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Heikki Manninen[1,2], Hanna Lehtimäki[3], Riitta Kilpeläinen[4], Eila Lautanen[4] and Kalle Kärhä[1]

# The qualifications and competence in supervisory and management skills among recently graduated Finnish forestry professionals

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## Highlights

- A remarkably large share of forestry professionals has supervisory or managerial duties soon after their graduation.
- Supervisory skills were considered important for all forestry professionals regardless of their position.
- The respondents recognized notable gaps in their competence in supervisory and management skills relative to work requirements, which higher forestry education must react to.

## Abstract

In the past decade, research and several surveys have indicated that the competence of higher forestry education graduates does not meet the requirements of working life regarding supervisory and management skills. The aim of this study was to discover what kind of supervisory and management competence is required in the daily tasks of early-career forestry professionals, and to what extent the teaching of these skills would be advisable to include in higher forestry education. The study was implemented through a Webropol survey of the Master's of Forestry graduates and forestry engineers graduated between 2018–2021, which mapped their supervisory and managerial duties and skills. The study population was 1046 people, of which 30.4% responded to the survey. The principal finding was of an apparent extensive need for the abovementioned skills, as supervisory duties are typical in the work of forestry professionals soon after their graduation. In this study, approximately one fifth of the employed respondents worked in a supervisory position, one third had supervisory or managerial duties, and half had an indirect network of subordinates. Supervisory skills were seen important for all forestry professionals regardless of their position. Moreover, self-management, team management, and well-being and occupational health management were regarded as important skills. However, there appeared to be notable gaps in all these skills. The study results contribute to improving working life orientation in higher forestry education. Based on these findings, we recommend that teaching of these subjects should be implemented by integrating the topics into field-specific courses.

**Keywords** competence gap; forestry organizations; generic skills; higher forestry education; working life orientation; work requirements
**Addresses** [1]University of Eastern Finland, P.O. Box 111, FI-80101 Joensuu, Finland; [2]South-Eastern Finland University of Applied Sciences, P.O. Box 68, FI-50101 Mikkeli, Finland; [3]University of Eastern Finland, P.O. Box 1627, FI-70211 Kuopio, Finland; [4]TTS Työtehoseura, P.O. Box 5, FI-05201 Rajamäki, Finland
**E-mail** heikki.manninen@xamk.fi
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# 1 Introduction

Globally, acceleration of digitalization and polarizing labor markets will change the future competence requirements, for instance, transversal skills will be highlighted (Orr et al. 2020). This requires reactivity in higher education institutes (HEIs), which have to be aware of key labor competencies and capabilities to fulfill the professional labor needs of society and employers. In Finland, the function and funding of HEIs are instructed by national laws and decrees. The statutory function of universities of applied sciences (UASs) is to offer higher education based on the requirements and development of working life (Ammattikorkeakoululaki 14.11.2014/932). Furthermore, the statutory functions of regular universities are to offer the highest education based on science and educate students to serve the country and humankind (Yliopistolaki 24.7.2009/558).

In Finland, orientation toward the demands of working life has been emphasized in higher education during the past decade (Opetus- ja kulttuuriministeriö 2012, 2019). The majority of Finnish HEIs' funding is based on national financing through the core funding model (Opetus- ja kulttuuriministeriön… 17.1.2019/117, Opetus- ja kulttuuriministeriön... 17.1.2019/119). Even though the volume of graduates is the dominant factor for financing, also the employment of graduates has been one criterion in the core funding model for HEIs since 2017 (Opetus- ja kulttuuriministeriön… 29.4.2016/331, Opetus- ja kulttuuriministeriön… 15.9.2016/814). Currently, the employment criterion is divided in two parts, of which another measures the quality of employment. Evaluation of this criterion is based on National Career Monitoring Surveys (Opetus- ja kulttuuriministeriö and Opetushallitus 2023), which are administered to students five years after their graduation. The indicators for the core funding model measure students' opinions about 1) their readiness for working life after their education, 2) satisfaction with their degree regarding their career development, 3) possibilities to apply the competencies learned in higher education in their current position, 4) requirements of their current position corresponding to the received education, and 5) their education's ability to develop specific working life competencies (Opetus- ja kulttuuriministeriö 2018).

An appropriate education is not only a conducive factor to better employment but also an essential element for better productivity and job satisfaction at the individual level. According to self-determination theory, human well-being requires satisfaction of three universal basic psychological needs: autonomy, competence, and relatedness (Deci and Ryan 2000). This macro theory is valid across domains such as parenting and education, but also in working life. The satisfaction of these needs "promotes autonomous motivation, high-quality performance, and wellness" (Deci et al. 2017). Because competence refers here to an individual experience in which a person has the skills to function properly in their work, working-life-oriented education is crucial.

In previous research in the field of forestry, working life competencies were categorized in various ways (Hejke et al. 2003; García-Aracil and Van der Velden 2008; Bullard et al. 2014), including as vocational and generic competencies or as technical, general, and personal competencies. However, a common highlighted theme has been the importance of generic skills such as the ability to work independently, oral communication, and problem solving (García-Aracil and Van der Velden 2008; Sample et al. 2015). According to Puhakka (2011), the significance of generic skills has been emphasized in previous research on the concordance of working life competencies and higher education. In addition, Rekola et al. (2018) highlighted that generic competencies will be essential in the forest sector in the future.

In Finland, creditable and regular surveys on learning outcomes and working life orientation in the field of forestry have been conducted since 2013 (Kilpeläinen and Lautanen 2013,

2014, 2017a, 2017b, 2019, 2021, 2022; Kilpeläinen 2014; Kilpeläinen et al. 2014; Lautanen and Kilpeläinen 2019). Along with a high graduate employment rate, these surveys point out many positive results from higher education in the field of forestry. For example, 79% of forestry engineers who had graduated between 2018−2019 evaluated their professionality to be quite good, good, or excellent. The most highly developed skills were traditional forestry-specific skills like forest regeneration, forest measuring, and silviculture (Kilpeläinen and Lautanen 2021). The learning outcomes of Master's of Forestry graduates and forestry engineers resembled each other; that is, 73% of Master's students who had graduated between 2018−2020 evaluated their professionality to be quite good, good, or excellent. Although the traditional forest-specific skills were also the most developed skills among the Master's graduates, some generic skills such as critical information acquisition and processing also received good evaluations (Kilpeläinen and Lautanen 2022). The results from the National Career Monitoring Survey support the abovementioned findings: 79% of forestry engineers that graduated between 2013−2018 and 83% of Master's students that graduated between 2012−2017 were at least "quite satisfied" with their degree (Opetus- ja kulttuuriministeriö and Opetushallitus 2023).

However, the findings of the abovementioned surveys have not been solely positive. Remarkably, many generic skills had not developed adequately during higher forestry education. Moreover, despite the knowledge offered by these regular surveys, this result has not improved during the past decade. Since 2011, forestry engineers have repeatedly evaluated that learning outcomes during their education were weakest in skills such as customer service, supervisory and employee skills, stress tolerance, and maintenance of well-being and occupational health (Kilpeläinen and Lautanen 2021). The results of the Master's degree graduates have been similar or even worse: the abovementioned skills were also ranked lowest in development in the same period, while only stress tolerance was remarkably better developed (Kilpeläinen and Lautanen 2022). Meanwhile, Forss et al. (2023) reported that employers value the management skills of forestry professionals when they recruit them to their organizations. The gap of competence in generic skills is observed broadly among university students in Finland. According to Ursin et al. (2021), generic skills among the majority of university students are only at a moderate level, and progression in generic skills has been slight during the course of education. The challenge does not exist in Finland only; Sample et al. (2015) revealed that social skills such as communication skills are also in high demand among forestry professionals in the United States. Nevertheless, these skills also have the largest potential to be developed.

In order to improve higher forestry education, we have to understand the current and upcoming requirements in the various roles of forestry professionals. We already recognize that forestry organizations operate in networks, with a clear requirement for leadership and management (Ovaskainen and Pajuoja 2020). Furthermore, in the National Career Monitoring Survey, both Master's of Forestry graduates and forestry engineers who graduated after 2013 evaluated supervisory and management skills to be quite important (Opetus- ja kulttuuriministeriö and Opetushallitus 2023). According to recent research on leadership, value creation happens when relating to stakeholders, which emphasizes the interaction skills of supervisors, for example (Lehtimäki 2020). However, development of these skills during education is limited. Among forestry engineers, this development was even slightly lower than for graduates of all other disciplines at a similar level of education (Opetus- ja kulttuuriministeriö and Opetushallitus 2023).

Consequently, we do not accurately know who, where, or what kind of supervisory and management skills are needed in the field of forestry. Thus, the main objective of this study was to investigate the importance of different supervisory and management skills and possible competence gaps in these skills among Finnish early-career forestry professionals. The research questions were as follows:

- What kind of supervisory and management competence do early-career forestry professionals need in their daily working life?
- From where early-career forestry professionals' current competence in supervisory and management skills is originated?
- What kind of education on supervisory and managements skills should be included in higher forestry education and how it could be developed?

In this article, the meanings of the terms "competence" and "qualification" are structured according to Hanhinen (2010). Competence consists of know-how and the capability of performing in work or a mission, and qualification refers to requirements and competency needs in a workplace or organization. The term "supervisory skills" is used to refer to the knowledge and skills that are needed in a supervisory position. It includes generic skills, but also the substance skills of management and leadership. The term "management" is used in a broad meaning, referring to knowledge and skills in its functions, but does not exclude leadership either.

## 2 Materials and methods

### 2.1 Population and questionnaire

This article focuses on recently graduated forestry professionals who obtained the title of Finnish forestry engineer (i.e., Bachelor of Natural Resources) or Master of Forestry (i.e., M.Sc. (For.)) who graduated between 2018–2021. In Finland, higher forestry education is currently offered in two regular universities and six UASs. The study population was identified from graduate data obtained from these eight HEIs. The population size was 1046 people, comprising 771 forestry engineers and 275 Master's of Forestry graduates.

The data was collected by a Webropol survey, which was open for answering from 28th February to 10th April 2023 as part of a larger data-gathering effort. The respondents were invited to participate in the survey via personal letter. The size of the sampling group was kept as parallel and large as the population as possible. However, deceased people, those living abroad, and people who were forbidden to disclose their contact details by the Digital and Population Data Services Agency were excluded from the sample group. Consequently, the invite letters were sent to 868 respondents (83.0% of the population) in February 2023. Reminder letters were also sent three weeks after the first letter.

The respondents were advised to participate in the survey via QR code or hyperlink. The questionnaire was built using the Webropol tool and consisted of 21 questions, most of which were multiple choice (Table 1). The first part of the questionnaire (5 questions) mapped respondents' backgrounds, such as the age, gender, graduation year, and the name of the HEI from which the respondent graduated. Some of the HEIs offers the Bachelor of Natural Resources as a hybrid learning program (i.e., multiform education), thus the execution of studies was asked to determine. The second part (5 questions) focused on respondents' current employment situation. Those who worked in the field of forestry were also requested to name their employer. All respondents were asked to evaluate the duration of their work and supervisory experience before and after their graduation. In the third part (3 questions), they had to answer if their position involved supervisory or managerial duties and, if so, how many subordinates were directly under and/or indirectly in their networks, such as in a subcontracting chain.

The fourth part of the questionnaire and the next two questions examined the respondents' opinions about the importance of different supervisory and management skills in their career so

**Table 1.** Subjects of multiple and open-ended questions in the questionnaire mapping supervisory and managerial duties and skills of recently graduated Finnish forestry professionals. The division into groups represents grouping of respondents for the analyses in the study based on their answers.

| | Subject of question | Division into groups |
|---|---|---|
| 1 | Age | |
| 2 | Gender | |
| 3 | HEI from which graduated | Master's graduates / Forestry engineers |
| 4 | Year of graduation | |
| 5 | Type of execution of studies | Original / Multiform |
| 6 | Employment situation | Forestry / Non-forestry / Not employed |
| 7 | Employer (*if in the field of forestry) | |
| 8 | Employer's field (*if in the non-forestry field) | |
| 9 | Work experience before/after graduation | |
| 10 | Work experience in supervisory position etc. before/after graduation | Experienced / Non-experienced |
| 11 | Supervisory or managerial duties in current position | Included / Not included |
| 12 | Number of subordinates | 0 / >0 |
| 13 | Number of indirect subordinates in networks etc. | 0 / >0 |
| 14 | Importance of and own competence in supervisory skills | |
| 15 | Importance of and own competence in management skills | |
| 16 | Contributors of supervisory and managements skills | |
| 17 | Open question about skill contribution | |
| 18 | Post-graduation education activities | |
| 19 | Name of education (*if attended in Q18) | |
| 20 | Justification for post-graduation education (*if attended in Q18) | |
| 21 | "Free words" | |

far. Furthermore, they were asked to evaluate their current competence level in these corresponding areas. The respondents had to give their evaluations on a Likert scale of "extremely slight" (1), "slight" (2), "moderate" (3), "high" (4), and "extremely high" (5). The questions included nine supervisory and eleven management skills that were compiled and defined based on the literature (Minzberg 1973; Kotter 1990; Sydänmaanlakka 2006, 2012; Mumford et al. 2007; Hyppänen 2013; Viitala and Jylhä 2019). To ensure that the respondents had a similar understanding of the terms used, descriptive examples of the meaning of each term were presented beside the questions (Table 2).

The fifth and the last part (6 questions) of the questionnaire handled respondents' development in supervisory and management skills. The respondents were asked to estimate how much their higher forestry education, work experience, and other factors had improved their skills in supervising and management. The scale (Likert) was the same as previously described. The next questions involved possible further training in these subjects. Finally, the respondents were asked to share their general thoughts and recommendations for useful actions in higher education to improve the development of supervisory and management skills.

Before the implementation of the survey, the questionnaire was tested on a total of seven people, including forestry professionals and the steering group of the project. In addition, to ensure the functionality of part four of the questionnaire (evaluations of supervisory and management skills), these two central questions were composed with four stakeholders, i.e., experienced managers from different key forestry companies. With their assistance, the categorization of supervisory and management skills was formulated to meet the qualifications in the field of forestry.

**Table 2.** Descriptive examples of the terms presented beside the questions 14 and 15 in the survey to recently graduated Finnish forestry professionals about their supervisory and managerial duties and skills.

| Skills evaluated | Descriptive example of the meaning |
|---|---|
| Supervisory skills | |
| Communication skills | Openness, clarity, timeliness, non-verbal communication |
| Feedback skills | Positive and constructive feedback, listening, intervening in problems |
| Human relations skills | Building trust, emotional intelligence, utilization of human diversity |
| Interaction and co-operative skills | Listening, influencing, showing appreciation |
| Labor law competency | Duties and rights, settlement of terms and conditions of employment |
| Motivation skills | Encouragement, improving the working atmosphere, generating collective targets |
| Negotiation skills | Preparing, defining of goals, problem-solving |
| Organizational skills | Orderliness, prioritization, delegation, detection of overall view |
| Recruitment and instructional skills | Evaluation of suitability, interview skills, orientation planning |
| Management skills | |
| Customer relationship and service management | Management of purchasing and sales business, productization of services |
| Change management | Reorganization of duties, handling of change resistance |
| Financial management | Business monitoring, utilization of business ratio, budgeting |
| Management by coaching | Recognition of qualifications, evaluation and development of competencies and capabilities, and encouragement of them |
| Network and subcontracting management | Contracting of terms and practises of co-operation, coordination |
| Project management | Planning, organizing, and involvement in periodic development projects |
| Remote management | Supporting and guiding remote or multi-seat workers |
| Self-management | Self-knowledge, self-development, time management, sense of work stamina |
| Strategic management | Visioning, formulation, implementation and monitoring strategy |
| Team management | Distribution and entrust of duties, resource allocation, directing activities |
| Well-being and occupational safety management | Caring about work resources and safety |

## 2.2 Data analyses

In order to examine individual competency needs, we performed a gap analysis of differences between the importance of and current competence in supervisory and management skills. The gap describes relative extent of shortage in respondents' competency in comparison to his/her opinion of required level of the skill. The gap was achieved by subtracting the current competence level from the importance of it in the respondent's career (Eq. 1):

$$G_i = I_i - C_i \quad (1)$$

where:
$G_i$ = the gap between the importance of and current competence in skill *i,*
$I_i$ = the importance of skill *i* in the respondent's career so far, 1,…, 5,
$C_i$ = the respondent's current competence level in skill *i*, 1,…, 5.

Statistical analysis of the data was made using IBM SPSS Statistics 28.0 software. Except for the open-ended questions, the answers were set as multiple choices or numeric values, which were described as frequencies and/or basic statistical descriptives such as averages, medians, and standard deviations. Differences between frequencies were evaluated with a $\chi^2$ test (chi-square).

Based on the background and several other questions, the respondents were categorized into different groups (Table 1). These groups were compared based on medians in different variables. The comparisons were carried out with nonparametric tests (Mann–Whitney *U* test and Kruskal–Wallis one-way ANOVA test). The significance of statistical values was evaluated at a 95% confidence level ($p < 0.05$).

Answers from the last two open-ended questions were gathered in ATLAS.ti software. The qualitative research data were examined with simple content analysis. A coding system was created to improve and intensify the analysis.

## 2.3 Non-response analysis

The analysis of the total non-response of the total survey data was conducted in the beginning of June 2023. Twenty-nine people from the sample group (n = 868) were systematically (systematic selection after random beginning) selected, and attempts were made to contact them via phone call. The questionnaire was shortened to nine questions, which were presented over the phone. The questions handled the respondents' background information, employment situation, supervisory or managerial duties and position, and importance of supervisory skills. Three people could not be reached and one did not want to participate in the survey. As 11 people had answered the original survey, 14 responses were gathered from the new respondents.

## 2.4 Respondents

The survey data consisted of 318 answers. Individuals who responded represented 30.4% of the total population of forestry professionals graduated between 2018–2021. Of these respondents, 28.9% held a Master's in Forestry (Table 3). More than two thirds (n = 218) of respondents were male, and the rest (n = 100) were female.

Of the respondents, 62.3% were 30 years old or younger. The rest of the respondents were divided quite evenly into older age groups between 30 and the age of the oldest respondent, 67 years. The average age was 32.6 years (median: 29.0 years, std: 8.7 years). Fifty-four respondents represented the multiform students (23.9% of forestry engineers), and their average age was 43.3 years. Most of the respondents had only a few years of work experience before their graduation (Fig. 1). The multiform students caused an exception to the distribution of work experience, as the majority of them had work experience of twelve years or even longer prior to graduating.

**Table 3.** Graduates and survey respondents by higher education institute (HEI) of forestry collected in the survey to recently graduated Finnish forestry professionals about their supervisory and managerial duties and skills.

| HEI of forestry | Number of graduates (N) | % of all graduates | Number of respondents (n) | % of graduates of HEI | % of all respondents |
|---|---|---|---|---|---|
| University of Eastern Finland | 103 | 9.8 | 43 | 41.7 | 13.5 |
| University of Helsinki | 172 | 16.4 | 49 | 28.5 | 15.4 |
| Häme UAS | 122 | 11.7 | 27 | 22.1 | 8.5 |
| Karelia UAS | 135 | 12.9 | 31 | 23.0 | 9.7 |
| Lapland UAS | 141 | 13.5 | 37 | 26.2 | 11.6 |
| Novia UAS | 22 | 2.1 | 2 | 9.1 | 0.6 |
| South-Eastern Finland UAS | 178 | 17.0 | 84 | 47.2 | 26.4 |
| Tampere UAS | 173 | 16.5 | 45 | 26.0 | 14.2 |
| In total | 1046 | 100 | 318 | 30.4 | 100 |

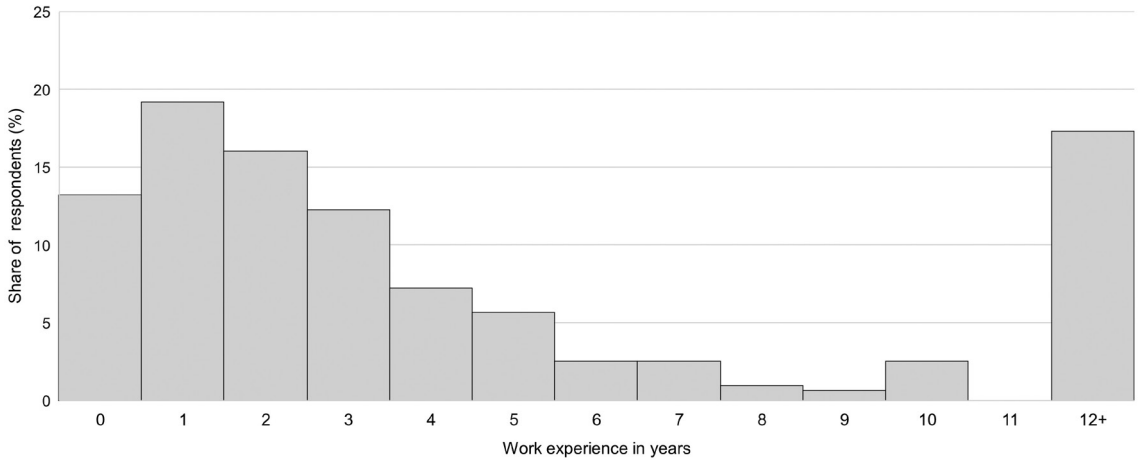


**Fig. 1.** Pre-graduation work experience of respondents (n = 318) in the survey to recently graduated Finnish forestry professionals about their supervisory and managerial duties and skills, in years.

# 3 Results

## 3.1 Supervisory and managerial duties

Of the respondents, 63.5% worked in "a position corresponding to their education in the field of forestry" (Fig. 2). The proportion was higher among forestry engineers (66.8%) than among Master's graduates (55.4%), but the difference was not statistically significant ($p=0.056$). In addition, 6.3% of the respondents had "other positions in the field of forestry" and 3.1% of the respondents worked as "entrepreneurs." The largest employers of the respondents who worked in the field of forestry ($n=222$) were "forest industries" (45.0%) and "forest management associations (FMAs)" (14.4%). Except for one respondent, every respondent employed in FMAs was a forestry engineer.

Of the respondents, 31.8% had experience of supervisory or equivalent duties before graduation. This most frequently took place over a quite short period. With over half of these respondents (51.5%), the experience was only one year long. Despite this, 49.5% of those who had prior supervisory experience also had supervisory or managerial duties in their current position.

Almost one fifth (19.9%) of employed respondents ($n=292$) worked in a supervisory position, having one or more subordinates. Of these, 60.3% had experience of supervisory duties before graduation. The share of supervisors was even slightly higher in the groups "a position corresponding to their education in the field of forestry" and "other position in the field of forestry." The number of subordinates per supervisor averaged 7.2 (median: 3.5, std: 8.9).

More than one third (33.9%) of employed respondents ($n=292$) stated that their position contained supervisory or managerial duties. From here on, we call this group the "Leading professionals." Approximately half of them had experience of supervisory duties before graduation. Almost half of the employed respondents (49.0%) had at least an indirect network of subordinates, such as in a subcontracting chain. This was even more common (55.4%) in the group "a position corresponding to their education in the field of forestry." Despite their longer prior work experience, the positions of the multiform students did not differ significantly from those of the other respondents. Only a direct supervisory position was slightly more likely to be held by a multiform student (28.8%) than by the other respondents (17.9%), but this difference was not statistically significant ($p=0.073$).

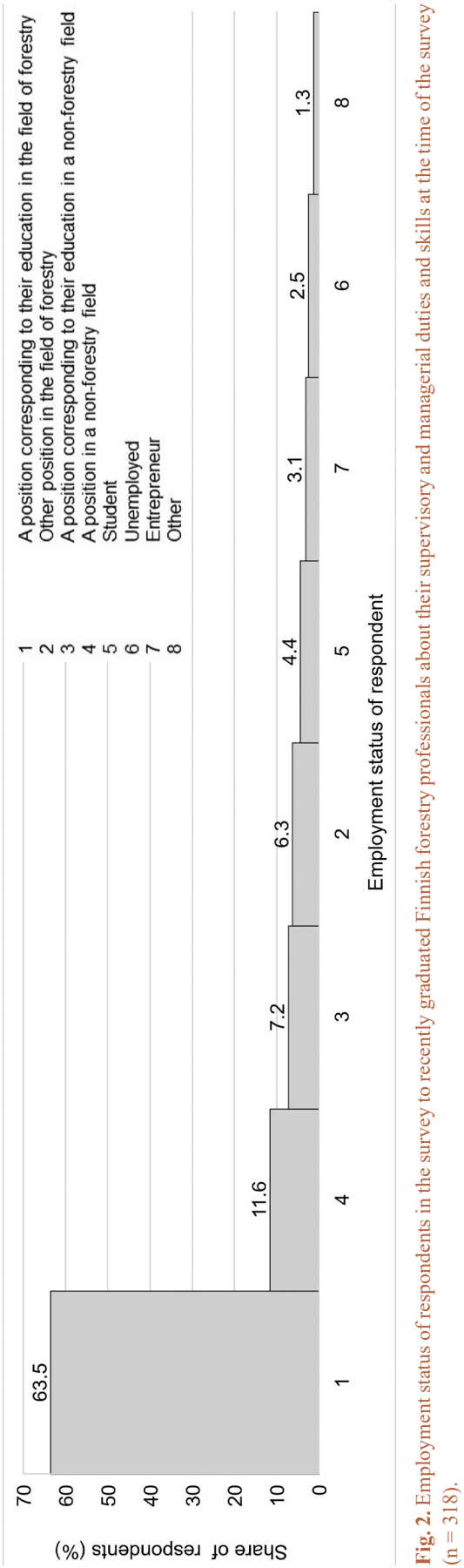


**Fig. 2.** Employment status of respondents in the survey to recently graduated Finnish forestry professionals about their supervisory and managerial duties and skills at the time of the survey (n = 318).

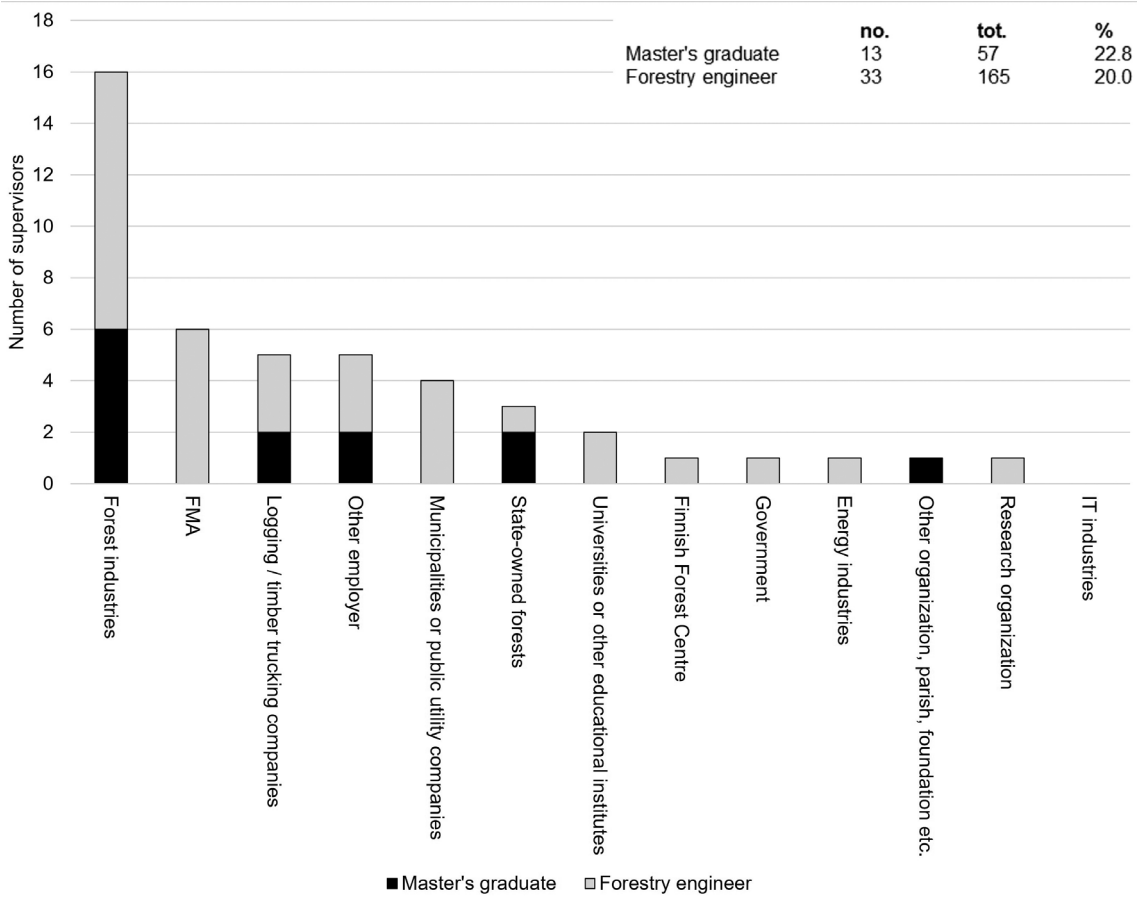


**Fig. 3.** Distribution of respondents in supervisory positions in forestry organizations discovered in the survey to recently graduated Finnish forestry professionals about their supervisory and managerial duties and skills. The total number encompasses all employed respondents in the field of forestry.

In the field of forestry (n = 222), 20.7% of respondents worked as a supervisor. Their employers were divided similarly with those of the other employees in the field of forestry (Fig. 3). However, Master's graduates were most frequently (37.5%) in supervisory positions in the largest group, the forest industries. Other key employers for supervisors were "FMAs", "logging or timber trucking companies", "other private companies", "municipalities or public utility companies", and "State-owned forests."

In the field of forestry, no significant differences were detected in duties depending on education. A slightly larger proportion of Master's graduates worked as a supervisor (22.8%; n = 57) compared to forestry engineers (20.0%; n = 165). In addition, 35.1% of Master's graduates and 36.4% of forestry engineers had supervisory or managerial duties in their current position. Forestry engineers (55.2%) had more indirect subordinates compared to Master's graduates (49.1%) but the difference was not statistically significant ($p = 0.431$).

## 3.2 Experienced importance of and competence in supervisory skills

The most important skills identified among all respondents were generic skills such as organizational, human relation, and interaction and co-operative skills (Fig. 4). The importance of all supervisory skills was evaluated as being relatively high, with averages from 3.82 to 4.60. The two least important skills (labor law competency, and recruitment and instructional skills) were slightly

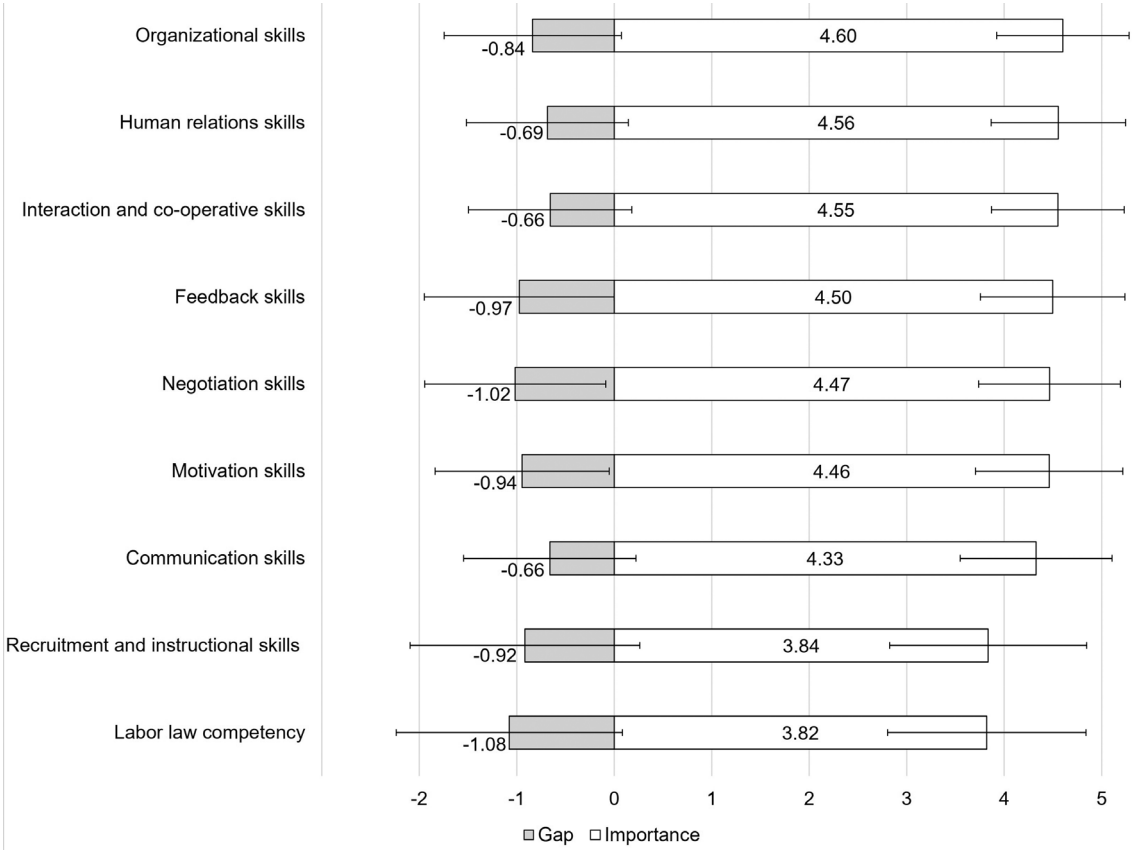


**Fig. 4.** The averages of the respondents' (n = 318) experienced importance of supervisory skills and calculated gap between this and their experienced own competence (from extremely slight (1) to extremely high (5)) in these skills discovered in the survey to recently graduated Finnish forestry professionals about their supervisory and managerial duties and skills. Bars indicate average values and lines standard deviations.

separated from the other more important skills. The largest calculated gaps between respondents' experienced importance and their own competence were in labor law competency (–1.08), negotiation (–1.02), feedback (–0.97), and motivation skills (–0.94).

The group of Leading professionals evaluated the importance of all supervisory skills higher than the other employed respondents. These differences were quite minor – under 0.3 in each – but statistically significant ($p < 0.05$) except for feedback skills ($p = 0.050$) and the two least important skills, recruitment and instructional skills ($p = 0.098$), and labor law competency ($p = 0.153$).

Of the respondents, 48.1% had previous experience of supervisory or equivalent duties before or after graduation. From here on, we call this group the "Supervisory-experienced professionals." They evaluated their own competence in all supervisory skills higher than the other respondents, and part of these differences were notable. The highest statistically significant differences were in recruitment and instructional skills (gap: 0.39; $p < 0.001$), labor law competency (gap: 0.38; $p < 0.001$), motivation skills (gap: 0.32; $p < 0.001$), negotiation skills (gap: 0.29; $p < 0.01$), and organizational skills (gap: 0.20; $p < 0.05$). There were no statistically significant differences in the other supervisory skills.

The comparisons between Master's graduates and forestry engineers indicated that the former group reported lower competence in every skill compared to forest engineers. There were statistically significant differences between Master's graduates and forestry engineers in labor law competency (gap between the groups: –0.33; $p < 0.01$), communication (gap: –0.31; $p < 0.001$),

organizational (gap: –0.20; $p < 0.05$), and motivation skills (gap: –0.16; $p < 0.05$). On the other hand, the results varied slightly when we examined the gap between importance and current competence. Nevertheless, Master's graduates had a higher gap compared to forest engineers in communication (gap: –0.20), organizational (gap: –0.21), and motivation skills (gap: –0.20), whereas labor law competency (gap: +0.14) showed the opposite trend. However, there were no statistically significant differences between the Master's graduates and forest engineers in the gaps calculated.

## 3.3 Experienced importance of and competence in management skills

Among all respondents, the importance evaluation of one management skill rose clearly above others (Fig. 5). The importance of self-management was evaluated to be 4.51 on average, i.e., between high and extremely high. In addition, team management (4.08) and well-being and occupational safety management (3.98) were slightly separated from the remaining management skills, which were divided quite evenly, with averages from 3.56 to 3.75. Although the calculated gaps between respondents' experienced importance and their own competence did not vary notably between the skills, they were at remarkable levels. The largest gap was in change management (–0.90), and the smallest was in project management (–0.61) (Fig. 5).

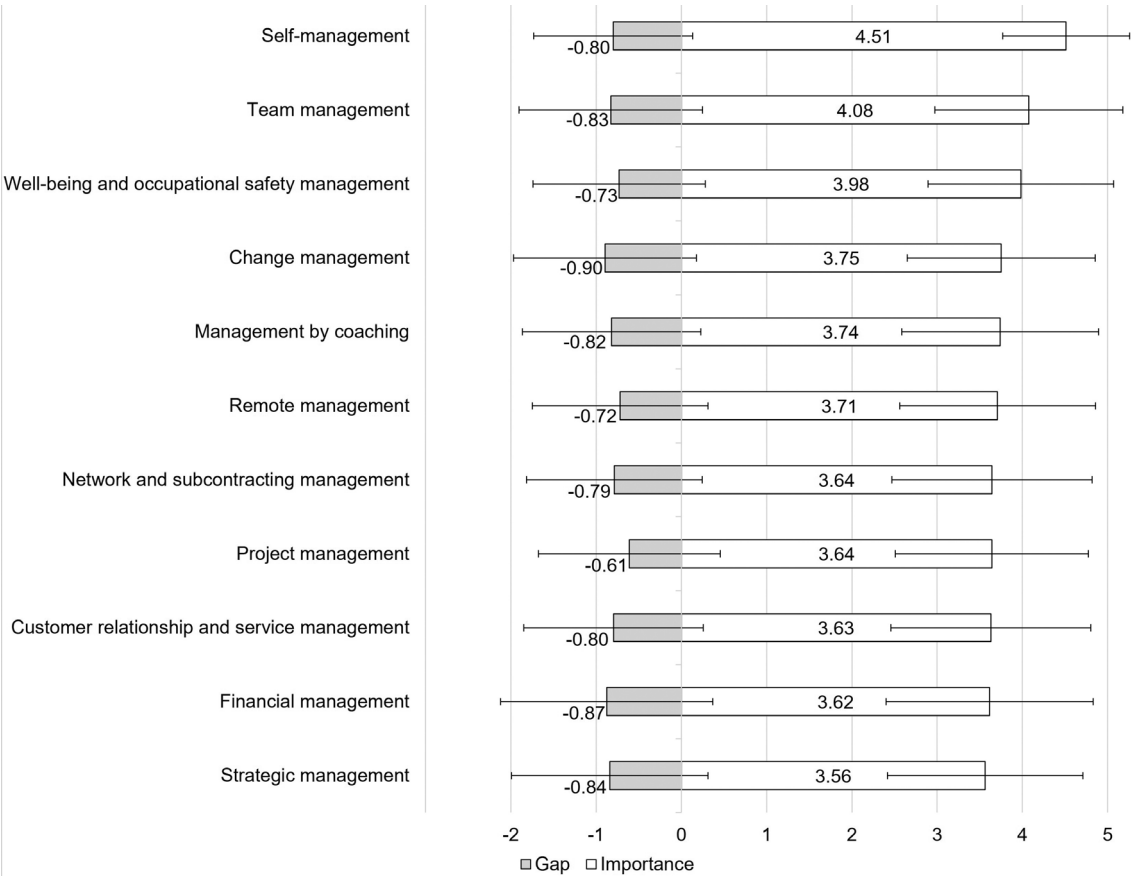


**Fig. 5.** The averages of the respondents' (n = 318) experienced importance of management skills and calculated gap between this and their experienced own competence (from extremely slight (1) to extremely high (5)) in these skills discovered in the survey to recently graduated Finnish forestry professionals about their supervisory and managerial duties and skills. Bars indicate average values and lines standard deviations.

The group of Leading professionals evaluated the importance of each management skill higher than the other employed respondents. There were statistically significant differences in the averages of eight management skills, from the lowest difference of +0.22 ($p < 0.05$) in change management to the highest (+0.51, $p < 0.05$) in well-being and occupational safety management. Moreover, remarkable were the three management skills that did not differ between the groups. In self-management, which was very important in both groups, with averages of 4.64 and 4.47, respectively, was no statistically significant difference between the groups ($p = 0.094$). There was no significant difference between the groups in project management ($p = 0.488$) or customer relationship and service management ($p = 0.548$), either.

Appropriate work experience had a remarkably improving effect on competency in most of the management skills. The group of Supervisory-experienced professionals gave significantly higher evaluations of their current competence in ten management skills than the other respondents. The highest differences were in team management (+0.60; $p < 0.001$) and network and subcontracting management (+0.59; $p < 0.001$), but significantly high differences were also observed in the lowest-valued skills, project management (+0.41; $p < 0.001$) and well-being and occupational safety management (+0.41; $p < 0.001$). The only exception was self-management, in which no differences in competence between the groups were found ($p = 0.610$). In fact, the standard deviation of all the respondents' evaluations of competence was the lowest for self-management, at 0.827.

The differences in respondents' own competence between Master's graduates and forest engineers were quite minor and varied in both groups' favor. Statistically significant differences were only detected for competency in management by coaching (+0.23; $p < 0.05$) and in well-being and occupational safety management (+0.22; $p < 0.05$), in the forestry engineers' favor. Furthermore, the only statistically significant ($p < 0.05$) finding in gaps between importance and current competence was the –0.26 lower result reported by Master's graduates for their project management skills.

Comparisons between respondents employed by different employers in the field of forestry ($n = 222$) indicated only weak signals of variation in the importance of and current competence in management skills. Evaluations of own competence in self-management indicated statistically significant differences ($p < 0.05$). The highest evaluations were from respondents who worked in research organizations, municipalities or public utility companies, and State-owned forests. Competence in network and subcontracting management also varied significantly ($p < 0.01$), and was weakest in IT companies, FMAs, and in government and other employers. The importance of project management skills was highlighted among respondents who worked in IT companies, municipalities or public utility companies, and the Finnish Forest Centre, but received significantly lower evaluations ($p < 0.01$) from other respondents, such as those who worked in logging or timber trucking companies.

## 3.4 Development in supervisory and management skills

The respondents' evaluations about "higher forestry education" as a contributing factor for supervisory and management skills were low-to-moderate (Fig. 6). The average of the evaluations was only 2.66 ($n = 318$), which is more than "a little," but less than "passable." The average of "work experience" was higher (4.01; $n = 318$), corresponding to "a lot." As the significant contributor of "work experience" was "other factors," (4.00; $n = 65$), which the respondents defined as, for example, "life experience," "hobbies," and "volunteer work." Furthermore, the evaluations of "other degree or sub-degree" were, on average, 3.44 ($n = 50$) and management education in the Finnish Army ("reserve officers' school or non-commissioned officers' school") averaged 3.38 ($n = 144$). The other degrees or sub-degrees named were mostly in the business sciences, management studies, or pedagogy. Post-graduate education was quite rare ($n = 30$).

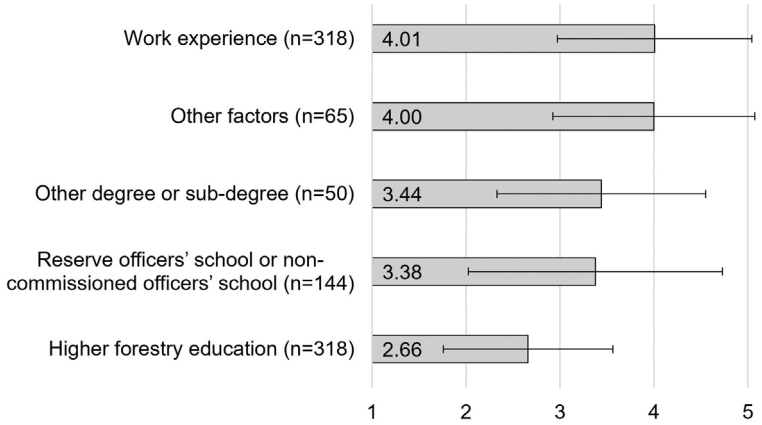


**Fig. 6.** The averages of the respondents' evaluations about the significance of the contributing factors for their supervisory and management skills (from not at all (1) to extremely high (5)) discovered in the survey to recently graduated Finnish forestry professionals about their supervisory and managerial duties and skills. Bars indicate average values and lines standard deviations.

## 3.5 Open questions

Answering the open questions was voluntary. However, 202 respondents (63.5% of all respondents) answered the question concerning useful actions for contributing development in supervisory and management skills during higher forestry education. After the qualitative analysis, the most-trending answer was "project and group work," with 37 mentions. For instance, one respondent wrote as follows:

*"In group work, it would be good to randomly select a manager for the project and, in addition to returning the assignment, to have a feedback conversation about the manager's and team's performance."*

The second most common answer, with 35 responses, was "management generally." The respondents hoped that their degree would include courses about management, for example:

*"Studying could include learning about the basics of management, for example in course format."*

Moreover, themes repeated throughout the answers included "supervisory skills and managing people" (25), "interaction skills" (18), "recognizing human diversity" (18), and "practical training" (18). In addition, working life orientation was highlighted. One respondent wrote:

*"In my curriculum there was one course in management, but it was useless. When studying management, the distribution should be 10% theory and 90% assignments of peer-to-peer management or such practical training…"*

In the last question of the survey, 118 respondents opened up about their more general thoughts on supervisory and managerial work. A great deal of dissatisfaction with leadership and management in the field of forestry was reported:

*"At the moment there is a lot of old-fashioned management in the forest industry, which unfortunately affects the well-being of employees and causes their movement to other fields. I myself changed to another working field specifically because of poor human resource management in the field of forestry. Besides my own experience in [a forest industry company], I heard similar occurrences from other companies, on a more moderate scale, though. After all, inadequate leadership skills or the invisibility of them in practical work are a huge challenge in the field of forestry, especially because there hasn't been any change despite regular feedback. It's necessary to emerge from the past millennium regarding this subject, too."*

Several respondents noted that not every forest professional will work in a supervisory or managerial position; nor would every forest professional be capable of such work. However, many respondents suggested that supervisory and management education would be very useful for every forest professional regardless of position:

*"The subject is important and even ordinary employees would gain an advantage from these skills, for example in guidance for trainees. Besides, supervisory and management studies support subordinate skills, too, which benefits the whole work community."*

On the other hand, many respondents claimed that leadership and management skills can only be learned through practical actions. In addition, some special characteristics in the field of forestry were also noted:

*"Management of contractor and contractor networks should be added in current education. This kind of operations model is currently common in the field of forestry, and management of it is completely different than the supervision of direct subordinates, which I've also studied during my life. I believe that this operations model will become widespread in the future."*

# 4 Discussion

## 4.1 Reliability of the study

The number of respondents was relatively high, at 318 and 30.4% of the total population. Relative to the number of letters sent (868), the response rate of the survey was good, at 36.6%. The representativeness of the respondents was quite extensive. Compared to the total population, the respondents who had studied at the University of Eastern Finland or South-Eastern Finland University of Applied Sciences actively took part in the study, and hence were slightly over-represented in the study data (cf., Table 2). The rest of the respondents were divided quite evenly, representing different HEIs with the same ratio as the number of graduates. The only exception were forestry professionals from Novia, who were highly under-represented. The gender distribution of the respondents was congruent with the total population.

The analysis of non-response did not show remarkable systematic distortions between the respondents of the survey and the responded population. Of the respondents who answered the shortened questionnaire via phone (n = 14), 78.6% were men, and most worked in a position corresponding to their education in the field of forestry (85.7%). Concerning the importance of supervisory skills, the averages of their evaluations fit into the standard deviation of the comparable evaluations in the original survey data. However, no one had direct subordinates, only 14.3% had some supervisory or managerial duties in their current position, and only 35.7% had an indirect network of subordinates. That is, there may have been a trend in which those with supervisory or managerial duties or similar in their current position replied to the survey more actively than others.

The validity of the questionnaire was confirmed by several professionals. Especially, the questions about supervisory and management skills were formulated with care by applying professionality of four stakeholders. Furthermore, some descriptive examples of the meaning of each term alongside the questions on supervisory and management skills were presented to ensure that the respondents had a similar understanding of them. We cannot find such variation in the answers that would indicate incoherence in understanding of these terms. However, misunderstandings among the respondents have been possible to some extent. In agreement with Wilton (2008), we are confident that recently graduated forestry professionals are best-placed to evaluate their current competencies in relation to the qualifications of working life.

### 4.2 Supervisory and management skills are necessary for many forest professionals

At the time of answering the survey, the respondents had post-graduation work experience of 1 to 5 years. One fifth of the respondents had subordinates, one third had some supervisory or managerial duties in their current position, and up to half had an indirect network of subordinates, such as in a subcontracting chain. Consequently, a remarkably large share of forestry professionals needs at least some kind of supervisory or management skills soon after their graduation.

Excluding labor law competency and recruitment and instructional skills, the importance of all supervisory skills received evaluations averaging between "important" and "extremely important" among all respondents. Hence, these mostly generic skills were considered to be important for every forestry professional. In addition, answers to open-ended questions repeated the importance of the competence of managing people. This observation of the importance of generic skills in the field of forestry aligned with previous studies (Schuck 2009; Arevalo 2011; Sample et al. 2015; Rekola et al. 2019). Nevertheless, the demand for these skills was further highlighted as important in supervisory or managerial duties.

Contradictory, we found a notable gap in relation to the current competence of respondents. A lack of negotiation and feedback skills may cause problems, for example, in working among forest operations, which are often implemented with subcontracting networks (Kronholm et al. 2019; Jylhä et al. 2020; Ovaskainen and Pajuoja 2020). A forestry professional plans and leads forestry operations, while the indirect subordinates in the subcontracting network are responsible for their implementation. Managing without a direct supervisory position may require even higher-level, or different, supervisory skills. According to Lehtimäki (2020), stakeholder interaction is important in value creation, which underlines the importance of interaction and co-operation skills, such as in the leading of subcontracting networks.

The results did not differ greatly from those produced by the National UAS Career Monitoring Survey, where both Master's of Forestry graduates and forest engineers emphasized skills such as initiative and self-direction, negotiation and communication skills, and stress tolerance. Furthermore, as a combining factor for these surveys, both highlighted a large gap in competence in these skills. Interestingly, similar shortages have been found generally among graduates from higher education in Finland (Opetus- ja kulttuuriministeriö and Opetushallitus 2023).

Despite some respondents stating that practical work is the best tool for learning leadership and management skills, the competence in human relationships, interaction and co-operative skills, feedback, and communication skills was not significantly better for respondents with experience of supervisory or equivalent duties. Therefore, it seems that these skills do not develop through practical work. Naturally, it has to be taken into account that the respondents had relatively short work experience. However, as crucial working life competencies, teaching of these subjects should be included more effectively in higher forestry education. For example, students' internship periods could be utilized more extensive for guided training of these skills.

Of the management skills, self-management was considered an extremely important skill regardless of the position a person has in an organization. Moreover, the reported current competence in self-management did not differ between respondents with more or less work experience. This suggests that self-management skills should be learned before employment. Moreover, Rekola et al. (2018) underlined that personal self-management skills will be essential in the forest sector in the future. The importance of team management relative to the other skills was also notable, with higher evaluation, which may have been a result of the common organizational structure in the field of forestry. Recently graduated forestry professionals often work as part of a team. The importance of other management skills was evaluated as "moderate" and "high." On the other

hand, apart from project management and customer relationship and service management, the demand for these skills was highlighted in supervisory or managerial duties. Thus, the need for these skills may not be universal, but is central for those whose career will lead to supervisory or managerial positions.

### 4.3 Higher forestry education needs to develop to improve working life orientation

The results of the survey revealed that higher forestry education has been comparably slight contributor for supervisory and management skills. Several respondents claimed that teaching of these skills had been inadequate both quantitatively and qualitatively. Indeed, the subject has not been particularly visible in the mid of 2010s in the programmes of Bachelors' degree, as obligatory studies of supervisory and management skills have varied between 2−10 ECTS credits depending on the HEIs (Häme UAS 2015; Karelia UAS 2015; Lapland UAS 2015; South-Eastern Finland UAS 2024; Tampere UAS 2015; University of Eastern Finland 2015; University of Helsinki 2015). Master's degree programmes have offered optional courses mostly (University of Eastern Finland 2015; University of Helsinki 2015). According to previous research, the respondents' unimpressive feedback concerning HEIs is not surprising. The development of supervisory skills in the education of Master's students and forestry engineers has been weak (Kilpeläinen and Lautanen 2017a, 2017b, 2019, 2021, 2022). The teaching of supervisory skills was already experienced as too low in relation to qualifications in the work of forestry professionals among graduates at the beginning of the 21st century (Kilpeläinen 2014). More surprisingly, higher forestry education has not developed in the past decade in relation to the teaching of supervisory and management skills. It seems that – in the regular universities, at least – this has been more or less a conscious choice. According to Shuck (2009), these institutions evaluated the importance of generic skills such as planning and time management, oral and written communication in the native language, and leadership comparably low in relation to qualifications of working life. On the other hand, UASs have included courses of general and supervisory skills broader than prior in the latest curricula (Häme UAS 2024; Karelia UAS 2024; Lapland UAS 2023; Novia UAS 2023; South-Eastern Finland UAS 2024; Tampere UAS 2023).

The results of this study should compel HEIs to develop their teaching of supervisory and management skills. Adding a management course into the curriculum may be a fast and obvious solution, but we also underline a focus to teaching methods. As stated in the responses to open-ended questions, students urge practical training. Meanwhile, forestry students have been quite satisfied with the working life orientation of their educations, especially in the substance skills in the Bachelor's degrees. Field education in particular is experienced as important (Kilpeläinen and Lautanen 2021, 2022). Generally, teaching of supervisory and management skills in higher forestry education seems to be scarce, but is it also initially out of working life orientation? Does the education offer similar managerial challenges that forestry professionals face in their work? Has forestry education been able to tie supervisory and management teaching adequately into the context of the work of forestry professionals? The results, and especially the answers to the open-ended questions, did not support this.

On the contrary, the teaching of supervision and management would be useful to integrate into forestry-specific courses. Virtanen and Tynjälä (2022) observed that collaborative and active forms of learning among constructivist learning environments and integrative pedagogy are essential in the learning of social skills. Several respondents stated that project and group work could have been conducive tools for learning supervisory and management skills. Indeed, project and group-work in forestry-specific areas and learning environments contribute the learning of generic skills as well as field-specific skills. Dividing roles and responsibilities among group members enables

students to reflect theory of management in practice. Furthermore, Problem-Based Learning, for example, is an effective learning method to simulate and practice the real challenges of working life (Poikela 2022) and was also recommended by some respondents.

The respondents shared concern of a risk that the teaching of supervisory and management skills would remain superficial and ineffective without a connection to reality. Nevertheless, training periods, for example, could be better utilized for the teaching of supervision and management. With high-quality pre-assignments, students would be able to learn about the real scenarios of working life more deeply. In line with this, Kettula (2012) presented encouraging and relevant results of innovative teaching methods that simulate real working life situations. Moreover, almost a third (31.8%) of the respondents had at least some experience of supervisory or equivalent duties before their graduation. This group was widely represented (60.3%) among current supervisors. On the other hand, half of the respondents with prior supervisory experience also had supervisory or managerial duties in their current position. Thus, prior experience appears to have lead graduates to similar duties sooner. From the point of view of pedagogy, the students' background and skill level is essential to recognize. Early experience offers a great opportunity for self-reflection in supervisory and management studies if it has been utilized in teaching.

## 5 Conclusions

In this study we examined what kind of supervisory and management skills are crucial at the beginning of forestry professionals' careers. First of all, we found that supervisory and managerial duties are very common early in these careers. This result, along with the high response activity obtained, emphasizes the real need for this study. Furthermore, one of the more significant findings to emerge from this study is that the majority of supervisory skills were seen as important for all forestry professionals regardless of their position. The respondents also highlighted the importance of management skills such as self-management, team management, and well-being and occupational health management. Notably, the gaps between respondents' own current competence and the importance of each supervisory and management skill were found to be evident. The largest and the most notable gaps were in those supervisory skills that are often described as generic skills.

In conclusion, we recommend that HEIs that offer higher forestry education focus more on the teaching of supervisory and management skills. The results especially emphasize the need for generic skills in the context of management. The developing actions should be motivational, as the present study shows the importance of the subject. Moreover, the working life orientation of education has become an increasingly essential part of the core funding model for HEIs. The integrated teaching of these subjects within field-specific courses is therefore justified. That may necessitate a renewal of the curriculum and of the education of teachers. Nevertheless, competence in management is so crucial that it affects the whole field of forestry, its attractiveness to employees, and their well-being at work.

## Supplementary files

Metadata of research data.pdf, available at https://doi.org/10.14214/sf.24007.

## Declaration of openness of research materials, data, and code

Access to the data is restricted. The data contain personal data, which cannot be disclosed. Anonymized data cannot be published until the entire research project is finished completed. Metadata of the research data are available at https://doi.org/10.5281/zenodo.13292847.

## Authors' contributions

All authors participated in devising the research framework and formulation of the survey questions, and revising the manuscript. H.M. performed the data acquisition and analyses and drafted the manuscript. K.K. participated in the data analyses, manuscript editing, and funding acquisition.

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