this distinction, knowledge reserve (table 1) refers to variation in behaviours and attitudes as to the repositories of knowledge. At one pole, knowledge is seen in very personal terms as something an individual possesses by virtue of education and experiences (tacit knowledge). At the other pole, the emphasis is on defining knowledge in more objective, social terms; it emphasises "manualised" know-how (explicit knowledge). Furthermore, knowledge can be disseminated within and between firms in a variety of ways. Some modes of dissemination are more formal than others; some are based on written communications (e.g. formal reports and documents), others on joint actions (e.g. telephone communication, solving a collective problem). Although related to knowledge reserve, dissemination mode (table 1) pertains to differences between a situation in which learning evolves informally and one in which a more structured, con-

trolled approach is taken to induce learning. In the formal approach, a decision is made that a valuable insight should be shared and used by others on a broad, institutionalised basis (the concept of non-formal learning will be introduced in the following section). Various forms of formal educational methods are generally employed for this purpose. In the informal approach, learning is spread through encounters with role models and gatekeepers who actualise the insight or method of behaving in a compelling way. Another version of the informal approach is the kind of learning that occurs when members of a work team share their experiences in ongoing dialogue. Lave and Wenger (1991) referred to this as learning through “communities of practice” and suggest that it takes place as a result of the social nature of most work.

In table 1, four variants of organisational learning are represented, as determined by knowledge reserve and dissemination mode. Previous research in Germany by Kutzschenbach (2006b) indicated that forestry contracting SMEs tend to prefer learning through role modelling and communities of practice (cf. section 3.5). However, there is no right or wrong learning style in general. A learning style represents the organisational learning capability of some sort; whether it is the right style for a particular firm or situation depends on the overall corporate strategy, market conditions, and performance demands.

Table 1: Knowledge dissemination and organisational learning determined by knowledge reserve and dissemination mode (from Kutzschenbach 2006a)

		<i>Knowledge Reserve</i>	
		Personal	Public
<i>Dissemination Mode</i>	Informal	Role Modelling	Community of Practice
	Formal	Occupational Training	Information Management System

3.4 Formal, non-formal and informal learning – basic categories for learning activities and “knowledge transfer”

One of the most important observations in developing vocational skills is the distinction between initial training, all learning before entering the labour market, and the continuing vocational training during a person’s working life.

Important for the description of knowledge transfer methods are our underlying assumptions regarding formal, non-formal, and informal modes of learning, which are three basic categories of learning activities (cf. table 1 above). Formal learning takes place in education and training institutions, is often highly regulated, and leads to recognised diplomas and certificates. Regarding the biography of an individual, formal learning can be divided into “initial learning” – all learning up to the individual’s entry into the occupational sphere – and “post-initial learning” (continuing education), taking place in the further course of life. Formal vocational learning is crucial for professional work performance. If we look at formal learning not only from the perspective of the individual, but also from the point of the organisation, established and formalised activities in the field of human resources development as well as a formalised knowledge management (Nonaka & Tekeuchi 1995) could be described as “formal learning”, too. Following, we will define the distinction between three basic categories of learning activities (cf. N.N. 2004, p. 15; cf. Werquin 2007)¹:

Formal learning takes place in education and training institutions, leading to recognised diplomas and certificates. With respect to lifelong learning, formal learning can be divided into initial learning and post-initial learning. Initial learning comprises all education to the point when students enter the labour market, post-initial learning after initial education.

Non-formal learning takes place alongside the mainstream systems of education and training and does not typically lead to formalised certificates. Non-formal learning may take place at the workplace or through the activities of civil society organisations and groups (such as youth organisations, trade unions or political parties).

Informal learning is a natural accompaniment to everyday life. Unlike formal and non-formal learning, informal learning is not necessarily intentional learning, and so may not be recognised by individuals themselves as contributing to their knowledge and skills

* * *

The relative importance of formal and in-formal is often not well understood, while the role of in-formal learning is probably underestimated. As it is difficult to assess there are, beyond general judgements, only few results of research as in figure 1, where the method of assessment is not documented either.

¹ Definitions are derived from European Commission (2000).

Even though the picture on knowledge dissemination in table 1 gives a distinct insight into different knowledge reserves and learning modes, there is a gap that has to be closed by the non-formal learning mode. In between informal and formal learning modes, non-formal mode has an intermediate position.

For the study of learning in (forestry) SMEs, non-formalised learning (non-formal and informal) seems to be of at least equal importance to formal modes of learning. Bringing the definitions above to the sphere of forestry enterprises, we see that the distinction between informal and non-formal learning can get blurry. If learning happens outside of the formal system, but can be identified as intentional act of learning, we speak of *non-formal learning*. This includes supplementary training courses at formal learning institutions as well as the active reflection of the own work process at the workplace (e.g. using sources like training manuals) or visiting a trade show. Non-formal learning can be defined as an intentional way to gain new competences that does not typically lead to certificates.

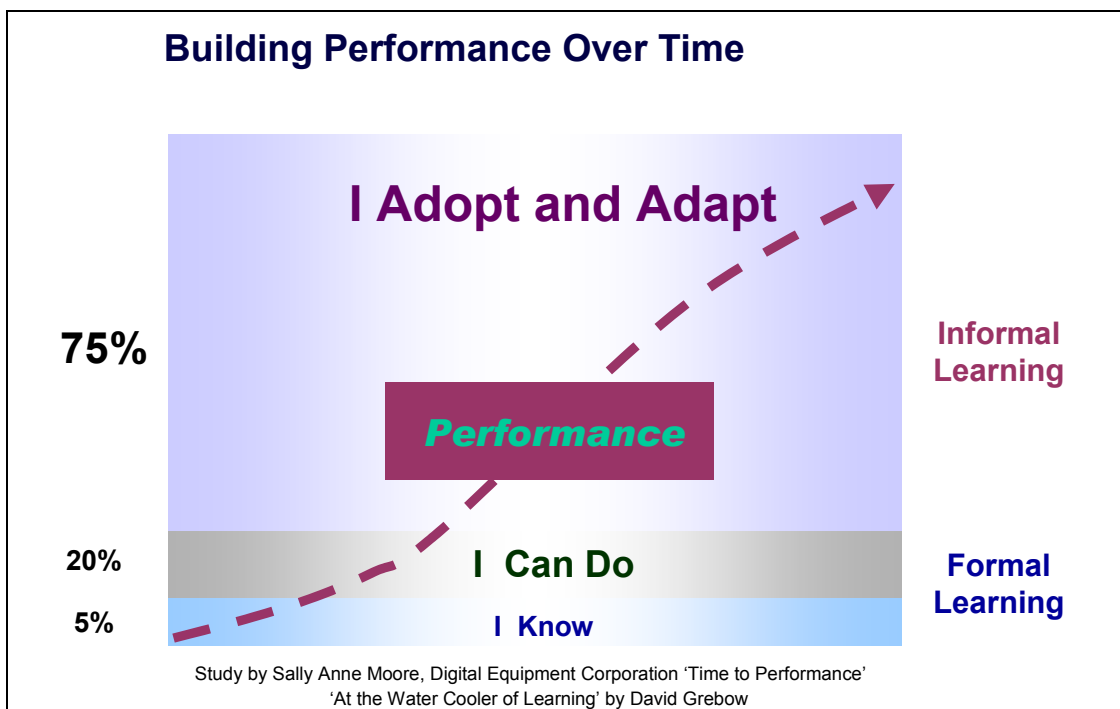


Figure 1: Roles and importance of informal and formal learning for performance over time

Informal learning is happening everyday at the workplace, as coping with a task enhances an individuals' knowledge and skills, as much as new tasks or new situations make it necessary to learn. But the distinction between non-formal and informal learning may not be clear. Someone who is actively trying out new functions of a machine, "playing" with it – maybe together with a co-worker –, has not necessarily the intention of learning something new about the machine, but still does so. This would be a typical example for informal learning. The same "playing around" with the machine situated at a trade show or in an informal come-together organised by a local forestry entrepre-

neurs association could be classified as part of non-formal learning. The concept of informal learning builds upon the observation of everyday learning in “communities of practice” (Lave & Wenger 1991), especially in regard to informal or “tacit” knowledge (cf. Polanyi 1966; Collins 2001; Hörning 2001). Tacit knowledge refers to personal insight, intuition, and abilities – knowledge that can only be learned by experience –, whereas explicit knowledge includes everything that can be shared and communicated (cf. section 3.2). Surely one can write down a “best practice” for a specific task in a formalised way, e.g. as enforced by quality management standards, but there still remains “residual” embodied or tacit knowledge necessary for a skilful performance of the task. This can only be learned by repeatedly doing the task – often in a “community of practice” (cf. section 3.5), that is by co-operating, communicating and learning from the observation of skilful co-workers (“role modelling” or “learning by example”). According to Kutzschenbach et al. (2006b), learning in forestry contracting enterprises can best be described with the concepts of “role modelling” (knowledge seen as a personal resource) and learning in communities of practice (knowledge seen as a shared resource).

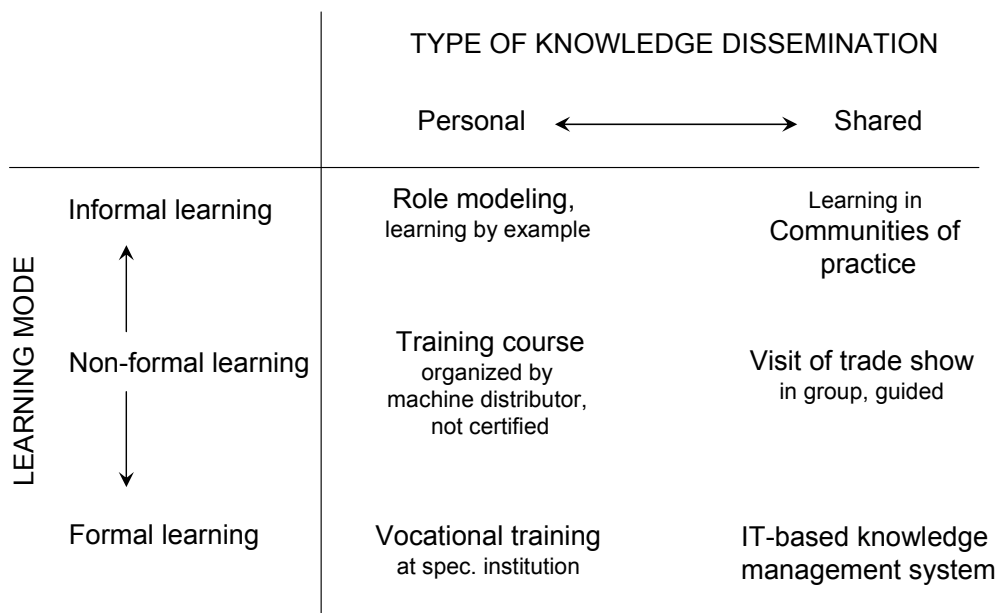


Figure 2: Examples for different modes of learning (expanding on Kutzschenbach 2006a)

One final caveat lies with the term *knowledge transfer*. Following a constructivist perspective on learning and on communication in general, knowledge *transfer* in a strict sense never happens (cf. Luhmann 1984). What can be observed as “knowledge transfer” between A and B, i.e. as learning, is in fact B *constructing* new knowledge, based on Bs observation and interpretation of the communications of A. This distinction helps us to understand that every case of learning is an active (but not necessarily intentional) process for the learner B. Only a strong “feedback loop” between A and B tightens the chance that the knowledge constructed by B has in fact any resemblance to the knowledge A initially wanted to “transfer” to B. When we use the terms “knowledge

transfer” or “knowledge transfer method” in the following text, one should bear in mind this distinction and perspective.

3.5 Communities of practice

Notwithstanding that formal and non-formal vocational learning are crucial prerequisites for professional performance, it is evident that a high amount of knowledge and skills is obtained in informal processes (cf. section 3.4). There is a permanent sharing of experience and knowledge among members of a work team or among contractors going on. Lave and Wenger (1991) referred to this as learning through “communities of practice” and notice that it takes place as a result of the social nature of most work settings. Further, knowledge belongs to “communities”. A community’s knowledge is not just the content of textbooks, articles, written procedures but also the people’s explicit and implicit or “tacit” knowledge (Nonaka & Takeuchi 1995, cf. section 3.3). Hence, a community’s knowledge comprises unwritten work routines, the layout of a workplace, a specialised language and common cognition of cause-and-effect chains.

According to Kutzschenbach (2006b) forestry contracting enterprises tend to learn in communities of practice and through role modelling (cf. section 3.3). As can be seen in table 1, these are two distinctive modes of knowledge dissemination in informal learning modes, as opposed to the formal occupational training and information management. Learning from other contractors or persons can be described as role modelling. The learners get information by examining the behaviour of the role model and transfer that information into relevant knowledge for the own businesses. The learning process is not necessarily intended, but e.g. coaching would be an intermediate between informal and formal learning mode also including role modelling.

Learning together in a social group, as forestry contractors are doing due to their common interest in their work, can be described as learning in a community of practice. Members of such communities are connected to each other in an informal way as they are confronted with similar problems and work tasks. The connecting element is the interest in solving current problems together but also alone. Members learn self-dependent, they could interact with other members and support each other, when a common benefit for the community is expected (Wenger 1998). A community develops when persons accept each other, and by allocation of certain roles within the community (Lave & Wenger 1991). Learning within a community of practice only takes place as long as there is an exchange of new and useful information.

Unlike a community of practice, information management systems are structured and intended with the aim to spread information especially within an enterprise. Information management is closely connected to knowledge management that summarises all management activities to use and develop knowledge for better achievement of business objectives (Nonaka & Takeuchi 1995). Information management systems often make use of digital databases which build a network between persons where information is gathered and stored. There is the need for detailed planning and supporting

structures to enable persons to use the information and to create knowledge from information. Nonaka and Tekeuchi (1995, p.9) defined knowledge management as followed: “Knowledge management is defined as the process of continuously creating new knowledge, disseminating it widely through the organisation, and embodying it quickly in new products/services, technologies and systems.”

Occupational training describes the total of activities and actions in the context of professional qualification. In most cases, courses are provided by training centres, training is addressed to individuals and courses are formally structured and end with an official degree.

3.6 Learning cultures

It is a major challenge to define the meaning of learning cultures (Weinberg 1999). Many approaches examine the problem by looking at the differences in content between learning cultures. Is this sufficient? What could be a meaningful definition of learning cultures, especially for the case of forestry operations SMEs?

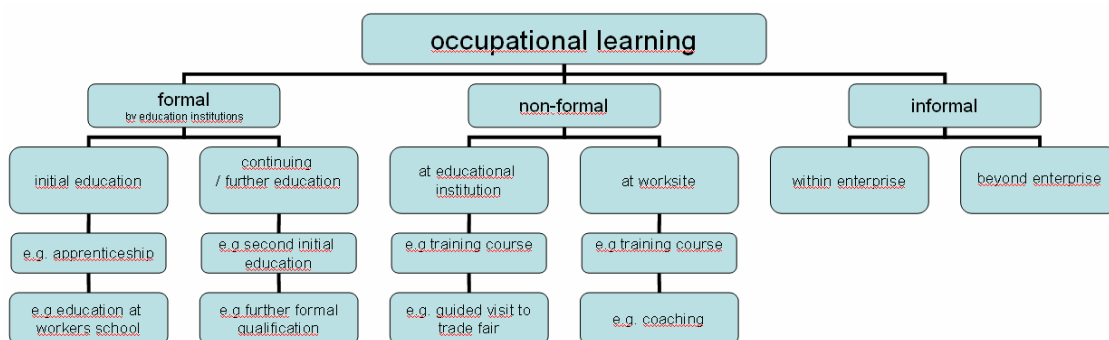


Figure 3: Ways to occupational learning and examples for formal, non-formal and informal learning

Describing learning cultures can start at different points that concentrate on ways of learning and the learning organisation on the one hand, on persons and their actions and attitudes on the other hand. It is important that a learning culture can be either defined in terms of different learning methods or in understanding culture (i.e. learning culture as part of a business culture). The first understanding assumes a neutral view on ways of learning with different persons or within enterprises, while the second approach encompasses the attitudes and values of learners and organisational cultures.

The dominant discussion on learning cultures has changed over the last years. Its understanding has shifted more and more towards the idea of a “new learning culture” (Erpenbeck 2003). So far, learning cultures were characterised according to the participation in seminars, courses and events, the time expenditure for such measures, influencing factors such as motivation, size of enterprises and the structures of the educational institutions. The overall aim in research on learning cultures was quality assurance. Latest surveys of learning patterns, e.g. in Germany, show a decline of partici-

pation in formal advanced training courses (BMBF 2006). One reason for this is that dominant views on learning culture do not include self education, competence development and lifelong learning. The focus on formal training courses ignores non-formal and informal modes of learning – within the process of daily work, in the social environment of co-workers/co-learners, and also in regard to learning that takes place in networks or by the use of new media. Besides, expertise, experience and values seems to attract less interest than formal qualification that can be measured in testable knowledge und testable skills. Thus, competences are hardly recognised in a comprehensive sense. Erpenbeck (2003) consequently asks for a wider view on learning cultures. However, every learning culture in fact includes the various modes and aspects of learning, education and vocational training, based on different ways of occupational learning that comprises formal, non-formal and informal learning modes (Figure 3). Thus, the understanding of occupational learning correlates closely with the contents of new learning cultures.

Table 2: Elements of learning cultures (Kirchhöfer 2003; changed and translated by Thomas Brogt)

elements	traditional learning culture	new learning culture
learner's position towards learning	determined by others, organised by others	self-determined, self-dependent
learning content	qualification	competences
learning canon	central curricula	individual learning arrangements
area	specific, separative	non-specific, lifelong, holistic
learning pattern	formal	non-formal, informal
time frame	single phases	lifelong
learning cooperation	institutional	network structures
certification	degree oriented	open, everlasting
learning culture	moderation, teacher, hierarchically structured	supporting the acquirement of knowledge, coaching, in partnership

The contents of new learning cultures are the result of common perception of actions and experiences of persons who are operating and working together. Kirchhöfer (2003) defines *learning culture* as the entirety of institutions, actions, mentalities and traditions connected to learning. Organisations, their structures and norms are built by individuals or by a community of learners with the aim to support the process of learning. Dominant learning cultures have changed rapidly over the last few years, moving from a high degree of institutionalisation (courses are highly structured), hierarchic occupational careers, certification schemes, differentiated course offers and specialised lecturers to an emphasis on more open and less formal ways of learning. Nevertheless, if we take the German situation as an example, characteristics of traditional school education

still play a large role in learning cultures. According to Kirchhöfer (2003) actual changes in learning cultures lead to:

- » the shift from certified knowledge transfer to acquisition of professional, interdisciplinary competences;
- » new ways of learning e.g. in groups of common interests, during leisure time or non-profit activities;
- » new learning patterns e.g. self-directed informal ways of learning;
- » the possibility to use new media and individual learning arrangements;
- » the change of the roles and the functions of education centres towards new institutions as intermediate actors;
- » the extension of the role of teachers in the direction of individual monitoring, mentoring and support;
- » the development of information networks between various actors and educative institutions.

Independent of single elements, such a new learning culture contains in its core the preconditions for the development and strengthening of knowledge transfer. The new structures aim to developing the competences and the willingness of a person to learn self-determined and self-dependent. According to Kirchhöfer (2003), learners have to evolve into entrepreneurs of their own education. The new emphasis on self-learning doesn't mean the end of formal learning. Formal structures and organisations for learning are still needed, as only suitable education centres in sufficient numbers will guarantee a comparability of educative levels and standards, and thus will help to lay common ground for further learning.

3.7 Résumé of literature review

The idea of the literature review of this chapter is to give a theoretical basis for understanding approaches of earlier, current and planned activities, their success and shortcomings in the field of occupational safety and health education, competence development and learning in the forestry operations SME. Now we will become more concrete: dealing with what we know about learning in forestry operations SMEs, what we found out within COMFOR and what consequences could be drawn in developing new instruments for supporting learning processes in the future. Definitions were given and concepts summarised on learning theories including formal and informal learning, knowledge management including dissemination and transfer, communities of practice and learning cultures, with special reference to new insights and trends of development. As one could see, there is neither a consistent approach nor one best way of com-

petence development of personnel of organisations. According to literature there is a general shift of attention towards non-formal and informal learning approaches. Parallel to that a shift from transfer and dissemination (roles of training institutions) to workplace learning happens, oriented to concrete tasks of the personnel. General conclusions drawn in attempts of transferring this understanding to the SMEs in COMFOR have been discussed in the COMFOR consortium meetings:

- » principles of adult learning and learning in organisations should be adapted and applied to the personnel in forestry contracting enterprises;
- » activities should be built upon pre-existing knowledge available on health situation as well as on mechanisms of influence of working conditions on OSH;
- » activities must take into consideration expectations in SMEs based on learning traditions, at the same time encourage an active role of contractors and employees as learners;
- » thus striving for acquiring competences within the enterprises is an expression of an output orientation (as opposed to input orientation – looking what somebody or some institutions can do to or for contractors);
- » the pivotal role and responsibility for the learning process on the contractors' side, being actors, not recipients, should be raised to a level of consciousness;
- » thus this “target group” of the COMFOR project should not be seen and treated as objects of actions from outside, but as active participants;
- » in an output oriented approach the role of the project and of RTDs within the project would be in the first place that of being think tanks, experts, moderators and stimulators; it is not so much a question of training, delivering, transfer, which would assume that there is somebody who knows and tells and the recipient just has to do what he is told;
- » training activities in a traditional setting (training courses in training institutions) must have a defined place: to be organised and offered upon request, when asked for by contractors;
- » instead organised learning within organisations as well as learning of organisations together should have a prominent place; this calls also for a strong role of coaching on the workplace;
- » learning and monitoring instruments developed together with the SMEs within COMFOR for the self-determined use within SMEs could be promising tools at the same time meeting expectations and traditions of SMEs and allowing an active role of the contractors.

4 State-of-practice of education and training in forestry operations SMEs

4.1 Means and acceptance of education and training for performance, safety and health

Increasing globalisation of markets, the complexity of linked economic structures and the development of information and communication techniques have led to radical changes in many sectors of business and social life. Consequently, knowledge is increasingly becoming recognised as a critical resource in many sectors of economy.

Researchers and practitioners recognised the importance of learning and knowledge also for the forestry sector. Already in 1998, a seminar on “Forestry training for target groups that are hard to reach” was held in *La Bastide des Jourdans* (France) (ILO 1998). All seminar members emphasised the crucial role of learning and knowledge for improving competitiveness and ensuring sustainable forest work and work safety. They concluded that it is essential for the development of the forestry sector

“[...] to overcome the barriers to reaching important actors like forestry contractors and small forest owners, and to find ways of providing training and extension to these groups” (ILO 1998)

Most researchers and practitioners in forestry will agree that the need for improved qualification in forestry is increasing as a result of technical innovation in harvesting operations and wood logistics, better competence will be needed on ecological and environmental issues and the increasing awareness of forestry’s social benefits. At the same time the forest operations are increasingly done by forestry contractors and their employees instead of direct employees of forest owners. However, there are many reasons why people working day-to-day in forestry are hard to reach by formal training courses (ILO 1998).

Training in forestry over the years has more and more been aligned with or integrated into the general systems of education, which have very differing traditions and shape in different countries. At the vocational level a large variety of training systems exists including brief introductory courses, well-designed apprenticeship systems and school-based trainings, mostly paid for from public funds and being part of the general training systems. An enquiry of the *Joint FAO/ECE/ILO Committee on Forest Technology, Management and Training* shows a considerable variation in training approaches whereas job content does not differ to the same extent. The findings were corresponding to the levels: vocational, technical and university, with forestry contractors as a fourth group. However, the introduction of mechanised wood harvesting systems has led to radical changes in working methods and thus in qualification demands. The Joint Committee enquiry though is more than ten years old, and it gives only little information on the education and training of forestry contractors.

4.2 Results from earlier research and development projects

Recently qualification attempts of many kinds have been undertaken initiated by training providers, national authorities, contractor associations or others. Many of them have been funded by various EU programmes, national or regional sources or through contractors' initiatives. However, the dissemination of results and insight gained from these initiatives has been limited. This was one reason to start the project ENQuaFor (European Network for Qualification in Forestry). It aimed to become a major European forum for exchange of information on occupational training and education (ENQuaFor Interim Report 2004). One major result is a sample of collected information on qualification measures in the ENQuaFor database which is available at <http://www.enquafor.com>. Another result was that most training providers used a variety of media to disseminate information on education and training in forestry, the predominant being the use of the Internet (Hudson 2004, ENQuaFor WP 4 report).

To overcome these barriers and enhance the contractors' skills the seminar provided recommendations, which one more time confirmed that forestry contractors are hard to reach by formal training courses:

“On-site training should be preferred whenever possible. Another precondition was well-trained trainers who not only mastered the technical subjects, but were also able to think like a contractor. To avoid a lot of training effort going to waste good communication between industry and contractors is critical.” (ILO 1998, p. 20).

Reasons for low acceptance of training opportunities have been named by Morat (1998, p. 22 f.):

- » there are doubts about the technical competence of the trainers;
- » courses are provided only by few forest workers schools;
- » courses too often take place during the main wood harvesting season;
- » the degree of organisation of contractors in associations is low;
- » trainers at forest workers schools with their own forestry education background do not meet the demands of the contractors with their technical orientation;
- » sometimes forest workers schools are placed in remote locations;
- » the relationship between cost and returns of training is not convincing to the contractors

“[J. Morat] reaffirmed that the underlying cause for the low interest in training among contractors was the lack of employment security and hence the uncertainty whether the investment in training could ever be recovered“ (ILO 1998).

“The present emphasis on formal training courses may not be the most effective approach. A broad range of channels, including self-teaching, distance learning, on-site training and coaching is available as a complement to or even as a substitute for formal training courses. New information technology offers new opportunities for outreach and training, including via internet, interactive CD-ROMs and coded TV channels“(ILO 1998, p. 9).

“For contractor training, these include the mobile counseling units operating in France, which combine immediate improvements through advice with a focused, client-specific assessment of the training needs of individual contractor firms. Other successful measures have been the provision of training through, or at least with the backing of, contractors’ associations or of the forest industries and owners using the service of contractors. Skill certification for chainsaw and machine operators is another example. It provides an opportunity to involve the target group in design and implementation establishes uniform minimum standards of competency and makes training more attractive, because skills acquired are recognized and are instrumental or even necessary for ensuring employment”(ILO 1998, p. 9).

“For machine operator training, harvester simulators based on personal computers or virtual images interacting with the cabin and commands of a real machine have become effective teaching tools. They work best when used as a complement to training on real machines”(ILO 1998, p.9)

“Funding for training [...] for groups that are hard to reach is the bottleneck in all countries and in itself one of the main reasons for the limited coverage. The small size of forest holdings and the lack of employment security mean that [...] contractors often do not only have very limited resources, but more importantly little scope or certainty of recovering an investment in training“(ILO 1998, p. 10)

In the EU project *ErgoWood* it was stated that an implementation plan is needed if the transfer of results from science to practice is to be successfully affecting the work situation and its development. An important result from *ENQuaFor* is the difference between collecting information about vocational training opportunities and the much more difficult task of convincing people to take part in training.

„The forest contractors’ enterprises see qualification as a fundament of competition and regard qualification principally as business of the contractors’ associations, to be acquired with help of organizers of training activities. The employees of contractors are more interested in technical contents, the managers of contracting enterprises prefer economic and marketing oriented contents.

The forest workers schools and the private training providers look at the qualification of this target group as a developable field of business. There are proposals that the partners in this market, i.e. training providers, representatives of contractors' enterprises, machine manufacturers and interested private training institutions should coordinate the courses and seminars they will offer at the end of each year. The agricultural employers mutual insurance association in Germany (BLB) is to be included as an important partner. If it concerns qualification in the fields of management, economics or marketing there should also be information about programmes of further organisations like the chambers of trade. The complete list should be made available through the websites of the different partners. A connection with activities of the Leonardo project EnQuaFor is presenting itself, which has similar objectives on the European level. [...]" (Morat 2005a, p.26)

Sharing personal knowledge requires interaction and informal learning processes such as conversation, and suitability for practical application of the kind that communities of practice provide, which may take many forms (Brogt & Lewark 2008).

4.3 Outlook

According to Morat, at least in Germany there is no specific formal education for contractors that is obligatory. There is little knowledge about the ways forestry contractors would most appreciate, but research clearly indicates a qualification demand. With regard to the educational concepts presented in chapter 3 education and training activities as described and discussed here mostly show an input orientation, i.e. the perspective of the trainers and the educating institutions.

When designing concepts of competence development for forestry operations SMEs, one should take into account, that these enterprises are characterised by a unique combination of backgrounds, competences, traditions, customs, attitudes, beliefs of the entrepreneur and the employees, which will be introduced in the following chapter.

5 Empirical results

Work packages 1.1, 1.2 and 1.3 of COMFOR dealt with empirical data on the different regional contexts and the case studies regarding the core SMEs of the COMFOR project. One objective for WP 2.2 was the identification of the actual ways in which learning occurs in the regions and enterprises studied. Together with additional empirical material the results from WP 1 enable us to describe the institutional framework in the different countries, the dominant learning cultures and empirically observable knowledge transfer methods in small forestry operations. These results then can be used to clarify how appropriate educative models can be established in the three regions.

5.1 Description of the empirical material available

A conclusive description of the questionnaires and results from work packages 1.1, 1.2 and 1.3 can be found in the COMFOR delivery D1 (Hudson 2008). The objective of WP 1.1 was to deliver information about the regional development and frame conditions for the workforce in forest operations, using a structured study with major wood chain stakeholders. WP 1.2 generated base-line data on research demands of forestry operation SMEs using interviews and surveys (ErgoWood tools) with the ten core SMEs (case studies) of COMFOR. WP 1.3 was aimed at collating these findings for WP 2. In the project, three research regions were used: *Northern Europe* (Sweden, Finland), *West and Central Europe* (UK, Ireland, Netherlands, France, Germany) and *East Central Europe* (Poland, Rumania, Bulgaria). These three regions can be distinguished by the importance of mechanisation for forestry operations, and by the economical importance of forestry (table 3).

Table 3: COMFOR research regions and core SMEs (cf. Hudson 2008)

	Northern Europe	West and Central Europe	East Central Europe
countries of the SMEs included in the case study (one SME per country)	Finland Sweden	Germany France Netherlands Ireland UK	Bulgaria Poland Rumania
mechanisation of forestry operations	well-established	rapidly developing	initial stage
economic importance of forestry	High	relatively low	changing

For each country, the six applied research organisations in the COMFOR consortium compiled an assessment of the situation of forestry in that country (WP 1.1), using input from major wood supply chain stakeholders (e.g. National State Forest Services, forest industry organisations, unions, NGOs etc.) and other data sources (Hudson 2008). The

questionnaire included statistically oriented items as well as open questions about the assessment of the situation, e.g. regarding current trends in the market structure.

Complementary to the regional data from WP 1.1, WP 1.2 looked closer at the single enterprise. One forestry contracting enterprise was selected in each country and interviewed. Main findings of WP 1.2 include the questions of appropriate ways of learning, knowledge transfer and dissemination.

A third source of information were group discussions with COMFOR partners from the three regions held in Busteni, Romania (see section 5.2.3).

5.2 Results from WP 1.1: regional frameworks for forestry training

5.2.1 *Training for forestry contractors in practice: levels of use, availability and barriers*

Training for contractors is available in most countries (question C13). In the East Central country group number and supply of training courses seems not to meet the demand, at least compared to former times. In the other countries, in general training for contractors is available. In some cases, cultural (France) or practical (UK, travelling distance) attendance barriers are mentioned. In most countries there exists no training specially targeted for contractors and their work force, but only forestry training in general. In Sweden, forestry contractors and their employees are seen as one main target group by the forest school *Gammelkroppa*. In Germany, further training for contractors regarding economical and management related issues is offered (organised by state forest training centres as well as by forestry contractors' associations).

Question C15 asked what kind of organisation does carry out the training for contractors. The answers from the East Central country group are not very conclusive; they seem to relate to specific projects and not to forestry contractors' training in general.

Out of the Nordic countries, only the Swedish questionnaires answered this question. It was explained that forestry training is part of the public school system with the *Naturbruksgymnasier* as higher secondary education for forestry and qualified professional education (e.g. by forest schools) is also available. Additionally to this public vocational training there exists also the private forestry training company *Alfta tekniska* as well as a number of training courses (chain saw licence) by certified trainers and training by machine manufactures. In France, Germany, and Ireland, we find a mixture of public and private training organisations. In Germany, forest workers' training is part of the vocational education system. Further training is also organised by state forestry schools. Additionally, private organisations (e.g. contractors' association) carry out training courses. In Ireland, training for forestry contractors is mainly carried out by a state company (*Coillte*), but there are also private companies. State company training is usually subsidised in order to encourage participation. In the UK, the greatest proportion of forestry contractors' training is carried out by commercial organisations and projects. The content of training courses follows legal requirements. In most countries, there are specialised forestry training courses, especially courses on the use of different machinery (chainsaws, brush cutter, harvester, and forwarder) (question

C11/C12). Whereas machinery training in general is not focused on forestry contractors only, in some countries – namely in Finland, Sweden and some parts of Germany – dedicated training programmes for contractors (or for machine operators) do exist.

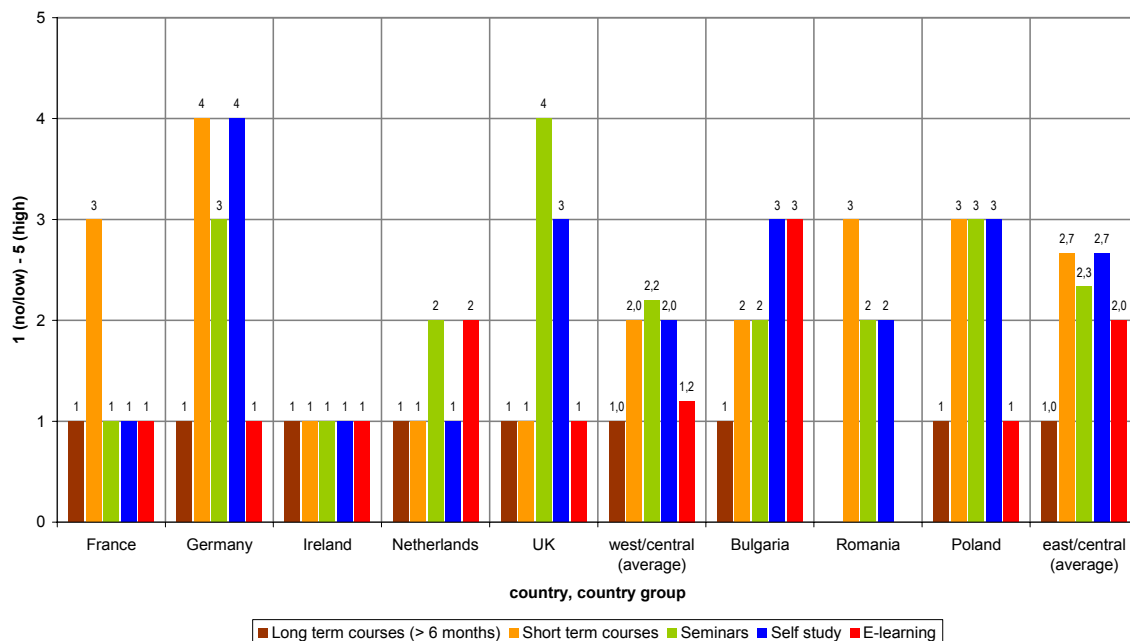


Figure 4: Level of use of different training methods by contractors and their employees (question C3)

Whereas training seems to be available in most countries, the level of use is generally low. This is especially important in regard to further training after the initial vocational education. Question C3 was aimed at the *different forms of training used* by contractors and their employees. This question was not answered for Sweden and Finland, so there are no data available for Northern Europe. , Fig. 4 shows that the level of use of direct training methods in the other countries in general is very low. Following our data, in both country groups long term courses are not used often – or possible do not exist at all. For shorter courses (short term course or day-seminar) and/or different forms of self-study – depending on country – the levels of use are a bit higher. In average, all these “other” forms of training were rated higher in the East Central country group than in the West Central group. Other than this, we do not see a comprehensive picture of the situation in the different countries. These numbers confirm the assumption that forestry contractors and their employees are – in general – rather hard to reach with traditional long-term training methods and that short-term seminars or self-study/e-learning are a little better for reaching these target groups.

The relatively low level of use especially of the three forms of further training requiring physical attendance brings us finally to the question: What are the *barriers* for contractors to attend training (question C16)?

We identified six main problems.

1. *“Time is money” (indirect costs of training)* – This was mentioned one way or the other for all “western” countries, but not for the East Central group. This problem of the indirect costs of training is formulated sharply in the French answer: “While the operator attends a training session, there is no production, but fixed costs remain”. This barrier is especially important in an already problematic economical context. One could also say, as in the Finnish answer, that it is a “question of priorities”.
2. *“Doubts about the quality of the training”* – For Sweden, France, the Netherlands, the UK and Bulgaria, doubts about the quality of the training were mentioned. This includes doubts about the quality of the teachers (or the lack of educated trainers, as in Bulgaria), the question if there are courses specifically adapted for the needs of forestry SMEs or contractors as well as image problems of the forestry training centres and problems with an “urban” learning culture – different factors that make it doubtful for contractors or their employees if the training will fit their needs.
3. *“Doubts about the benefits of training”* – A related topic (mentioned in the answers from Sweden, Germany, Romania) is doubt about the benefit of training. For Sweden and Germany, this is mostly the question whether “training has direct influence on productivity or can lead to the improvement of the business situation” (Germany). For Romania, it is uncertainty if the investment pays back, i.e. if a worker who was trained will remain in the company after training.
4. *“Access and availability”* – For Sweden, France, the Netherlands and the UK and for Bulgaria, questions of access to training were mentioned. This includes the general availability of adequate training courses as well as topics like the need to travel, long distances to training centres or inadequate timing of training courses.
5. *“Direct costs”* – Not only production loss and indirect costs, but also the direct costs of courses were mentioned by some countries (Sweden, Bulgaria, Romania) – i.e. expensive fees and/or a lack of financial resources.
6. *“Bureaucracy”* – For France, the complexity of the funding system was cited as one barrier. Also the German answer “general lack of initiative” and the Polish reference to “EU Structural Fund regulations” can be seen as hinting towards problems with bureaucracy and regulations.

In general one can see some differences between the East Central group and the other two country groups: in the countries of the East Central group the *lack of adequate training possibilities* and teachers and the *direct costs* seem to be more important, whereas in the Nordic countries and the West Central group the most important barri-

ers seem to be *doubts about the quality* and the perceived *benefits of training courses vs. indirect costs of training*.

To bring down these different barriers it seems to be necessary not only to *increase the availability* of training courses (timing, distance, fees, cultural aspects), but also to *prove the (economical) benefits* of attendance in relation to the perceived indirect costs of training to the contractors and their supervisors. This fits well with the *strategies to overcome the barriers* identified in the country reports (question C17). Ideas from the survey reports include:

- » Organise *better funding*, e.g. by helping to apply for EU subsidies or by lobbying for funding assistance through the government (Ireland, Sweden, UK), and also reduction of direct costs of training courses (Germany).²
- » Find a *time frame for training sessions that is adapted to the needs of contractors*, e.g. with courses in the evening (after work), or in times of the year when amount of work is low (France, Sweden, UK).
- » The *place for training sessions* is also to be considered, e.g. possibilities for local training sessions, maybe even at the workplace – “training coming to the contractors” (France, Sweden, UK). Another possibility could be the institutional framework of technical colleges (Sweden).
- » *Fit the content of training to contractors’ needs*, e.g. with a combination of practical and theoretical elements, or with customised and more flexible packets targeted to contractors (France, Germany, Sweden, UK). Another idea concerning the content of training is to favour *exchanges* between contractors (UK).
- » Finally: find a way to *change contractors’ priorities about training* – by making them more self-confident about using monitoring tools and self-training materials (Finland), by PR campaigns with “best practice” examples (Germany), or, on the other hand, by making training obligatory (Bulgaria). Also longer contracts between contractors and employees could help reducing the risk of early leave for contractors (Romania) as way to change their priorities about training.

In short: training should take place at times and places with high availability to contractors, there should be a way to fund it, but most important of all, it should include contents and aim at competences that bring real benefits to contractors, so that they themselves change their priorities regarding training.

² Question C19 shows that in most countries some kind of funding or support for training is available – via EU funds (especially EU structural fund), development aid (GTZ), specialized governmental funds, or via trade unions or contractors associations. In Romania, no funding is available; in Germany, only in some federal states funding schemes exist.

Some incentives (or “forces”) for contractors to undertake training already exist (question C18), even if these incentives are seemingly not enough for a “change of priorities”. Apart from the topics discussed above (e.g. subsidies for funding, better promotion of benefits), following the country reports we can identify three general ways to enforce or to encourage participation in training (especially in OSH training).

- » First of all, there is the perceived or actual necessity to show certificates, i.e. the formalised results of training, to bid in government submissions for tender or to work in certificated forests. This incentive can also have the form of extra credits in the evaluation of submissions for tender, if the operator is trained. *Certification* as a possibility to encourage attendance to training was mentioned for Ireland, for the Netherlands, for Poland, Romania, Sweden and the UK.
- » A second topic is “*big players*” and their demands (Bulgaria, Finland, France, Germany, Sweden): these could be legal demands, but also obligatory training enforces by insurance companies, or the demands of the forest industry itself as customer of contractors. “A big and strong industry – the customers – they tell the contractors and they ‘obey’.” (Finland). Certification schemes could be seen as one – formalised – variant of these “big player demands”.
- » The third form of incentives approach the *self-interest of the contractors*: by showing good examples (France, Germany), by monetary incentives (value checks by chain saw manufactures, reduced insurance fees; Sweden) or by highlighting the benefits of improved productivity and efficiency (Ireland, Poland, UK).

* * *

There is a saying (attributed to Lao Tze or as “Chinese proverb”) that to give a man a fish means to feed him for a day, but to teach a man to fish means feeding him for a lifetime. The quotation could be extended by another one, attributed to Antoine de Saint Exupéry: „If you want to build a ship, don’t drum up the men to gather wood, divide the work and give orders. Instead, teach them to yearn for the vast and endless sea.” Forestry contractors’ training at best reaches the state of “teaching them to fish” at present, certainly not yet instilling an intrinsic “yearning” for knowledge.

5.2.2 *The role of occupational safety and health in forestry training*

The central topic of COMFOR is ergonomics, respectively *occupational safety and health* (OSH). With questions C4 to C6, it was asked if there is some form of *compulsory* training³ on health and safety and work organisation as a requirement for working

³ Following the questionnaire, it is not totally clear if the question was aimed only at OSH training or at training for forestry work in general. Here it will be assumed that the former is true.

in the forest as chain saw operator, machine operator, or lorry driver (our target groups). Following the answers to the survey, the highest standard of compulsory training in occupational safety and health can be found in the East Central country group. According to the survey, members of each target group need to acquire licences or certificates showing their competence in health and safety. The other extreme are the Nordic countries – neither the operation of chainsaws or of machines needs compulsory health and safety training. Only lorry drivers in Finland (not answered for Sweden) need to have some basic training (rather about traffic safety than about occupational safety and health). The situation in the West Central group is mixed: for Germany and for the Netherlands, there exists no compulsory OSH training for the three target groups. On the other hand, in Ireland and in the UK some form of compulsory OSH training seems to be necessary. In France, there exists compulsory OSH training for lorry drivers, and the necessity to show OSH competency (but no formal certificates) for chain saw operators and machine operators.

Together, this shows a picture of high compulsory OSH standards in the East Central group, of (almost) no compulsory OSH training in the Nordic countries and in Germany and the Netherlands, and some form of compulsory OSH training in Ireland, the UK and France. On second view, this picture becomes a lot less clear if we look at the *different understanding* of compulsory OSH training in the different countries. For example, the description of requirements of the compulsory training in Ireland (forestry code of practice, first aid) or Romania (introductory training on protective equipment and OSH) sounds a lot like the requirements for occupational safety regulated in the insurers' *Unfallverhütungsvorschriften* (UVV) (cf. UVV Forsten 1997) and the code of conduct for Germany's state forestry. Thus it is possible that the difference between the country groups regarding the answers to questions C4 to C6 ("Is training compulsory before being permitted to work in the forest?") can be explained at least partially with different "mental models" of compulsory OSH training.

Another item of questions C4 to C6 was to identify *the "main driver" for compulsory OSH training* for work in forests, if such a kind of training exists. Possible answers included law, insurance companies, state forest organisations, clients, and certification bodies. The question was – again – answered in different ways by different researchers. Nevertheless, it becomes clear that only the first three institutions mentioned are influential in regard to compulsory OSH training: law or legal requirements and codes of conduct from the state forest authority, or from insurance companies.

Whereas questions C4 to C6 had the topic of compulsory training (in OSH), questions C7 to C9 asked about *competence certificates* for the three target groups: "Are competence certificates required? (Competence certificates include a period of assessment of the operator working in actual forest conditions (rather than just theoretical classroom training) and include aspects of health and safety, work organisation etc."

The answers result in a similar picture as above: with the exception of machine operators in Poland, in the East Central group for every target group competence certifi-

cates are required. In the Nordic countries, for all three target groups the answer was “no”. For the West Central group, we see again a mixed message: for Ireland and UK there exists some requirement of competence certificates, for Germany and the Netherlands, no such requirement is given, and for France it depends on the type of lorry/machinery (i.e., if a “loading crane” is in operation or not). Again, we cannot be sure if this seemingly clear-cut picture shows the whole truth: e.g. for Poland and for the UK the necessity for a special driving license for lorry drivers is mentioned – at the same time, in Germany a special driving license for lorry drivers of course also exists, but the question of competence certificates for OSH was – so it seems – not understood as including special driving licenses.

The “driver” mentioned for competence certificates for the target group of lorry drivers is mainly the law. For West Central, for UK and France law is seen as main driver for the other groups; for Ireland, the state forest authority and certification bodies are mentioned. For the East Central group, legal requirements, insurance companies (Romania, Bulgaria), certification (Romania) and the state forest authority (Bulgaria, Poland) are seen as main drivers for the requirement of competence certificates.

Regardless of different possible understandings of the questions C4 to C9, one *conclusion* from these questions could be the general idea that the *reported* level of (formal) compulsory training and certification in OSH in the Nordic countries seems to be much lower than in the East Central region. In the West Central group one could distinguish between a “continental” model (Germany, Netherlands, and partly France) with a rather low level of OSH training and certification requirements, and an “isle” model (UK, Ireland, and partly France), where law or the state forest authority is seen as a driver for some sort of compulsory OSH training or certification.

5.2.3 Group discussions on OSH awareness - examples for learning/dissemination channels

The data on OSH training in forestry acquired from the stakeholder reports can be complemented with the results of three group discussions. These discussions – one for each country group – took place as part of the COMFOR project workshop in Busteni, Romania (2007, June 28). The discussions were carried out in groups, representing the three European regions, and were accompanied by the corresponding applied RTD performers. Group discussions were on learning and dissemination channels. In each group, two topics were discussed: Where do contractors get information to get into action regarding OSH, and how could awareness for topics like health be raised?

Table 4 shows the drivers and incentives that help contractors to raise their awareness of occupational safety and health topics. The results can be sorted into three different categories: in the Nordic countries as well as in East Central Europe, one big driver for OSH awareness seem to be *actual health problems*, resulting in an individual's direct motivation to change OSH practices. Another driver is *external demand* (in all three country groups): in the “softer” form of certifications processes or industry demands (Nordic countries, West Central Europe) or in form of obligatory health checks

(East Central Europe). Finally, for Northern Europe and for East Central Europe *input from professionals* – contractors association or COMFOR researchers – was mentioned. This form of information dissemination as factor for a raised OSH awareness was not mentioned in the group discussion for West Central countries.

Table 4: Drivers for awareness on OSH topics

Northern Europe	West Central Europe	East Central Europe
Pressing problems	Demands of the wood processing industries, as these industries wish contractors to follow industry standards (like ISO 9000) / certification systems	Actual problems
Input from contractor associations' representatives		Input from COMFOR researchers
Input from COMFOR researchers		Obligatory medical health checks for chainsaw operators (health evaluation system)
Certification process (certification required OSH standards)		
External initiatives		
Expectation of monetary benefits		

An important point regarding the input from professionals is the role personal contacts and personal trust plays. Forestry contractors associations in Finland and Sweden are seen as important multiplier of information, spreading this information through channels like newsletters, magazines or (short) meeting. From interviews and the discussion with the chairmen of the contractors associations, it seems reasonable to assume that personal contact between association representatives and contractors is more important for the raise of OSH awareness than the formal organisation. In the West Central group, it was mentioned for the United Kingdom that here direct contact between enterprises (coaching, sharing knowledge on work performance and OSH) is quite important for the spread of information.

In general, the results of the group discussions can be brought down to a distinction between reactive and proactive strategies on OSH. All three drivers mentioned – actual health problems, external demands, input from professionals – are related to *reactive OSH strategies*. In conclusion, one could say that forestry contractors think about occupational safety and health only in reaction to external stimuli. Action related to safety and health does not take place intrinsically motivated. The contractors see it as something “that has to be done”, not as something they do voluntarily or as part of established routines. The dominance of reactive OSH strategies also means that knowledge dissemination strategies based on voluntary participation only, without the existence of actually “driving” incentives – visible and strong benefits of OSH training, legal demands or necessities of industry certification processes, social control – will definitely not reach out to a majority of contractors. Social control here means a situation where contractors expect that their peers (or their association representatives) expect them to integrate OSH action into their daily routines and doings.

Results of the discussion show clearly that raising awareness on safety and health is in most cases a matter of external drivers. Only in case of current problems, such as accidents, contractors will get into action. External driving forces seem to be different between Northern Europe, West Central and East Central Europe. In the Nordic countries awareness and resulting action is on the one hand a matter of information that is spread among the contractors. On the other hand, external driving forces were identified. In the Nordic countries the certification process causes some demand for action related to safety and health. Such forces were found in the region East Central Europe too. The situation in the region West Central in contrast seems quite simple. Wood processing industries force contractors to fulfil certain standards on safety and health.

The picture drawn from the discussions shows the important role of the forestry contractors associations in Finland and Sweden as multiplier of information that is spread among contractors. However, it is to state that the strengths of contractors association highly depend on personal contacts and trust rather than on the formal status of the association.

In the following, the questions on how contractors start action to improve safety and health situation in their enterprises and on where do contractors get the relevant information needed were raised. Again, results show differences in the three regions. In particular, working conditions in the three regions differ essentially due to different levels of mechanisation. While in the Northern Europe region the use of high mechanised working systems is common practice, the situation in the East Central region is still affected by motor manual forestry work. Consequently different enterprise organisations exist with an assumed impact on *learning cultures*.

Representatives of the Northern Europe region mentioned, that every action depends on costs for the action and what (economic) benefit can be expected by the contractor. Best transfer channels that were identified by the ten contractors were representatives of contractors associations and RTDs within the COMFOR project. Only few younger people seem to use the internet as a source of information (< 60 %). To remark is that the specification on the kind of information is missing.

In general, personal contact e.g. meetings with representatives of contractors association, other contractors or even customers are regarded to meet requirements of the contractors to overcome financial and temporal barriers. To raise awareness on topics such as safety and health, contractors said that contractors association should use videos to visualise possible problems. The answers to the question how contractors learn about issues on safety and health, was quite similar in the Northern European countries. Learning at worksite from others is most important especially when older contractors instruct younger and vice versa. The biggest problem is to form suitable teams within the enterprise due to small numbers and age patterns. Learning from other contractors is challenging, due to the general lack of time.

The situation in West Central Europe can be characterised through lack of awareness on safety and health. The main statement of the contractors was, that only acci-

dents that have already taken place, will bring up such topics. However, stress by working pressure was seen as an important factor that influences work performance of forestry contractors.

Demonstrations at work site were seen as appropriate measure of knowledge transfer to contractors. Coaching can be carried out by training centres, but contractors would also appreciate learning from other contractors. Contractors are interested in practical solutions that can be adapted immediately to daily work processes.

The participants of the discussion groups stated, that awareness on safety and health depends on the personalities of the contractors. Consequently, there was no mutual consent on best ways to raise awareness. The Internet as a source of information was little used due to general lack of willingness and lack of hardware. Drivers to start the process to improve the safety and health situation are various. Such forces can be national laws or regulations, but also the expectation of higher return of money due to improved safety and health situation. In practice, most improvements came up after accidents had happened in the enterprise as preventative reaction.

The group discussion with representatives from East Central European region resulted in a description of the situation that is characterised by strict hierarchies, clear separation between operational and management level and top-down organisational structures. It was stated, that as a consequence only managers attend workshops or seminars in general. But information is hardly transferred from these managers to employees due to the fact, that there are no regular staff meetings. Managers have no contact to employees on the operational level. As a consequence, managers' role as leaders is weak and interventions when e.g. safety and health standards are hardly known.

5.2.4 *Conclusion: From regional frameworks to learning cultures*

The most important result regarding the regional framework for training and learning in forestry contracting enterprises is the gap between supply and actual participation in training courses, especially in regard to occupational safety and health courses. Elements of forestry contractors' training include modes of formal learning, e.g. secondary or tertiary vocational courses for forest technicians or certified forest worker. Additional formal courses and non-formal training possibilities exist, organised by the state, private enterprises or forestry stakeholders. Even if the number of courses targeted at forestry contractors is low, in most countries training courses that could be of interest to forestry contractors do exist. A partial exemption is the East Central group, where the number of training courses is too low for the demand.

Actual participation shows another picture. Especially in regard to long term courses (further education with more than 6 months), the level of use by forestry contractors and their employees is rated in all countries as very low. For some countries (France, Germany, UK, Romania, Poland), the reports show that short-term courses, day-seminars and the possibility to use self-study materials have a medium level of use by contractors and their employees. No training method in no country was rated higher

than 4 on the scale 1 (no use) to 5 (frequent use). Thus, one can say that actual participation in further education training courses is rather low.

As described above, six main barriers for participation in training courses were identified. In the East Central group, this includes the availability of adequate training possibilities (i.e. lack of qualified teachers, lack of courses) and direct costs (fees), in the other two country groups the main barriers are the indirect costs of training (“time is money”) and doubts about the perceived benefits of training. Quality issues, questions of access and availability, and problems with bureaucratic procedures were also mentioned. Strategies to bring down these barriers include the supply and the demand side. On the supply side, one could say that training should be available at all, should take at times and places with high availability to contractors; it should be subsidised without too much bureaucracy. Most important: training should be attractive and include content and competences that are seen as real benefit.

On the demand side, three main drivers include *legal and insurance company demands*, demands of other *big players* like the forestry and wood processing industries or the state forest service (e.g. participation in bids for tender only with certificated training) and finally incentives approaching the self-interest of the contractor (e.g. lower insurance rates with training). Especially in regard to the first two “drivers”, *formal certification schemes* can be identified as important.

Unfortunately, the data on occupational health and safety (OSH) in the country reports are not always clear, because different participants obviously had different ideas about “compulsory OSH training”. The three most important “drivers” for OSH training – for the necessity to show certified OSH competencies – are legal requirements, codes of conduct from the state forestry authority, and demands from insurance company. Regardless of different possible understandings, the *reported* level of (formal) compulsory OSH training in the Nordic countries seems to be much lower than in the East Central region. For the West Central group, one could distinguish between a continental model with a rather low level of compulsory certification requirements, and an “isle” model (UK, Ireland, partly France), where some sort of compulsory OSH training or certification exists.

The results on OSH training can be complemented with the question of drivers for the raise of OSH awareness. As result of group discussions, it becomes clear that forestry contractors mostly are not intrinsically motivated in OSH actions. Reactive OSH strategies are dominant, i.e. action on OSH (e.g. training in occupational safety and health) takes place only in reaction to external inputs and demands, or after actual health problems became visible. External drivers include legal demands or the certification process, but also “social control”, i.e. expectations about OSH conduct by trusted peers and forestry association personal. With this, we move from the realm of the formal and institutional framework to the question of dominant learning cultures.

5.3 Case study results: knowledge transfer methods in forestry SMEs

The results from WP 1.1 on the context of knowledge dissemination were complemented with a detailed case study on learning and knowledge dissemination in each of the ten countries participating in COMFOR (WP 1.2).

5.3.1 *Educational background of the contractor and the employees*

To get a better understanding of the educational background of the contractors and the employees, details on job and training were asked. There is no typical career to become a contractor or a machine operator. However, the answers show clearly that in general the contractor/firm owner has a higher level of education – educational levels above secondary school, even high school – than the employees.

Employees in Northern Europe and West Central Europe usually have attended forestry school, i.e. have a vocational education in forestry. The situation in the East Central region is different to the two other regions; employees here do not generally have attended forestry school.

The contractors were asked, if forest workers had to attend special training courses before they were allowed to work in their business. In general, chainsaw operators have to prove special skills or experience over long time. This is often enforced by legal regulations (see previous chapter). Most contractors said, that chainsaw operators are trained on the job and reasons to attend courses after basic education is mostly due to law (e.g. chainsaw operators working in Germany state forests have to attend one-day safety & health trainings once a year, or the “green card” system in Sweden). However, there was no evidence, that training courses for chainsaw operators specially focus on safety & health related issues.

For becoming a machine operator, no special training is required. In all three regions, every employee could work as machine operator. In some enterprises the contractor prefers machine operators with experience working with harvesting machines. Machine operators usually get training-on-the-job. In Finland, the law enforces that machine operators have to go to a medical check up every 3rd year.

5.3.2 *Knowledge transfer methods used by contractors and employees*

Answers given on the question if courses in the field of occupational safety and health were taken up by contractors and/or employees show a low level of attendance. Some issues on safety and health were part of apprenticeship at forestry school. In most enterprises, a first aid training course is obligatory. The contractor in the UK stated several courses (e.g. Introduction to Workplace Safety and Health or Risk Management) as well as the contractor in France (e.g. *Forêt-Défi* – training to safety and health that takes place every year). In some enterprises, in regard to occupational safety and health, contractors train the employees on the job according to their needs and existing regulations. One reason why courses on safety and health are not very attractive to contractors is that benefits are not visible directly. Courses that show effects immediately

on work performance are seen as more attractive; e.g. courses on topics such as machine techniques or on efficient machine operating. The German contractor stated that for him a course that shows the employees the importance of machine calculation and gives them a feeling for “stand still” costs would be considered as very successful.

Content and presentation of the courses should be so that contractors can use the knowledge immediately in their daily work. Solutions for current problems offered through courses make these attractive. Courses that are practical, understandable and can be applied immediately are considered attractive. This confirms the results from WP 1.1.

Most contractors have no experience with self explanatory teaching materials.

5.3.3 *Participation in training programmes*

Results from WP 1.1 show various training programmes offered by different organisations. But results from the case studies make clear that contractors know only a part of the offered courses. We asked for courses that are available for the contractors and the employees. In all enterprises with the exemption of Bulgaria we found a rough idea what courses are available. In Bulgaria, no training courses were mentioned. Only the answer from the German contractor gave some details on specific courses. Special courses on safety and health were not mentioned in general. From the answers we conclude that most contractors cannot say in detail which institution offers what kind of courses.

We asked the contractors about perceived barriers to training. In all forestry contracting enterprises time lost for production and/or cost for continued pay of salaries during the time attending e.g. training courses were considered the main barrier to training (i.e. “time is money” in the discussion of the WP 1.1 results above). As possible incentives for attending training courses contractors mentioned the knowledge that work performance will improve, and that the knowledge from the course can be applied practically. Another reason for participation is legal regulations and certification schemes. Most contractors said that they do not need/want such forms of enforcement.

The answers given on the questions on further demand for special knowledge, outstanding training and possible problems due to lack of training support these results. On the one hand, most contractors said that work performance in terms of technical skills and management skills could be improved. They see the possibility for improved work performance. On the other hand, they consider lack of knowledge not as reason for major problems. The idea that problems will be fixed with time one way or the other is common sense among the contractors that were interviewed.

5.3.4 *Non-formal learning and informal learning*

If it is right that non-formal (i.e. learning that happens intentional, but not in an institutional framework with formal certification etc.) and informal modes of learning have

become especially important, this should be visible in the answers from the contractors and enterprises.

We asked the contractors if (informal) *collective forms of learning* do happen in their enterprises. Only three contractors told about *team work* as a possibility to learn from others (contractors from the Netherlands, Germany and the UK). A more common form of collective learning are *gatherings* (“regulars’ table”, “Stammtisch”) or *other types of non-formal meetings*. For example, in the case of the Bulgarian enterprise, such meetings took place regularly once a month. In other enterprises such gatherings were called ad hoc, if the contractor thought it necessary. The context of a regular’s table is not always the enterprise. It can also be a professional association. In Finland, the Machine Owners Association organises regular gatherings. It is not unusual that other people than the employees regularly attend – e.g. other contractors.

Other possibilities to learn from and with others in forestry contracting enterprises have been mentioned: One way is to *learn by observation and imitation*. Contractors observe how other contractors do things and how work is performed well in these enterprises. Also, learning from each other on the job falls into this category. A good example was given for work in highly mechanised harvesting operations. When a machine breaks down, contractors and employees learn from each other or from a mechanic, while fixing the machine. Next time, they probably know how to fix the machine on their own and do not need to call for other machine operators or the mechanic.

Circulating forest magazines among the employees is another possibility to facilitate access to knowledge, as we found in France.

For the contractors in the Nordic countries and in West Central Europe, visiting fairs and exhibitions is a very prominent form of *informal learning*. The situation in East Central Europe is different. If visits to fairs and exhibitions occur at all, here the owner is visiting the fairs, but not the employee.

Job enrichment, job rotation or job enlargement were not regarded as a way to spread knowledge among employees. On the contrary, it was mentioned that specialisation is best for work performance and employees are most successful in their job when they have defined tasks. Only the situation in the UK was described differently. *Job rotation* here is used and has good effects on work performance, widening the breadth of skills that individuals have and reducing the monotony of some repetitive tasks.

Role modelling (see above for definition) is carried out in Romania, Bulgaria and Germany within the enterprise. Workers with very good skills and high work performance help others to overcome certain problems. It was mentioned that role modelling has to be done in a sensitive way and that it then can considerably increase productivity. External experts, who show how to improve work performance to the contractor and employees, carry out role modelling in Finland.

Answers to the questions on the use of e-learning, knowledge management systems, multimedia-based learning or the use of internet for knowledge transfer and learning facility give a seemingly clear picture. There is in general no e-learning, no knowledge

management system, no multimedia-based-learning and no use of internet for knowledge transfer. However, in other parts of the questionnaire there was evidence that some knowledge dissemination tools are used very well. This includes *learning CDs* that are used in some enterprises when dealing with the handling of new machines. In addition, the *internet* is used by most of the contractors, but not explicitly considered as a source of knowledge. It was mentioned as source of information on new machines, tenders or the market situation. As far as gathering information about these topics involves the adaptation of new knowledge, one could describe this use of the internet as informal learning.

5.3.5 Sources of information – the network map as tool

One important aspect of learning and knowledge transfer are social networks. A methodical tool for the analysis of social networks is the “network map” (Eitmann 2002). Michael von Kutzschenbach (2006a; 2006b) adapted this instrument for the study of knowledge dissemination processes in forestry SMEs. Ego-centric network map are used to map sources of information as well as contacts with which ego shares knowledge, placed accordingly to their assessed importance for ego. Next to ego are contacts and sources that are deemed most important, further away we find contacts and information sources that are less relevant. The “network nodes” are placed in the network not only accordingly to their distance to ego, but also following different social contexts or “sectors”.

Kutzschenbach defined these sectors as

1. the enterprise itself (employees, clients, ...),
2. contractors’ associations/machine owners association and
3. other sources and social contacts.

Network maps following this concept were used in COMFOR as empirical visualisation tool, i.e. they were filled out together with interviewees or as part of group discussions.

As an example, one could look at the results for three German forestry contractors which are synthesised into one network map that can be found in Kutzschenbach (2006a, p. 11). This network map (fig. 5) shows “nodes” for business/work related information from these three contractors. Family members and employees are the most important source of knowledge for the entrepreneur (“ego”). Clients and other contractors are also information sources, but less important. The contractors’ association is identified as source of knowledge in form of meetings and social association activities (medium importance) and in the form of the associations’ consulting service/help desk (deemed not very important because the information found there isn’t seen as actual and relevant). Other sources for knowledge include the business’ financial consultant (medium relevance), general and forestry specific magazines and newspapers (low relevance) as well as personal contacts from hobby activities (low relevance).

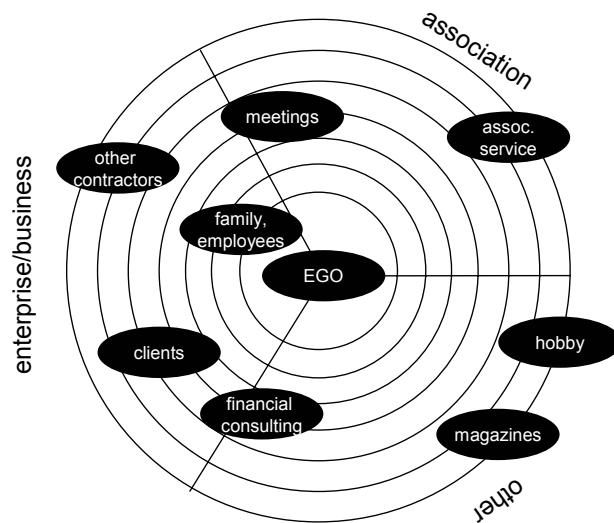


Figure 5: Synthesised network map (contractors from Germany; Kutzschenbach 2006a)

Thus the network map is a most useful tool to identify sources of information of forestry contractors. Beside the identification of sources of information, previous questions could be explored in more detail. For that reasons, the network map is one of the most meaningful tools when ways of knowledge transfer and dissemination shall be identified and described.

Using the network map as tool, it was asked for different sources for information. Information sources could be personal (people you ask for information) as well as public (such as journals or database). The network maps used for this inquiry contained three main areas of sources of information: Business/enterprise, (educational) institutions (replacing the strict view onto associations) “other”. Unfortunately, not all network maps used these three areas in similar ways. The network maps for the case study enterprises can be found in Annex A.

5.3.6 Regional differences in information sources and learning cultures

Using network maps, we found some differences between the three regions. In the *Nordic region*, institutions like the Machine Owners Association or the SMF (Swedish Forestry Contractors Association) play an important role as source of information and in the process of knowledge dissemination to contractors. Magazines and consultants are also mentioned to be a source of information that is used frequently. Close contacts exist to customers that are also seen as source of information. The *learning culture* of enterprises in the Northern region can be characterised by:

- » strong impact of forestry contractors association,
- » strong structured networks between contractors and associations,
- » informal network between contractors, other contractors, employees,

- » many formal contacts besides informal personal contacts that are sources of information.

In *West Central Europe*, sources of information that are part of or closely related to the enterprise – such as family, employees, colleagues or customers – are of especially great importance. Contractors help to get relevant and actual information on tender, development of wood markets or technical developments. Family and employees seem to be important to get information on work performance and to discuss current issues within the enterprise. *Learning cultures* in the West Central Europe can be described as follows:

- » Most sources of information are personal contacts.
- » Personal contacts are much more important than formal networks.
- » Impact of forestry contractors association exists, but this is rather weak
- » Contractors have rather little contact with other contractors.
- » Trade and fair shows or magazines give contractors insights in new technical developments.

Contractors in *East Central Europe* say that they get most information from family and employees, followed by customers, newspapers and magazines. Learning cultures in East Central region are affected by strong informal structures where personal contacts and strong customer orientation dominate. The network map leads to the assumption, that contractors do not use many sources and so far there is no indication that they attempt to enlarge the use of knowledge resources.

In conclusion, contractors from the West Central and East Central regions mentioned sources of information that are naturally closely connected to the enterprise first. These sources are followed by information sources that are not that close and directly available to contractors, such as workshops, fairs and consultants. Consequently, these are ranked as less important compared to the sources mentioned before. The situation in Northern Europe seems to be a little different. Here institutions like contractors associations are seen as more or equally important than contacts within the enterprise. Another common result from the search for information sources with network maps is the importance of personal contacts (and thus of personal trust) for information gathering. Published information sources (magazines, internet ...) are less important.

5.4 Conclusions from the empirical material

In the previous sections, the empirical material available was discussed in detail. Now we will look at this material again, this time using the key questions (section 1.3) as guide, thus coming to the conclusions.

The first key question asked for the *qualifications and competences* of forestry contractors. For this question, it is important to distinguish between (formal) qualifications and (actual) competences. Regarding the first, as we have seen, there is no typical career to become forestry contractor or machine operator. The employees of the enterprises in Northern Europe and in the West Central region usually have a vocational education as forestry worker or forestry machine operator as educational background. The firm owners or entrepreneurs themselves in general have a higher level of education, in some cases higher tertiary education. Further education and training courses with formal certification do exist, but are not often sought after by contractors and their employees, with the exemption of courses that are enforced by law or by the insurance company (e.g. mandatory occupational safety and health training for chainsaw operators). In the East Central region, most of the employees do not have vocational training as forestry worker.

In the self-assessment of their *competences*, contractors see possibilities for improving their work performance, but in general they do not see necessity for *active* competence development.

From the institutional questionnaires we can conclude that the *qualification demands* of the forestry contractors are mostly external driven. Only if legal or insurance regulations (or clients) demand specific qualifications, or if there are massive incentives for specific certified qualifications, there is a demand for training activities. This is especially true for occupational safety and health certifications. The contractors from the case studies answered the question if they have demand for specific training mostly with no (one exception was courses on electrics, hydraulics, computing). From other sources (namely Brogt 2007; Kutzschenbach 2006b; Morat 2005b) we do know about the mismatch between contractors' competences on the one hand and clients' demands on the other hand (e.g. economical competences, technical process-oriented competences). Following the results from the empirical COMFOR study, this qualification mismatch does not lead the contractors to active searches for these competences. Thus, in conclusion, and answering to the question how contractors define their qualification demand, one could say, mostly they do not define their demand, and if they do so, they follow external "drivers" and incentives. The predominant view on competence development does not include middle-range or long-range scenarios and strategies, but – following a "hands-on culture" – brings demands for qualification in view if and when concrete problems arise. For the field of knowledge about occupational safety and health, such a problem could be an actual health problem bringing contractors towards to reflection, or it could be the "problem" of certification needs that leads to solutions – maybe in the form of attending OHS training.

Network maps and interviews allow for a detailed view into *the ways contractors acquire information they perceive as relevant*. As described above (section 5.3), personal communication seems to be the most important "knowledge transfer channel". With the exception of the Nordic countries, this means mostly directly business-related

contacts: employees and co-working family members, other contractors (depending on different learning cultures), clients, the machine distributor, suppliers. In most case studies, personal and hands-on communication and training (e.g. fairs and exhibitions) was preferred to study and knowledge transfer via internet or printed matter. This brings matters of trust and personal relations into view. Institutional structures like associations' help desks or training schools in most cases are not seen as preferred and important sources of information. This also can be interpreted as a preference for informal, maybe non-formal forms of learning about formal forms of learning.

We do not know in detail about *factors influencing "successful" knowledge transfer*. On the one hand, contractors seem to perceive knowledge transfer as successful if they see an improved work performance or other monetary benefits as result. On the other hand, from WP 1.1 as well as from WP 1.2 we know a lot about perceived barriers for training or study. Besides the quality of the training content and economical questions – direct and indirect costs of training – it seems necessary that the *context* of training fits the possibilities of the contractors (e.g. place and time) and that the *culture* of training is focused on practical use, exchange of information, "hands-on" knowledge. This brings forward the idea that variants of role modelling, coaching and collective learning could be a more successful way for "knowledge transfer" than traditional seminars and courses.

This also means that yes, there is a need to develop new methods for knowledge transfer, or rather, switch from thinking in the model of the "old learning culture" to ideas of the "new learning culture". This also means: it is not only important to think about "methods" and curricula of "training" or competence development in general, but also to think about factors that make competence development more attractive for forestry SMEs and brings the idea of active knowledge acquisition into the forestry contractors' culture.

6 Evaluation of the tools used in COMFOR

Before we come to recommendations and lessons learned (next chapter), we will have a look at the tools used in COMFOR and their evaluation. The project developed and adapted seven “tools”, i.e. materials (paper sheets, electronic documents in Excel) that could be used by contractors for monitoring economic and ergonomic aspects of their enterprise, thus helping them in the continuous development of the enterprise.⁴ Most of the tools should be usable without assistance. The tools have been tested with the COMFOR business partners and adapted for each participating country.

Looking at the definitions and concepts at the beginning of this text, we classify the COMFOR tools under “non-formal learning” (mostly in the way of personal learning activities, not as group activity). The tools clearly are focused on learning – using the tools, the contractors generate knowledge about their enterprises, and may find out where opportunities for improvement exist and how they may be approached. If the contractors use the tools for monitoring their enterprise, they do it with the intention to improve their business practice and their performance, thus self-learning with the COMFOR tools is definitely an intentional act of knowledge generation.

In general, the tools cannot be classified as “formal learning”, because even if some formal institutions (contractors associations, applied research institutions) were involved in the development and adaptation of the COMFOR tools, they are (at the moment) neither part of official curricula nor connected with institutional certifications. For some of the countries involved in COMFOR, this may change if/when such institutions include the use of the COMFOR tools in their further learning courses or OSH trainings.⁵ Whereas some of the tools (e.g. “sitting tool”) could become part of informal practices, in general the tools are used consciously, with specific goals in mind, but in a non-formal way.

At the last COMFOR project meeting on April 28/29, 2009, in Schöneck, Germany, reflections on the usability of the COMFOR tools and the experiences from the different partner countries took a big part of time. The meeting was also used for an evaluation using a short questionnaire (see below). Besides some of the COMFOR partner countries’ reports include information about the view of the tools from the perspective of their “end-users”, i.e. forestry contractors trained by the COMFOR partners. This in-

⁴ See <http://www.enfe.net/comforopen/comfor.htm> for more information about the seven tools and their use. The tools are: 1. Health & Performance, 2. Cost-Benefit Tool, 3. WORX for SMEs, 4. Skills-Check for Contractors, 5. Skills-Check for Operators, 6. Ergo-Check, 7. Sitting Tool. As an “umbrella” for the use of these tools in business practice, there is “the process” – a manual for the practical introduction of the COMFOR tools into the business workflow.

⁵ This could be the case in the Netherlands, where training in the use of the COMFOR tools could become part of the responsibility of the field personal of the insurance company, the “ErBo inspector”, and in Finland, where at least some of the tools will be included in the regular training activities by major players.

cludes Finland, France, Sweden and Poland. Summarising all these feedbacks, one could say, that most of the contractors trained in these countries found the training sessions on COMFOR tools useful and satisfying. The majority of the contractors trained said they won't use all the tools, but they will include at least one or two of them in their day-to-day business. On the other side, a point discussed in many country reports was the need to train contractors for using the COMFOR tools – they are not (or at least: not all of them are) self-explanatory and need some initial training or consultancy. All partners attending the project meeting were asked to fill out the COMFOR project evaluation survey; 17 partners participated. The survey included questions on the project as a whole, but also on the value and usability of the tools.

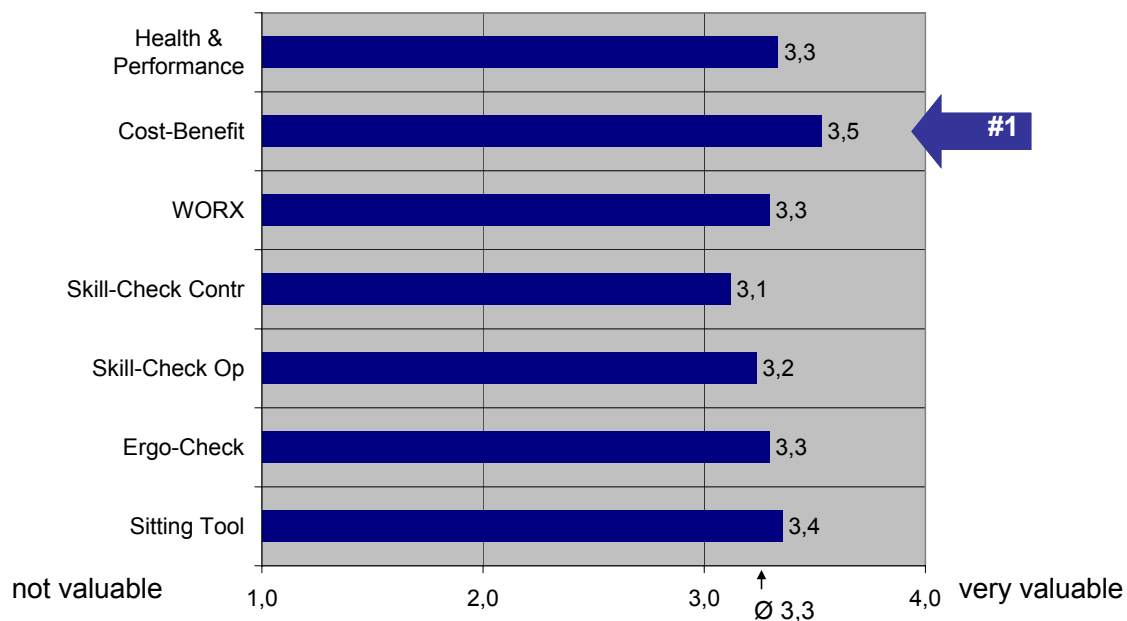


Figure 6: Are the tools developed in COMFOR valuable for contractors? (Results of Schöneck survey, Ø marks the average value)

Fig. 6 shows that all the tools developed and adapted in the process of the COMFOR project were rated as valuable by the participating partners, differences of ratings of the different tools were small. The average rating for all tools is 3.3 points (scale: 1.0 “not valuable at all” to 4.0 “very valuable”). The biggest value was ascribed to the economically oriented Cost-Benefit Tool (3.5), the lowest value was given for the Skills-Check for Contractors (3.1).

Even with the small number of participants, some trends could be seen when grouping the participants (SMEs, intermediate associations, research organisations). For example: The partner from SMEs in average rated the value of Ergo-Check higher than the other participants (3.6 vs. 3.3 points), and the value of the Health & Performance Tool lower than others (3.0 vs. 3.3 points). Partners from the East/Central country group rated the Cost-Benefit tool even higher than other partners (3.8 vs. 3.4 points), and the Skills-Check and Sitting Tools lower (3.0 vs. 3.4/3.5 points).

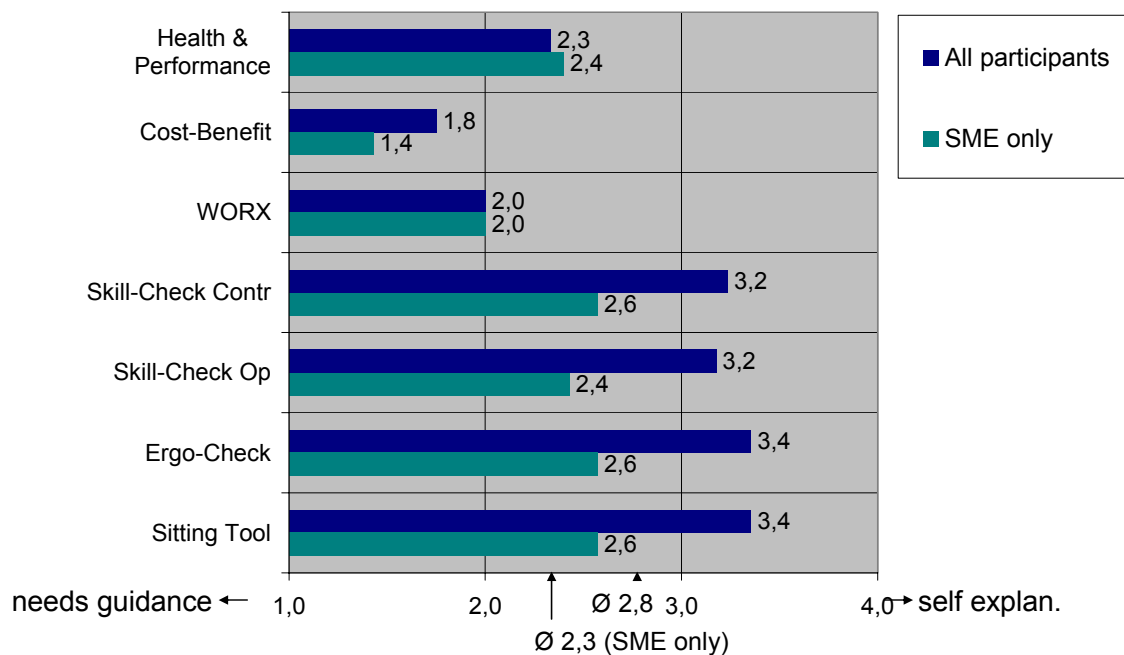


Figure 7: Are the tools developed in COMFOR usable “as-is” by contractors? (Survey results, Ø marks the average value, scale 1.0 “guidance needed” to 4.0 “self-explanatory”)

Whereas the high value of the tools is not contended, the usability of the tools “as-is” was rated very low by some partners for some tools (Fig. 7). Looking at the ratings from all participants (scale: 1.0 “guidance needed” to 4.0 “self-explanatory”), there is a clear difference between the first three tools (Health & Performance, Cost-Benefit Tool, WORX) and the other four tools (Skills-Check Contractor/Operator, Ergo-Check, Sitting-Tool). It seems that the rather simple, checklist oriented character of the latter four tools definitely makes them more usable “as-is”. But even these four tools were on average rated only as moderately usable without guidance by the SME partners (2.4 to 2.6 points). The lowest rating was for the Cost-Benefit Tool (1.4 points SME partners, 1.8 points all participants). The low usability rating emphasises that at least the first three tools cannot be used without proper training or guidance. This doesn’t make the tools less valuable; on the opposite, the Cost-Benefit Tool was rated as most valuable, especially by the SME partners.

We also asked in an open question for further remarks about the tools. The following remarks were mentioned most often:

- » Problems especially with cost-benefits or WORX, more simplification, validation etc. necessary (6 mentions)
- » Various positive remarks (friendly tools, excellent etc) (4 mentions)
- » Adaptation to motor-manual/machine-manual work necessary (3 mentions)

One participant also remarked that “a laptop/USB version and communication option should be provided”. It was also commented that the tools work best as systematic management package, and that not all of the tools are made for continuous use. Taken together, the ratings and remarks emphasise the rather high value that is ascribed to the different tools, but they also show the need for further simplification and adaptation, if the tools are to be used consistently “in the field” without guidance.

To conclude, the tools and the process developed in the COMFOR project were seen as valuable for contractors in the different partner countries. The economically oriented Cost-Benefit Tool is rated as especially valuable, but as difficult to use without further guidance. This leads to the final chapter, reflecting about the pedagogic techniques predominantly used in the COMFOR project –, paper-based or digital self-learning material for a non-formal mode of learning – and recommendations for further projects on learning and knowledge transfer with forestry contractors.

7 Recommendations

To start with, we find a vast variety of forestry contracting enterprises in Europe today: from the tiny owner-operator enterprise to the large service corporation with fifty employees and sub-contractors, while in many countries there is a majority of small and medium sized enterprises (SMEs). Tasks are ranging from manual and motor-manual work to highly mechanised operations in harvesting and other fields of work in forestry. These differently structured enterprises are embedded in very different socio-economic situations in the different parts of Europe, coming from specific histories. The differences include enterprises having staff with or without a formal education in forestry work. This variety is partly reflected in the COMFOR project by the structure of the ten participating SMEs.

The explicit goal of COMFOR is to contribute to competence development for this spectrum of enterprises, contractors and employees, in order to prepare them better in terms of performance and competition – not least with the help of ergonomic competence and a raised awareness for the costs and effects on performance linked to failing health and work related accidents. Given the differences in structure, background, socio-economical situation and personnel, it seems obvious that there can't be one way that is fitting for all.

Generally the forestry contracting sector has been named “difficult to reach” for a number of reasons (cf. Kastenholz/Lewark 2005; Kutzschenbach 2006a; Westermayer 2006). Evidently, these small scale enterprises are often found in difficult economic situations where they cannot and do not react to “education offers” easily. Also, the attitudes and the learning cultures of rural small-scale enterprises can be seen as barriers to successful knowledge transfer. The success of traditional courses and training institutions in the field of forestry contractors over the last 20 years was limited (cf. Morat 1998). These traditional courses refer to traditional thinking of education and training in *formal learning* settings: courses of basic education and continuing education given at these institutions leading to certificates. This has a place and will have also have a place in future, especially when the enterprises hire new employees and perhaps in a few cases when new tasks, operations or machines are coming up and the competences seem only be acquirable through traditional courses. But the role of traditional ways to acquire new competences will be rather limited. Occupational health and safety training will be part of these formal programmes. The biggest impact will be found in the basic vocational education programmes. With a growing importance of certification and prescriptions of vocational training obligatory to become a forestry contractor or an employee in a forestry contracting enterprise one can assume a growing role of formal learning. Therefore it is important and will become even more important to look at the training programmes of these institutions, especially regarding OSH training. The COMFOR tools can be used as teaching and learning material in formal learning settings, regarding economical knowledge as well as in relation to ergonomic questions.

The bigger challenge though probably lies in competence development for the staff with already some years of working experience. Their common attitude may be that they know their job and do not see a potential of further competence development. Why should they go for that? Who will inspire them? Whom will they trust? Who could give them exactly the expertise they may need? What would be the appropriate and accepted form of knowledge dissemination and achievement?

Under these circumstances focus on *non-formal modes of learning* instead of formal learning settings must be considered. These modes of learning have been central for COMFOR. The COMFOR tools are the result of a participatory development process, based on the trust and experience of forestry contractors. These tools can be used in formal learning settings, but in general they are developed for use as material for non-formal learning, i.e. for non-certified self-teaching, for learning with peers or in coached learning processes. The evaluation (chapter 6) showed that the ease of the process of development and of use of the COMFOR tools greatly varied. The more complex tools will need initial guidance. The contractors' associations and professional forestry personnel may bring the self-learning and self-monitoring tools to the attention of forestry contractors, demonstrate their use and help raise the awareness for the usefulness of the tools. Again this might not be done in the setting of a formal training institution, but rather at already existing places of non-formal learning – as a presentation on a forestry exhibition or fair, as part of technically oriented training sessions (e.g. combining of the QS Harvester programme and the COMFOR tools in Germany), or as an element of consultancy work by insurance companies' or forestry administrations' representatives or by contractors' associations.

In the previous chapters we found that main barriers for (OSH) training are the perceived or actual costs and the availability of training opportunities and their times and places. Because of these barriers OSH training may be more successful in a non-formal way. But even a good availability of sponsored training opportunities near to the contractor's place of work won't guarantee success. The same is true if we look at the prospects of e-learning: even if a forestry contractor's association actively and in a "loud" way would advertise the COMFOR tools, and even if we take into consideration that a website established for this purpose would be peer-optimised, the existence of the tools is only a necessary precondition, not a guarantee for success. This leads to the question of expected benefits and of OSH awareness. One possible solution could be formalisation – not by including OSH competence into formal learning programmes, but in the formal requirement of OSH competences (cf. Werquin 2007). Formal recognition becomes a driver for OSH training only if it is linked to other external drivers, for instance if formally recognised OSH competences would be required before a contractor could take part in bids for tender, or as part of forestry certification processes.

Such requirements would lead to an increasing demand for OSH training, but it would not guarantee a raise of awareness for OSH topics, or especially for the connection between performance and ergonomic measures. Using COMFORs Cost-Benefit-

Tool is one way to prove that OSH actually is linked to performance. Including OSH topics into courses, materials and training sessions that are perceived as highly beneficial – improving the economical performance – would be another way. In general, the idea of the “body as most valuable machine” could be a good metaphor for such a strategy to raise the awareness of the direct benefits of OSH.

So far, so good – but what could we say about *informal modes of learning*? We agree with the findings from literature on learning and knowledge transfer, that the tacit practices of everyday work are probably most important for the development of skills and competences. The high potential of informal learning is by far not recognised or exploited, certainly not by the COMFOR project, which did not specifically aim at informal learning. At the end of the project, we have to look further ahead: what are recommendations for learning and knowledge transfer beyond the scope of COMFOR? For the future the systematic development of ways to influence informal learning seems to be of outmost importance. There are at least two approaches that look promising for development of OSH competences in small-scale enterprises in the forestry sector.

One approach would focus on social networks or communities of practice (CoPs) (cf. Kutzschenbach 2006b): looking at the details of informal knowledge transfer in such networks, between peers. Coaching could link traditional modes of learning and informal learning – bringing everyday working and learning practices to a conscious level. Regarding OSH (and also regarding performance oriented contents of learning or knowledge transfer), such a strategy would aim not only at learning by example, but also at the raise of peer expectations for OSH standards. It also means to ask who could be the gatekeepers. The first approach for further development of informal competence transfer would use existing social networks and facilitate the formation of new social networks; to look how to establish and propagate norms and standards in such networks and in working groups (cf. Wolff 2004). The underlying hypothesis is that the strongest control of work practices comes from peers, that it is social control – either enforcing fast and sloppy work, or enforcing compliance with ergonomic standards.

The focus of a second approach could lie in the combined use of formal and non-formal OSH training on the one hand and informal practices on the other hand. The question would be how OSH monitoring and OSH training could become part of the unwritten routines of everyday working life. How can convince a contractor be convinced that ergonomic movements are part of every mid-day break? This includes the traditional question how e.g. machines could be designed in a way to enforce compliance with occupational health standards, but it reaches beyond ergonomics in a technical sense. OSH monitoring as part of everyday practices could also mean that a look at costs of illness can become integrated into financial checks. As with other social practices, the integration of such elements in the routines of working life is finally based on repetition – and, linking to the first approach, on the standards and expectations of peers. The “process” formulated in the COMFOR project (<http://www.enfe.net/comfor-open/comfor.htm>) may be a first step in that direction.

We conclude that the tools developed in COMFOR could find their place in formal learning in the institutions of initial and continuing training. In the project, they were mainly treated as parts of non-formal modes of learning. Here, and even more in informal learning, it would be necessary to emphasise not only defining of relevant contents and development of the corresponding tools, but also to think about ways for enhancing the social acceptance and making such ideas parts of every-day routines .

8 Summary

In this report we present the current state of understanding and practice in the field of competence development and knowledge transfer in the forestry operations sector, especially with regard to occupational safety and health. We discuss various approaches on learning, education and knowledge transfer. We examine the learning conditions of forestry contractors in three different regions (Northern Europe, West Central Europe, East Central Europe), and we come to conclusive recommendations regarding factors influencing “successful” knowledge transfer. This report builds upon a number of existing working papers and presentations, as well as discussions at the COMFOR project consortium meetings.

Evaluating the literature on concepts of learning and knowledge transfer, we distinguish between different modes of learning (formal, non-formal, informal) and discuss knowledge management, role modelling, (new) learning cultures and communities of practice. These are important concepts in the current academic discourse on learning. In regard to an outcome oriented educative approach, and in discussion with the COMFOR project participants, some of the general conclusions from this, relevant to COMFOR, include

- » the importance of taking pre-existing knowledge, learning cultures and expectations in forestry SMEs into account;
- » the role of contractors in the COMFOR project not as passive recipients, but as active co-creators of the learning process;
- » the role of the RTDs in the COMFOR project as moderators and experts, not as “knowledge producers”;
- » focusing on collective approaches, coaching, self-learning and in general on less formalised ways of learning.

Looking at the state of the education and training practice in forestry operations SMEs, we could build upon earlier studies and projects (especially ENQuaFor and ErgoWood). Their results are enriched by empirical data from the COMFOR project itself. Six main barriers reducing training attendance by forestry contractors and their employees were identified: 1. the role of indirect costs of training (production loss); 2. doubts about the quality and content of training; 3. doubts about the actual economic benefits of training; 4. problems of access to and availability of training courses at adequate times and places; 5. the direct costs and 6. bureaucratic barriers. We discuss different strategies to overcome these barriers. In short: training should take place at times and places with high availability to contractors, there should be a way to fund it, but most important of all, the content should be aimed at bringing real benefits to contractors. Incentives to raise training attendance could include 1. certification and the inclusion of training cer-

tificates in bids for tender; 2. more generally: legal or economical enforcement, i.e. demands for certified competences by “big players” in the field; 3. incentives building on the own interest of the contractors.

Looking especially at occupational health and safety (OSH) courses, one can find a gap between supply of courses and actual participation. At the moment, most contractors are not intrinsically motivated to participate in OSH training. Action in regard to OSH takes place only if there are external requirements, or after actual health problems become visible. One could say that the fundamental problem of OSH training in this field can be found in the social situation – only if the network of peers and colleagues actively expects a commitment to OSH (and continuous training in this field), an actual raise of awareness for OSH benefits might be achieved. This result fits with the results from mapping the social networks involved in learning in the different regions – personal contacts are more important as sources of information than published sources (magazines, internet) or institutional training courses. This can be interpreted as a preference for informal and perhaps non-formal modes of learning.

The conclusion from the empirical material is that besides the barriers mentioned, the “channels” for successful “knowledge transfer” should be compatible with the contractors’ learning culture and the situational context. This means focusing on actual benefits, practical experience and the “hands-on” exchange of knowledge. Thus forms of role modeling, coaching and collective learning should be expected to work better as ways for “knowledge transfer” in general than formalised modes of learning like traditional courses. These results match the expectations distilled from the literature review.

Finally, we looked at the “products” of the COMFOR project. We found that these tools are in general perceived as useful, but that some tools need external guidance to be used. There is a need for further simplification and adaptation. Also the question how these self-learning and self-monitoring tools could be integrated into the operational routines of forestry contracting enterprises still remains open. Two strategies answering this question – i.e. the question of making better use of informal learning – could be either further working for building social networks, peer pressure and facilitation of informal learning processes or place emphasis on the formation of every-day routines and the role of informal learning.

The tools that are the “products” of COMFOR were seen mainly as parts of non-formal modes of learning in the project. They could become part of formal learning in institutions of initial and continuing training, and they also could become integrated into every-day practices, i.e. informal learning. These connections between the COMFOR tools and their contents on one side, and the modes and cultures of learning on the other side will be challenges for further development and research of highest importance.

9 Deutschsprachige Zusammenfassung

In diesem Arbeitsbericht stellen wir den Wissensstand und den Stand der Praxis in den Bereichen von Kompetenzentwicklung und Wissenstransfer in kleinen und mittleren Unternehmen (KMU) der Forstwirtschaft vor. Der inhaltliche Schwerpunkt liegt dabei im Themenfeld Arbeitsschutz und Gesundheit. Dazu wurden verschiedene theoretische Ansätze zu Lernen, Weiterbildung und Wissenstransfers diskutiert und die Lernbedingungen für Forstunternehmer in drei Regionen (Nordeuropa, westliches Mitteleuropa, östliches Mitteleuropa) untersucht. Damit lassen sich Handlungsempfehlungen für einen erfolgreichen Wissenstransfer ableiten. Dieser Arbeitsbericht basiert auf Diskussionsbeiträgen und Vorträgen im Rahmen der Arbeitstreffen des COMFOR-Projekts.

Aus der Literatur zu Lernkonzepten und Wissenstransfer heraus kann man verschiedene Lernmodi (formell, nicht-formell, informell) und übergreifende Konzepte (Wissensmanagement, Vorbildlernen, Lernkulturen, „communities of practice“) ableiten, die für die hier vorliegende Untersuchung ebenso wie für den gegenwärtigen akademischen Diskurs zu Lernprozessen relevant sind. Aus diesen Ansätzen lassen sich – im Hinblick auf die praxisorientierte Perspektive des COMFOR-Projekts – aufgrund der Diskussionen mit den ProjektteilnehmerInnen einige grundlegende Schlussfolgerungen ableiten, die für das Projekt COMFOR relevant sind:

- » Es ist wichtig, die in forstlichen KMU vorhandenen Wissensbestände, Lernkulturen und Erwartungen zu berücksichtigen.
- » Forstunternehmer dürfen im COMFOR-Projekt nicht als passive „Empfänger“ von Wissen gelten, sondern müssen als aktive Ko-Produzenten des Lernprozesses betrachtet werden.
- » Ebenso sind die Forschungseinrichtungen im COMFOR-Projekt eher Moderatoren und Experten, nicht jedoch „Wissensproduzenten“.
- » Das Projekt muss auf gemeinschaftlichen ausgerichtet werden, „coaching“ und selbstständiges Lernen berücksichtigen und insgesamt eher weniger formelle Formen des Lernens bevorzugt behandeln.

Um Aussagen über die aktuelle Weiterbildungssituation in forstlichen KMU zu treffen, wurde auf frühere Projekte zurückgegriffen. Zu nennen sind hier insbesondere ENQuaFor und ErgoWood. Die Ergebnisse dieser Projekte konnten mit empirischen Daten aus dem COMFOR-Projekt ergänzt werden. Wir konnten sechs zentrale Hürden identifizieren, die die Häufigkeit senken, mit der Forstunternehmer und deren MitarbeiterInnen an Weiterbildungsveranstaltungen teilnehmen. 1. Ausfallkosten (d.h. indirekte Kosten durch Arbeitsausfall während der Weiterbildung); 2. Zweifel an der Qualität und an der Relevanz der Inhalte der Maßnahmen; 3. Zweifel am tatsächlichen ökonomischen Mehrwert, der durch eine Teilnahme erzielt werden kann; 4. Schwierigkeiten beim Zu-

gang zu Veranstaltungen (Angebot, zeitliche und räumliche Aspekte); 5. direkte Kosten der Teilnahme an Maßnahmen; 6. bürokratische Hindernisse. Strategien, um diese Hürden zu überwinden, müssen sich vor allem darauf beziehen, dass Veranstaltungen zu Zeiten und an Orten stattfinden, die für Forstunternehmer leicht zugänglich sind. Es muss Möglichkeiten geben, die entstehenden Kosten auszugleichen, und – am wichtigsten – der Inhalt der Weiterbildungsveranstaltungen muss darauf ausgerichtet sein, einen tatsächlichen ökonomischen Mehrwert für die Forstunternehmer zu ermöglichen. Anreize, um an Veranstaltungen teilzunehmen, können in drei Richtungen gehen: 1. Zertifizierungen über die erfolgte Weiterbildung, die bei der Teilnahme an Ausschreibungen nachgewiesen werden; 2. d.h. genereller gesprochen: rechtliche oder marktgesteuerte Erzeugung einer Nachfrage für Weiterbildung, etwa dadurch, dass „big players“ Zertifikate über bestimmte Kompetenzen sehen wollen; 3. Anreize, um das Eigeninteresse der Forstunternehmer zu steigern.

Die Teilnahme an den angebotenen Kursen zu den Themen Arbeitsschutz und Gesundheit ist gering. Momentan gibt es bei den meisten Forstunternehmern kaum eine intrinsische Motivation zur Teilnahme an Arbeitsschutz-Weiterbildungen. Erst wenn externe Zwänge auftreten, oder konkrete Gesundheitsprobleme sichtbar werden, steigt das Interesse an derartigen Kursen. Ein steigendes Bewusstsein für die Bedeutung von Arbeitsschutz und Gesundheit wäre erst dann anzunehmen, wenn aus dem jeweiligen sozialen Netzwerk von Forstunternehmern – beispielsweise von Kollegen – deutliches, kontinuierliches Interesse, an Arbeitsschutz und Gesundheit erwartet wird. Derzeit sind eher entgegengesetzte Wirkungen zu beobachten. Gleichzeitig passt Die Relevanz des sozialen Netzwerks für Lernprozesse bestätigen die Ergebnisse, die wir aus „Netzwerkarten“ entnehmen konnten, die Forstunternehmer aus unterschiedliche Regionen erstellt haben: persönliche Kontakte werden als wichtigere Informationsquellen gewertet als Veröffentlichungen (Druck, Internet) oder institutionalisierte Weiterbildungsmaßnahmen. Wir deuten dies als Präferenz für informelle, möglicherweise auch für nicht-formelle Formen des Lernens.

Aus diesen empirischen Ergebnissen lässt sich die Schlussfolgerung ziehen, dass es neben dem Überwinden der genannten Hürden vor allem darauf ankommt, „Kanäle“ für den „Wissenstransfer“ zu wählen, die zu den vorhandenen Lernkulturen und Kontexten passen. Das bedeutet beispielsweise, sich auf den tatsächlichen Nutzen, praktische Erfahrungen und einen am konkreten Beispiel erfolgenden Wissensaustausch zu konzentrieren. Entsprechend ist zu erwarten, dass Lernen von Vorbildern, Coaching und kollektive Strategien hinsichtlich des „Wissenstransfers“ besser funktionieren als formalisiertere Vorgehensweisen.

Diese Ergebnisse werden abschließend in Beziehung zu den „Produkten“ des Projekts diskutiert. Die im Projekt COMFOR entstandenen „Tools“ werden zumeist als nützlich empfunden, einige sind allerdings recht kompliziert und kommen nicht ohne externe Hilfestellung aus. Entsprechend gibt es einen Bedarf für weitere Vereinfachungen und Anpassungen an die jeweilige regionale Situation. Gleichzeitig bleibt offen, wie

diese an Selbstlernen und „Selbst-Monitoring“ orientierten Tools am besten in die betrieblichen Routinen forstlicher Dienstleistungsunternehmen integriert werden können, um durch informelle Lernformen unterstützt zu werden. Strategien, um dieses Ziel zu erreichen, können entweder am sozialen Netz als „Lerngemeinschaft“ ansetzen oder bei der Untersuchung der Entstehung und Festigung von alltäglichen Routinen.

Die aus dem Projekt COMFOR heraus entstandenen Tools lassen sich vor allem dem Modus des nicht-formellen Lernens zuordnen. Sie eignen sich auch zur Einbettung in formelle Lernformen in Institutionen der Aus- und Weiterbildung. Genauso könnten sie aber auch in alltägliche Arbeitsabläufe integriert werden, also Teil informeller Lernprozesse werden. Diese heute noch offenen Verknüpfungen zwischen den „Tools“ und ihren Inhalten und den unterschiedlichen Lernformen und Lernkulturen stellen eine bedeutende Herausforderung für weitere Forschungs- und Entwicklungsprozesse zum Themenfeld Lernen und Wissenstransfer in forstlichen KMUs dar.

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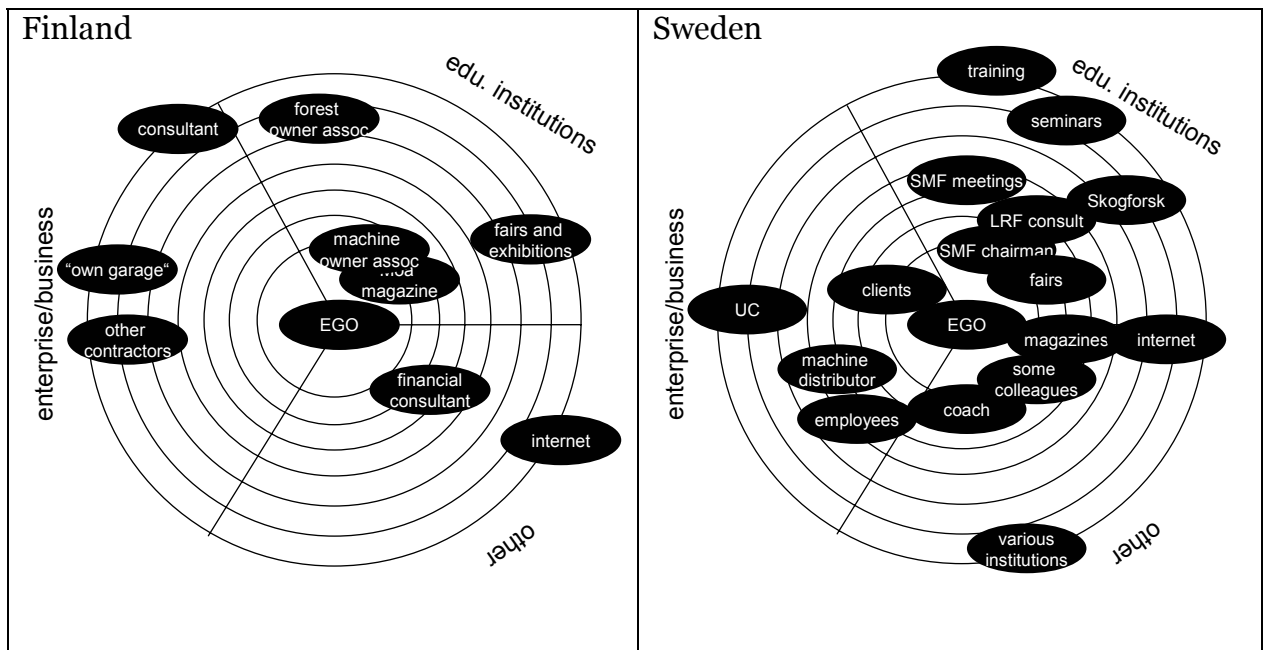
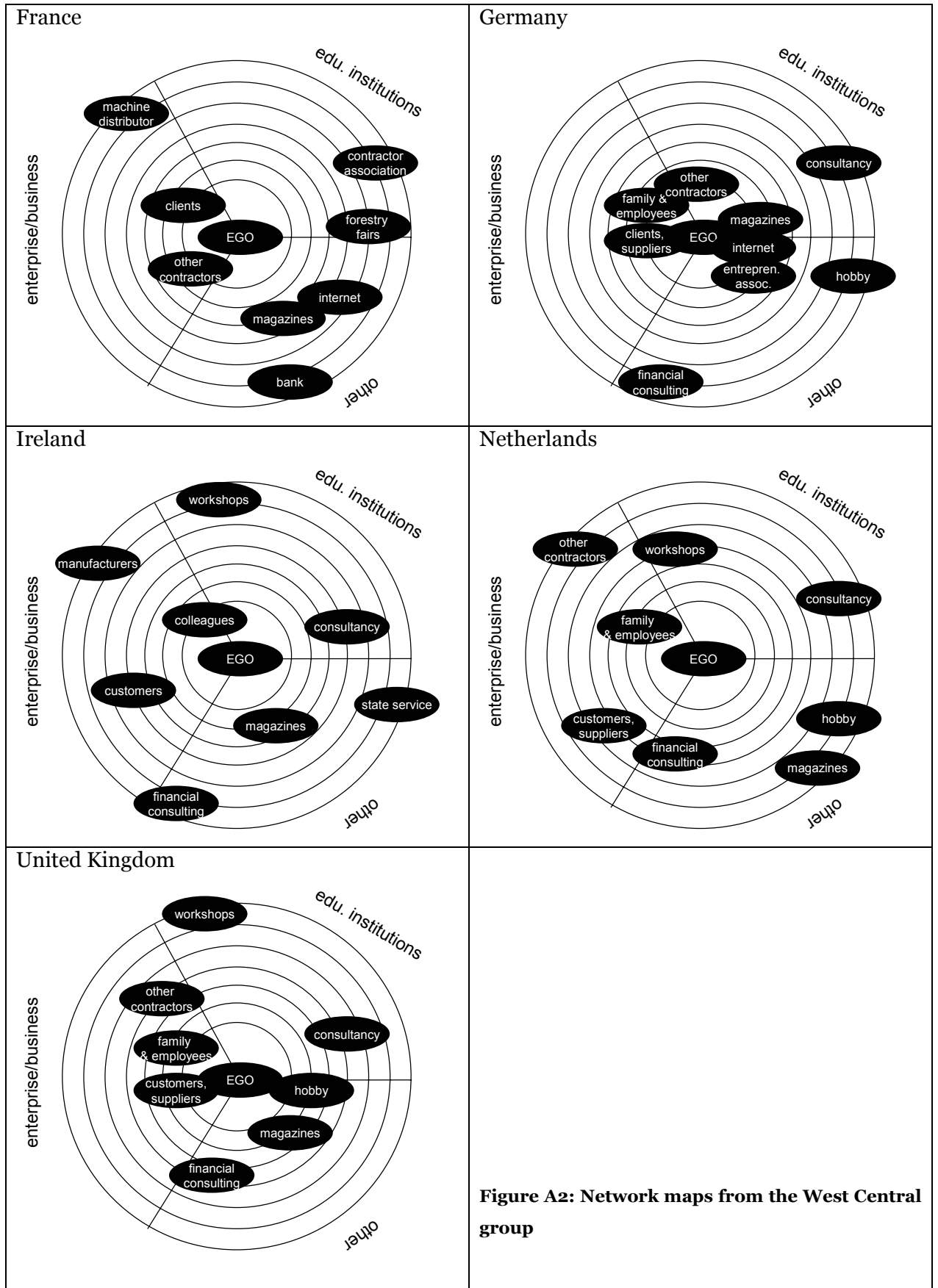


Figure A1: Network maps from the Nordic countries



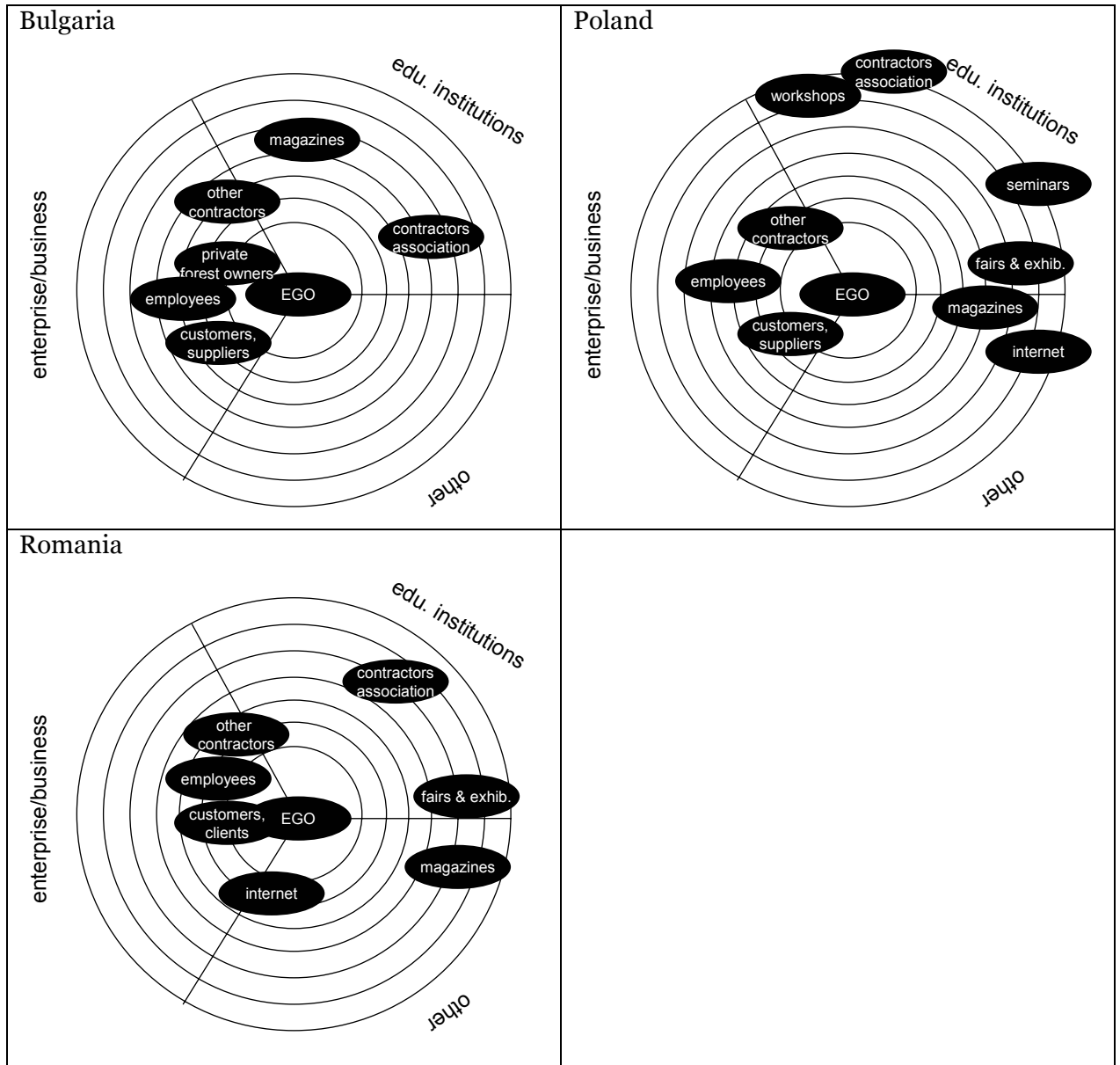


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