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Mika Rekola[1], Jaakko Nippala[2], Päivi Tynjälä[3] and Anne Virtanen[3]

Modelling competences and anticipating the future competence needs in the forest sector

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Highlights

- The most frequently used practices of modelling competences in Finnish forest sector organisations were superior-subordinate review discussions and quantitative surveys.
- Competence modelling was used for several human resources functions but surprisingly not for hiring and compensation.
- The experts interviewed underlined the need for generic competences in the future, especially they highlighted the importance of information processing and personal self-management skills.

Abstract

This explorative study examined practices of competence modelling in the forest sector organisations and how organisations anticipate changes in competence needs in the future. Semi-structured in-depth interviews (n=10) were conducted amongst forest sector experts in Finland and data was analysed by thematic analysis. The findings showed that the practices of modelling competences were diverse, most frequently used ones being superior-subordinate review discussions and quantitative competence surveys. In addition to these formal systems, informal modelling, especially on the team level and in smaller companies was also frequent. Organisations used competence modelling for several human resources functions, such as appraisal, motivation and promotion of employees. Surprisingly hiring and compensation functions were not mentioned. Perceptions related to competence modelling were generally speaking positive. The most important challenges were the lack of further actions and sometimes the extraordinary burden to the employees. When anticipating the future, the experts interviewed mentioned several commonly recognised trends, e.g., development of information technology, fragmentation of working life and structural changes in labour markets. All these require more generic competences related to information processing and personal self-management, especially respondents highlighted the importance of self-awareness skills. It is concluded that several useful practices for competence modelling already exist and that present study provides a basis for further quantitative further study.

Keywords competence modelling; human resources; forest sector; work life; future needs
Addresses [1]Department of Forest Sciences, University of Helsinki, P.O. Box 27, FI-00014 University of Helsinki, Finland, [2]Suomen Partiolaiset – Finlands Scouter ry, Töölönkatu 55, FI-00250 Helsinki, Finland, [3]Finnish Institute for Educational Research, P.O. Box 35, FI-40014 University of Jyväskylä, Finland
E-mail mika.rekola@helsinki.fi
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1 Introduction

Forestry and forest industry has been going through transformation from traditional product orientation towards service and customer oriented business models (Toppinen et al. 2013). This transformation together with the emerging bioeconomy are setting new demands for the competences relevant in the forest sector (European Commission 2012; Holm et al. 2017). Competence can be defined as "a combination of knowledge, skills and attitudes appropriate to the context" (European Communities 2007). Furthermore, different actors are increasingly facing pressures on taking into account various stakeholder needs and demands. Nowadays the work of forest professionals is more dealing with people than with just trees, thus they need to manage with the expectations of the general public more than before (Rekola et al. 2010; Sample et al. 2015). Emerging technologies and changes in the nature of work are also posing challenges for developing competence, which stresses the need to build the human capacity to support this development (Piva et al. 2005). Some competences will become less relevant, while others will become more important in the future, for instance, communication and time management skills. These skills have many labels such as key, soft, generic or general, cross-job or transferable, or 21st century skills (Hejke et al. 2003; Tynjälä et al. 2006; García-Aracil and Velden 2008; Andrews 2008; Trilling and Fadel 2009; Binkley et al. 2012; van Laar 2017). The increased need of these skills has been recognised in the forest sector as well (Schuck 2009; Kilpeläinen et al. 2014; Sample et al. 2015).

A hot topic in the forest sector is how organisations in the field are dealing with the change. Which kind of tools they have to manage competences? Do they somehow model competence needs and take proactive actions to meet future challenges? From the organisational perspective, competences can be seen as part of organisations strategy and success. According to the resource-based view of the company, competences are part of intangible assets and they can work as a way to achieve sustained competitive advantage over competitors (Barney 1991; Galbreath 2005; Lähtinen et al. 2008). This view endorses the modelling and management of competence since the organisations have a direct gain from the results (Draganidis and Mentzas 2006; Armstrong and Taylor 2014).

Campion et al. (2011) divide competence modelling into three parts: analysing competency information (identifying competences), organising and presenting competency information, and using competency information. In the forest sector, research on competence modelling, consisting of all the three components is a new theme and as far as we know, earlier studies about how modelling is used in this sector are not available. Therefore, the nature of the present study is exploratory. The aim was to describe competence modelling practices and find out future competence needs from the organisation´s point of view. In more detail, the following research questions were guiding the study:

1. What kinds of practices are used to model competences in the forest sector organisations?
2. How the modelling of competences is perceived in the organisations?
3. What kind of future challenges and trends are forest sector organisations experiencing, and what kind of competences they expect for meeting the challenges?

The study is based on the following theoretical starting points: the concept of competence, the modelling of competences and their reflections in the forest sector. What follows is a conceptual review and introducing data and methods. After results and discussion some conclusions are drawn.

2 Conceptual framework of the study

2.1 Concept of competence

There are several definitions about the concept of competence, and the debate of different meanings is widespread (Boyatzis 1982; Dubois 1993; Spencer and Spencer 1993; Fleishman et al. 1995; Green 1999; Le Deist and Winterton 2005; Hogg 2008; Mulder et al. 2009; Mäkinen and Annala 2012). For example, Weinert (2001) distinguishes nine theoretical approaches to competence, and Mulder et al. (2007) divide competence research in three traditions, each of which include a variety of definitions. In their review Mulder and his colleagues (2007) conclude that the concept of competence is multidimensional, and that the specific use of the concept depends on the context of the users.

European Commission defines competence as "a combination of knowledge, skills and attitudes appropriate to the context" (European Communities 2007). This can be seen quite similar to widely used KSAO model: a Knowledge, Skill, Ability, and Other characteristics that is needed for effective performance in the jobs in question (Green 1999; Schippmann et al. 2000). The only difference is that while the former mentions attitudes the latter includes ability in the definition and the miscellaneous class of other characteristics, which may include attitudes. Both stress the context in general or more specifically the requirements of work places.

In this study we assume that competence consists of skills, knowledge, abilities and other relevant characteristics specific to a certain field and job. We also emphasise that although these elements of competence can be analytically separated, in high level competence they are tightly integrated and fused into each other (Tynjälä et al. 2016). Thus, we see competence as a holistic phenomenon.

The contents of competence can be classified roughly into two: subject specific and generic competences (Allan 1996; Delamare and Winterton 2005). Subject specific competences are often labelled as technical or domain specific competences (Tynjälä and Newton 2014; Sample et al. 2015; Tynjälä et al. 2016). Examples of forest related subject specific competence areas are silviculture, forest policy and wildlife management. Generic competences, in turn, are often described as "soft", or "transferable" skills that may be common to a variety of disciplines or occupational fields. However, there has been criticism against this view with the argument that so called generic skills such as communication skills are context and field specific in nature and appear differently in different kind of jobs (Jones 2009; Krause 2014).

One of the main theoretical differences among the definitions is the divergence between the concepts of *competence* (plur. competences) and *competency* (plur. competences). The meaning of the former is typically underlying characteristics of an individual, which are causally related to effective or superior performance in a job. This is the output view of the concept (Hooghiemstra 1992), whereas the latter one emphasises the potential and characteristics of the employee (Hogg 2008). These characteristics need a certain type of working context to be expressed so that we may say this definition has to focus on the process of being competent (Boyatzis 1982). All the definitions can be thus categorised into three particular approaches: (1) a work-oriented approach, (2) a worker-oriented approach, and (3) a multidimensional approach (Horton 2000). In this study the emphasis is multidimensional; in the following we use the term competence but it may refer to both ideas of competency and competence.

2.2 Competence modelling

Competence modelling is a part of human resource management (HRM), and it has been studied under the umbrella of HRM studies (Redman and Wilkinson 2013; Armstrong and Taylor 2014). According to Campion et al. (2011) the concept of competence model is some 20 years old. It refers to set of competences that are needed for effective performance in the particular job (Green 1999; Campion et al. 2011). The individual competences, such as knowledge, skills, abilities, and other characteristics (KSAOs) that are needed in a particular job are typically referred to as the competence model.

The act of constructing competence models can be labelled as competence modelling. Campion et al. (2011) provides a best practices competence modelling guidance with three topic areas. First, *analysing competency information* (identifying competences) should cover for instance the analysis of the company context and earlier competence models and performing a job analysis to develop relevant competences. In this phase surveys or observation studies are made in order to explore the important competences related to the jobs under examination. Second, *organising and presenting competency information* includes for example a definition of proficiency levels for competences and generic (cross-job) and technical (job-specific) competences, using competence libraries, and using diagrams, pictures, and heuristics to communicate competence models to employees. Third, *using competence information* covers wide range of aspects, on the one hand how to use competence models in HRM and developing organizations ,and on the other hand how to use information technology and other tools to maintain competence models.

As an example of organising and presenting competence information is shown in Table 1. The competence name "Project management" is in the first line. Just below the name is the competence definition: "project management is the art of creating accurate and effective schedules…". Below the competence definition there are proficiency levels describing behaviour related to demonstrated level of mastery. For instance, level 1, being the lowest level of proficiency, shows that one "identifies risks and dependencies and communicates routinely to stakeholders". Levels of proficiency are additive so that level 2 includes all that is included in level 1. Related to risk management behavior level 2 includes the following description: "develops systems to monitor risks". The highest proficiency, level 4, includes in addition to levels 1, 2, and 3 the definition "proactively identifies implications of related internal and external business conditions to risks and dependencies".

Table 1. The structure of competence model (modified from Campion et al. 2011).

Project management. Project management is the art of creating accurate and effective schedules with a well-defined scope while being personally accountable for the execution and invested in the success of the project. People who exhibit this competency effectively and continuously manage risks and dependencies by making timely decisions while ensuring the quality of the project.

Proficiency level 1	Identifies risks and dependencies and communicates routinely to stakeholders. Appropriately escalates blocking issues when necessary. Understands project objectives and expected quality. Champions project to stakeholders and articulates business value.
Proficiency level 2	In addition to level 1 Develops systems to monitor risks.
Proficiency level 3	In addition to level 1 and 2 Anticipates changing conditions and impact to risks and dependencies.
Proficiency level 4	In addition to level 1, 2 and 3 Proactively identifies implications of related internal and external business conditions to risks and dependencies.

Campion et al. (2011) state that methods for competence modelling are heterogenous and not always rigorous. However, the traditional job analysis methods can allow for a robust approach to competence modelling. These methods include observations, interviews, focus groups, and surveys (Parry 1996; Lucia and Lepsinger 1999; Rodriguez et al. 2002). The study by Arevalo et al. (2010) is an example of forest sector competence modelling using quantitative surveys, the instrument including traditional Likert scale, whereas a qualitative method, Behavioural Event Interview (BEI) represents a unique approach to competence modelling. The essence of BEI is highly in-depth interviewing process concerning employees' successes and failures in their working life (McClelland 1973, 1998).

2.3 Competence modelling in forestry sector

The classification of competences into subject specific and generic has been widely used in forest sector (Arevalo et al. 2010). It is evident that the changes of forest sector have had impacts on the measurement of both these classes of competences. Subject specific competences have evolved along time based on technological change, for instance, manual timber procurement has smaller role today compared to work made with felling machines (Uusitalo 2010).

The raising importance of generic skills in forest sector working life has been seen for a long time in competence studies (Barrett 1953; Arevalo et al. 2010; Sample et al. 2015). One of the major findings has been the fact that there is a need to have more training for generic competences such as communication, ethics, teamwork and leadership (Barret 1953; Miller and Lewis 1999; Sample et al. 2015).

The reasons for the importance of generic skills today can be seen from the contextual changes of forest sector. Forestry and forest sector has gone through a transformation along with social, economic, and technological drivers such as digitalisation and globalisation. More forest specific contexts for competence needs are bioeconomy and corporate social responsibility. Bioeconomy is about resource-efficient and sustainable use of natural resources. It is aiming to skills related to innovativeness and low-emissions economy, the sustainable use of renewable biological resources for industry, while ensuring biodiversity and environmental protection (Hetemäki and Mery 2010; Nikolakis and Innes 2014; European Commission 2012). Corporate social responsibility urges skills dealing with people and need to manage with the expectations of the general public. This calls for generic competences such as communication and networking competences more than before (Mikkilä and Toppinen 2008; Schuck 2009; Rekola et al. 2010).

3 Data and methods

3.1 Collection of the data and analytic methods

The purpose of this explorative study was to examine competence modelling practices and competence needs in the forest sector according to the three research questions set. While the main approach of the study is inductive, certain theoretical frameworks guided the research so that approach of the study in general can be described as combining inductive, deductive and abductive approach where data driven observations and theory driven conceptualizations interact (Tavory and Timmermans 2014). Because the nature of this study was exploratory, that is, no earlier studies on the forest sector competence modelling was identified; it was necessary to gain a preliminary picture of the current situation through in-depth expert interviews. The overall goal was to gain as representative picture of Finnish forest sector as possible. However, because in-depth interviews

Table 2. The characteristics of respondents in the data.

Respondent	Title or field of expertise	Size of organisation	Business
Interviewee 1	Development (R&D)	500+	Governmental
Interviewee 2	Marketing, responsibility	50–100	Consulting
Interviewee 3	Resource management	500+	Sawmill
Interviewee 4	Administration, HR	500+	Governmental
Interviewee 5	CEO	10–20	Consulting
Interviewee 6	Sustainability management	500+	Forestry
Interviewee 7	HR	500+	Pulp and paper
Interviewee 8	IT-manager	30–50	Consulting
Interviewee 9	HR	30–50	Governmental
Interviewee 10	Counsellor	30–50	Governmental

have unavoidably a small sample size, it is clear that data cannot fully cover in detail the Finnish forest sector.

All of the study aims, especially second and third ones called for a sample which represents a wide perspective of business expertise. For instance, the third aim related to study future challenges and trends that forest sector organisations are experiencing, set a need for wider sample outside the pure HR people. Furthermore, smaller companies typically have no pure HR or development professionals. The target group was thus HR and/or development professionals in various organisations. The emphasis was given in the distribution of respondents around the most influential organisations, different sizes of organisations, and private/public sector background.

Data was collected through semi-structured in-depth interviews of ten representatives of different forest sector organisations in the fall 2014 in Finland. Respondents were recruited from the workshops organised in October 2014 on the subject of further education and lifelong learning in the field of forest sciences. Some respondents were also recruited through researchers' own networks. The diversity of expertise was large and titles varied from IT-manager to CEO. There were three pure HR professionals and one development professional. Both governmental (4) and private (6) organisations were represented. Out of 10 respondents two came from small and medium-sized organisations (Table 2).

The interview length varied between 30 minutes to one hour. Questions centred on the following main themes related to the research questions: (1) What methods and practices of competence modelling respondents know and what is their attitudes towards them. (2) How do forest sector organisations perceive the elements of competence; and (3) The future of work life in the forest sector and competences needed.

The respondents were allowed to freely elaborate their opinions and thoughts about the topics. The questions described in the interview protocol (Table 3) were used to loosely guide the interviews whenever it was needed to ensure the flow of the conversation.

First the interviews, all made in Finnish language, were transcribed and then reviewed. To ensure the accuracy of the transcribing process, random segments (1 minute each) of the interview recordings were selected and double checked against the transcribed text. Thematic analysis was used to analyse the data. Thematic analysis is performed through coding the material in phases to create meaningful patterns. The different phases of the analysis are: familiarisation with the data, generating initial codes, searching for themes among codes, reviewing themes, defining and naming themes, and producing the final analysis (Auerbach and Silverstein 2003). The software used for the analysis was Atlas TI version 7.

Table 3. Interview protocol. Main themes and guiding questions used during the interview.

Main themes	Guiding questions
Beginning	What skills have been most important to you in your daily work life? Try to describe your work day five years from now: What skills do you need during the day? How do these occur at your work day? How has work in your organisation changed?
Methods and practices of competence modelling in the organisation:	Does your organisation use any form of competence mapping? How is your organisation measuring skills? How are the results taken into account? Have you ever done skills assessment at any stage?
The elements of competence and skills important for working life:	General skills have been emphasized in earlier surveys about important skills in the forest sector. Can you give examples of general skills relevant to practical working life based on your own experience? Can you give an example of practical working life situation where general skills are needed? Where and how did you learn these skills? How would it be possible to measure general skills? What do these (general) skills include? Can you describe what the above-mentioned skills mean for practical working life? (you can choose as many as you want)
Attitude towards competence measurement:	Does it make sense to measure competence and does it benefit the organisation? How do you measure and map competence needs at your workplace / work? What kind of information does competence measurement give you? How are the results obtained utilized?
The future of work life in the forest sector and competences needed	What specific forest sector related skills should be taught at the university? What should be taught in general? How important is earlier work experience for a new recruitment? How could the link between the working life and the university be improved?

Coding was basically data driven in a sense that the codes were not predefined, but they emerged from the data. However, when a theory-resemblance was recognised in the data the code was named after the corresponding theoretical concepts. Both Finnish and English language were used in the name of codes. The frequency of the codes was also calculated and the overlap examined. The themes derived from either theory or emerging from the data were coded as families (super-codes) in Atlas TI. Initial codings were put together in the following coding families: competence modelling, generic competences, subject specific competences, and future needs. These families were used as search criteria when reports of all quotations for these families were produced.

At the first phase of the analysis coding, searching for coding families and producing final analysis was conducted independently by two researchers. After that the initial results were discussed in the research group and modifications needed were made. The purpose was to collaboratively produce the categories. This kind of group approach to data analysis makes it less likely that the analysis will stop partway (Bowden 2000; Kettunen and Tynjälä 2018). The final results reported here are thus based on researcher triangulation approach. In this kind of approach computing inter-rater reliability is irrelevant because the idea is to produce shared understanding of the outcome rather than compare individual interpretations (Smith and McGannon 2017). Finally, quotations from the individual interviews were selected for illustrating the findings and

providing examples. The translation of quotations from Finnish to English were made by authors. The principle of translation was to keep the original content and style untouched.

4 Results

In the following sections, the results are organised according to the research questions: first, what kinds of practices are used to model competences in the forest sector organisations?; second, how the modelling of competences is perceived in the organisations?; and third what kind of future challenges and trends are forest sector organisations experiencing, and what kind of competences they expect for meeting the challenges?

4.1 Practices of competence modelling

Four different themes emerged related to practices of competence modelling: 1) specific methods used, 2) identifying competences, 3) organising competence information, and 4) use of competence modelling.

4.1.1 Specific methods

The most often mentioned methods of competence modelling were *review discussions* between employees and the superior. All of the respondents mentioned this practice and all of the organisations represented were using it. *Quantitative competence surveys* were the next frequently mentioned (four out of ten).

Respondents considered the two aforementioned practices being as complementary to each other. Quantitative surveys often provided background information for the review discussions. In addition to these two main methods also informal competence modelling was found important especially on the team-level and in smaller organisations. Informal modelling means, for example, observations during every day work, coffee table discussions and so called "tacit knowledge" about what kind of skills certain people have and what are their strengths. Communication was regarded essential in regards to recognising skills in an informal way:

"We are a pretty small group and we talk with each other quite a bit… Who can do this, who knows some specific language and who knows how to answer to a very specific area? This is the organisations own memory and tacit knowledge. And then measuring it, maybe it feels for us very bureaucratic." (Respondent #2)

"We try to talk with the employees as much as possible and that we try to figure out their strengths and weaknesses." (Respondent #5)

4.1.2 Identifying competences

As mentioned in the previous section all respondents described some methods of competence identification and they acknowledged the importance of competence modelling in general level. The meaning of identifying competences was highlighted by several interviewees, like this:

"In a way you should of course aim to recognise those you think are the important skills and then you should find out what kind of gaps are out there (Respondent #10)

"(identifying competence surveys) ..yes we have had those, and every now and then new plans are around, for instance now there is an aim to integrate these issue into review discussion where both parties could reflect the performance.." (Respondent #7)

" I have personally been executing three surveys, kind of a test which all have sought somewhat different things. ...we have for instance so called 360, so that you have your boss, employee, and colleague, there are certain sets of questions and you receive anonymous feedback" (Respondent #6)

Some examples related to the importance of competence modelling were also given outside forest sector, for instance, the Kone Inc. was quoted as a good example of a prosperous organisation which has utilised competence modelling:

"well how about these kinds of firms that have clearly made progress in all this, for example Kone, how they have made it, you should go there and see (Respondent #10)

4.1.3 Organising the competence information

According to Campion et al. (2011) organising the competence information is among others defining the language of competences and setting levels of proficiency on those competences or using competence libraries. An example of setting the company level of proficiency for certain competence was mentioned as follows:

"Knowledge. In a way we have tried to define what kind of knowledge we need at the organisational level. First of all, there are defined substance related skills and then there are general skills. How we want to weigh these two kinds of competences on different positions. What is the starting level that you should have if you want to become for example manager, customer manager or something else." (Respondent #6)

Using illustrations such as diagrams and pictures to communicate competency models is also a way of organising competence information. An interviewee mentioned competence library, IPE, International Position Evaluation system, however, the interviewee remarked that the system is not used in their own organisation. From the following quotation it is possible to realize that the interviewee sees the current way of describing positions' competences unreliable, instead he/she would see IPE as a useful system:

"I know that those IPE classifications are somehow used in bigger companies, oh well however no such thing in our firm, I have a rule of thumb that in our case the position is described in a way you pull from hat, once in some other places the position has a IPE-code" (Respondent #8)

In generally speaking, organising competence information was a theme that was hard to recognise from interviews. This is rather technical human resource management area in the competence modelling and most likely interviewees were not aware of all these aspects in detail.

4.1.4 Use of competence modelling

Unlike organising competence information, the use of competence modelling was a common topic in interview discussions. A typical usage among interviewees was review discussion – that is appraisal function. The basic idea of review discussion is to evaluate employee's activities and performance. This evaluation is then the starting point to competence modelling and finding out the competence development needs from the individual employee's perspective and reflecting also the needs of the organisation. This idea was clearly visible in the following quotations:

"Every employee is reviewed at least once a year. The superior appraises actions and performance. This is for example of one starting point for personal development needs." (Respondent #3)

"..and then if you think about some feedback you received it has been seen a good way, and if it is a longer time ago that you had your appraisal discussion you need to split those issues, you know, those things that are needed here (in this organisation)" (Respondent #4)

A part of review discussions was also the motivation function. That is, during the review discussion employee's answers to competence survey was elaborated and superior tried to increase employee's self-reflection and motivation:

"I considered that certainly this person is a better master of those things and I just asked him that what you in fact were thinking when answering the questionnaire like this…I did not directly say that your own review was at too low level…and it was a rewarding moment for many to realise that actually I can do all kinds of things – more than having thought earlier." (Respondent #4)

Keeping records of individual competence measures was seen useful also for promotion function. This function needs from the individual´s side to follow the development of competences throughout the career, and in this respect the importance of résumé was emphasised. That is why for both HR department (employer) and employee it was seen important to keep the personal competence information up to date:

"it is in a way the purpose that our human resources management will have a more precise picture of those things that motivate the fellow like myself to do my best for the firm, in a way most likely when I will apply inside the firm the next position then they will focus on what they know about this guy." (Respondent #6)

One way of keeping personal records was measuring of competences through employee's outputs. This principle was clearly stated in the following quotation:

"Competence should be measured through different performances that describe competence. Meaning that, if someone working as timber buyer knows his or her job well it should show up as good performance. You have to have certain amount of wood coming in, good cost structure, certain activity and so forth. The results that this specific person achieves at their job describe the competence as well. If there are deficiencies on the performance, then we need to find out what kind of measures should be taken in order to successfully perform one´s duties." (Respondent #3)

It was realised from interviews that small companies do competence modelling through informal practices. In these organisations, all competence information is thus more or less depending on the perceptions and personal memory of superior as follows:

"Through all informal discussion you get to know what each one knows…well, which projects you could allocate to whom is informal and you have to yourself dig up this information, all this knowledge is somehow developed to you informally around coffee tables." (Respondent #8)

4.2 How the modelling of competences is perceived in the organisations?

All the respondents saw modelling of competences in general level as a positive and important thing for the development of the organisation:

*"In a way it **drives people to prepare** because they know that [the performance] **will be measured** and you can see it clearly **effects the attitude**." (Respondent #5)*

Some of the respondents also criticised the meaningfulness of competence modelling. The meaning of competence itself was seen as unclear and hard to define; especially within the context of daily work life it could feel very abstract. It was noted that the modelling feels like an extra layer of unnecessary work on top of normal duties. It was noted that the work performance shows if the competences are there or not. Respondents also realised that for some employees, the competence modelling can have a negative sound as well:

*"I think you should **be very subtle when measuring competence**. So that it doesn´t cause such a feeling that now I am being observed and followed. Someone is watching what I am achieving." (Respondent #1)*

The generic competences, such as project management or language skills, were seen as the easiest to model quantitatively. However, when moving towards leadership competences the item was seen more like qualitative:

"Well in the first place it was a prolonged process to define what are those (competences) when HR started to launch this kind of a massive project, ...you can in a way do it with project management or language skills, so that you can define it in a scale 1 to 5..however with leadership skills it turns to be more like qualitative" (Respondent #4)

With large organisations one specific challenge with quantitative competence modelling was that when the organisation is heavily occupied with experts the list of competences is growing rapidly. Experts' subject specific competences could be really detailed and to measure them all in a quantitative survey makes it heavy, for instance:

"...that for example something like this that I know chemistry does not tell anything, however, if you know something like organic stereo chemistry and tell it with five letter acronym of an analysis then it already tells something…when you do this kind of a matrix you will have a damn big number those single items." (Respondent #10)

The company size also influences how and on what scale it is possible to do any competence modelling. It was considered that because of promotion purposes there is no need for formal competence modelling in a small organisation because the likelihood for the change in job description is small. Besides the aforementioned problems, employees also felt frustrated for the burden of competence modelling systems and the lack of follow-up actions:

*"And of course **the upkeep of the information is very important**. So, that we bring in to the systems the information of what courses people have taken, what competences they have and so forth. But I must say that **the upkeep is heavy and time consuming**. And another thing that should be recognised is that **people are increasingly critical on how they use their time**. So if they do not see any benefits from something they will not take part or are not **motivated**. This applies for the training and competence measuring as well." (Respondent #7)*

Overall the attitudes towards the competence modelling were positive and it was seen as an important tool for the development of the organisation. This was perceived important in all interviewed organisations, private and public.

4.3 Future challenges and competence needs

The importance to know the future needs and respective competences was stressed in several responses. Furthermore, when competences are measured with current outputs (indirect measure) the challenge of getting to know about future needs was stressed, for instance:

***"**We are talking about **strategy or long term** planning. Part of this is recognizing different **development needs**, recognizing different **organisational needs** and **competences that the organisation ought to** have…. We **measure competence through indirect measures**. Of course there are challenges; let´s say for example you might perform well, but how about in the future? **So you have to think about the future as well**." (Respondent #3)*

The following six themes emerged as dominating future trends in the field of forestry: 1) Increasing mobility, 2) Automation including intelligent systems using big data, 3) Technology as an aid for work, 4) Organisational changes, 5) Uncertainty, and 6) Internationality. The following extracts from the interviews illustrate how the interviewees discussed the themes 1) to 3):

*"Working **does not necessary need a physical space** and you can basically work wherever. The **connection is very much online** all the time. Sometimes you have to be able to close all the devices and start thinking about something else than just the **constant flow of information**. Overall I think this could happen really fast. Five years from now everything will be very **automatic** and you just follow the information or type in to the computers what you want to acquire and **it produces the information**." (Respondent #1)*

*"I believe that in five years a lot of the tasks will be **automated.** You open your computer and will have a summary of **what is happening** at the moment and what would be important to note. This all will come automatically." (Respondent #1)*

*"You do not need a specific place for work anymore. Instead **you can work from anywhere and at any time**. You are online all the time." (Respondent #6)*

In relation to the uncertainty it was noted that the demands and expectations that the younger generations have for work are changing along with the nature of employment:

*"There is **no such thing as permanent position** anymore. There are just positions until further notice." (Respondent #7)*

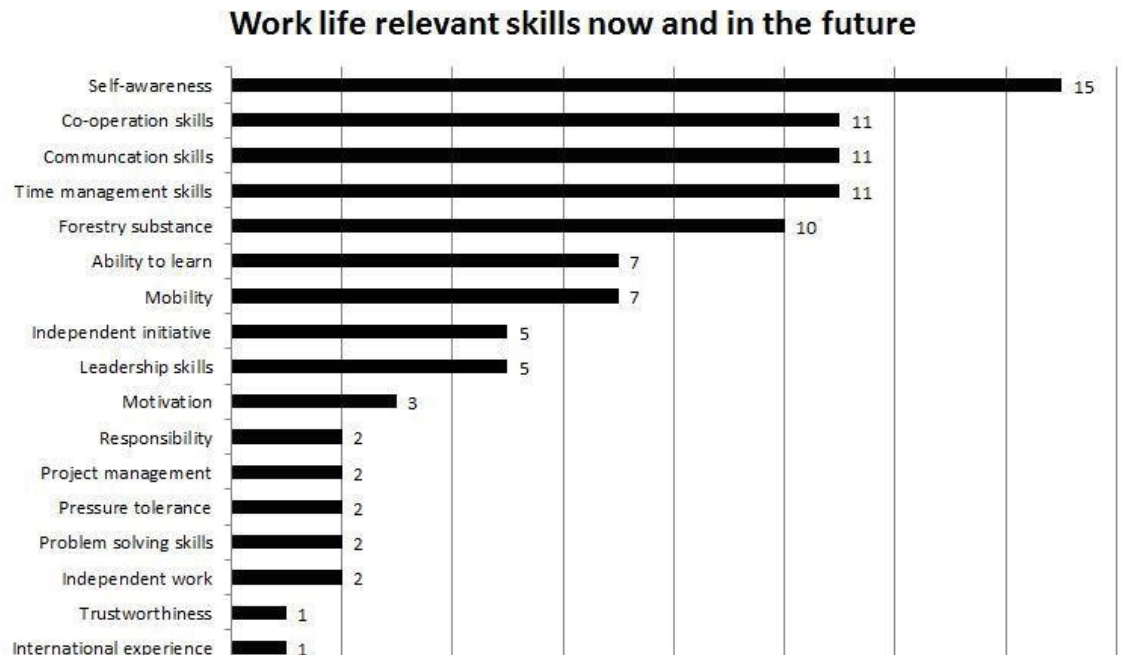

Fig. 1. Work life relevant competences in the future. Numbers are mentions by the respondents when discussing about the future of work and important competences (codes overlapping).

As regards to the competence needs in the forest sector the respondents identified several skills and knowledge important in the future. Especially, they emphasised the importance of generic skills. Fig. 1 illustrates in detail what kind of attributes came up in discussions about the future work life. The bars in the figure describe how often these aspects were mentioned during the interviews.

The attribute most often mentioned was that of self-awareness. The respondents explained that while in the past the permanent position was perceived important, nowadays work is seen more as projects, and it is common to change employers frequently. This can be both due to changes in the nature of labour market but also because attitudes of the employees have been changing as well. This development emphasises the need for self-awareness of the employees of their competences. It is important for the employees to be able to recognise their own strengths and weaknesses, as well as what is the most suitable and effective way for them to work. One of the respondents described this in the following way:

*"How are you going to **sell yourself** if I have to tell you tomorrow that there is no more work? How will you **sell yourself** to the next employer?" (Respondent #8)*

Besides self-awareness, the respondents emphasised the importance of co-operation, communications and time management skills. The future work life was seen as more and more fragmented, thus demanding more skills of this sort from the employees. In the following quotations, the respondents discuss these skills.

"You have to be well organised. If necessary, you close down all the phones, ignore the e-mails, close all the programs so that no one is able to disturb if you have something urgent that needs to be done. The person has a responsibility to be able to determine when you are ready to receive external signals and when you are not." (Respondent #6)

"One important thing would be to be able to leave time for thinking. Meaning that, if you have your calendar full all day, every day, having several meetings a day it might not be the best possible solution." (Respondent #1)

In addition to the generic skills described above, substance knowledge was also brought up in the interviews. A typical comment related to substance competences is that it is so self-evident that people do not remember or identify it properly. This was nicely stated in the following quotation:

"And it is always when asking those competences especially related to leadership then you hear things like those (generic competences). Your own basic competences which is there behind you is not mentioned because it simply stays there and is not in the surface visible. The basic competences remain thus undervalued, because we do not recognise it because it is so self-evident." (Respondent #3)

5 Discussion

Results of the study show that in the Finnish forest sector the competence modelling practices, especially in the forms of review discussion and quantitative surveys, was commonly used even though not always in a systematic way. These two methodological approaches were seen complementary and supporting to each other. Beside these two formal methods informal approaches were also common especially on a team level and in smaller organisations. This is an important aspect in the competence modelling, since tacit knowledge can be very valuable in successful management of operations like Nonaka and Takeuchi (1995) have already stressed. Comparing these results with the literature (Rodriguez et al. 2002; Campion et al. 2011) we may realise that traditional job analysis, expert interviews, and structured focus groups were the methods not mentioned by interviewed managers.

Results of this study can be reflected in the light of earlier competence literature, especially Campion et al. (2011) classifying competence modelling into three main topic areas: identifying competences, organising competence information and use of competence models. Of those topic areas interviewees seem to have a general level understanding about the need for identifying competence in their organisations – taking the fact of their difficulties to deeply understand the concept of competence. Especially respondents acknowledge the aim of linking competences and human resources with organisational goals which is in line with Lähtinen et al. (2008) and Toppinen et al. (2013).

Any items related to the second topic area, organising the competence information, was not so frequently mentioned by interviewees. This observation is most likely understandable when we recall that this topic area is in many ways rather technical, including for instance the use competence libraries (Homer 2001; Campion et al. 2011; Matook and Maruping 2014). The respondents were mainly not HR experts and thus not familiar with such technicalities.

However, the third topic area, use of competence modelling, was rather frequently touched upon by interviewees. The most common functions of competence models were appraisal, motivation and promotion. Whereas, the recruitment and compensation functions were almost missing in the discussions (Campion et al. 2011; Tripathi and Agrawal 2014).

The interviews revealed interesting perceptions of competence modelling. Organisation wide surveys of the competences have been seen very hard to implement due to an extensive amount of work and time involved. This was also recognised as a possible obstacle by Markus et al. (2005) and Sleezer et al. (2014). Especially smaller organisations often considered formal competence modelling taking too much resources and yielding little benefits. These findings are in line with the literature of

performance measurement systems (Bourne et al. 2000). On the contrary, review discussions were more continuous in nature and were repeated annually no matter the type or size of the organisation.

Our findings showed that the forest sector experts expected several work-related challenges such as increasing amount of information, use of mobile technology, organisational changes and uncertainty. It seems that traditional ways of working are making way for more flexible – an expectation in line with the trends identified commonly elsewhere (Blok et al. 2012; Green 2006; Holman 2013).

Expected future changes was seen to set important requirements for the employees, such as self-awareness of one´s own competences, working habits, and other generic skills. These expectations are comparable to long term trends in forest related competence needs (Barret 1953; Miller and Lewis 1999; Sample et al. 2015; Schuck 2009; Kilpeläinen et al. 2014). Some respondents reminded that despite generic skills emphasis, substance related competences are important but often as self-evident neglected.

A main limitation of this study is the small sample size which is typical in explorative qualitative studies. Therefore, generalisations of results into the whole forestry sector in Finland and beyond is not possible. However, the data was unique covering small, medium and large organisations in private and public sector, thus providing good variation in terms of informants' backgrounds. In qualitative research, the quality of the data and the variation of respondents is a bigger concern than the quantity of the data. Some researchers have reported very small saturation point, that is, the point where no new information emerges when the number of participants is increased (Kettunen and Tynjälä 2018). We believe that in our study the experts interviewed and our analysis provided a useful basis for further, quantitative, investigation. Another limitation may be that the respondents' considerations were mainly related to competence modelling of expert professionals, whereas attention was not paid so much on blue collar workers who, however, still comprise the majority of employees in forest sector as a whole.

6 Conclusions

On the basis of the present study we can conclude that the experts in the forest sector are facing similar future challenges and competence needs than other sectors of business and industry. The development of technology, uncertainty and internationalization are acknowledged as global trends in many studies (Davies et al. 2011; Tynjälä 2013; Fidler and Williams 2016). Similarly, the competence needs recognized in the present study are in line with the literature. Several foresights (Davies et al. 2011; Fadel et al. 2015) suggest that in addition to field-specific professional knowledge and skills, future jobs require more than ever different kind of generic skills such as diverse social, communication, thinking and problem solving skills. Furthermore, our interviewees stressed not only skills and competences but also other attributes, especially self-awareness. These findings have practical implications suggesting that education in the field should focus not only on subject-specific knowledge but also on developing diverse generic skills. Also, further education, in-service training and learning at work are important for experienced professionals in the fast changing world.

As regards competence modelling, the respondents recognised and acknowledged its importance for the success of the organisation. However, it is important to keep in mind that competence modelling should not burden the employees unnecessarily besides their core tasks. Proper structures and methods for modelling can yield valuable information for the management, but also motivate employees on their personal development. The size of the company sets its own challenges. It was noted that small companies can model competences easier through informal channels, whereas larger companies could need more formal structures or combine both.

Overall, it can be concluded that several useful methods and frameworks for competence modelling exists. An important part of the future research is to continue exploring to what extent these methods and frameworks are in use in forest sector organisations. With this knowledge, better competence modelling and human resources management can be developed in order to improve the overall performance of forest bio-economy sector.

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